

# International Conference On Culture Technology(ICCT) 2018

November 15~18, 2018

Zhijiang College of Zhejiang University of Technology, Shaoxing, China



International Association for  
Convergence Science & Technology



한국과학예술포럼  
Korea Science & Art Forum  
[사] 한국전산융합연구원



浙江工业大学之江学院  
ZHEJIANG COLLEGE OF ZHEJIANG UNIVERSITY OF TECHNOLOGY



In-Cooperation



SIGAPP



ORIENTAL CONSULTANTS GLOBAL



AUTODESK.



中国设计智造大奖  
Design  
Intelligence  
Award





# Opening Address

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**Pyeongkee Kim**

Honorable Chair of ICCT2018



It is my great honor and pleasure to welcome all of you to ICCT2018 in Shaoxing, the hometown of intelligent people and tasty yellow wine(黄酒) for over 2,500 years. I am more honored than ever, for we could invite such important scholars as keynote speakers : Dr. Pan Yunhe - Academician of Chinese Academy of Engineering, Dr. Kwangyun Wohn - Chair of Korea National Council of Science & Technology, and Dr. He Renke - Dean of Hunan University. I want to express special thanks to Deputy Mayor Shao Quanzhen of Shaoxing City for his full support and participation. As all of you may already know, they have been serving us so excellently and giving such great influence in both academy and society. Instead of introducing their incomparable career here, I want to remind you that their lives show the very essence of creativity and convergence in addition to their teaching. I believe this is not a coincidence that we came to invite these respected speakers to this conference of culture and convergence technology.

Facing a sharp decline in birth rate and the huge effects of increasing use of AI technology, more innovative and wise future educational strategies are needed more than ever in all universities. With all participants, I really thank the president-speakers for the special session entitled “Higher Education for the 4th Industrial Revolution Era” : Dr. Sangdong Kim of Kyungpook National University from Korea, Dr. Rolly Intan of Petra Christian University from Indonesia, and Dr. Xuan Yong of Zhejiang International Studies University from China. I am sure that this will be a great time to find and share great insight on this issue.

While we prepare for these events, through such an excellent and friendly cooperation of General Party Secretary Zheng Yaping and President Li Penglin from Zhijiang College of Zhejiang University of Technology, my understanding of global cooperation, leadership and true friendship became clearer and deepened. I thank them again for their unlimited support for all the successful events. I also thank President Ye Fangchun of Shaoxing University Yuanpei College for his utmost support and help for CADI2018 and ISCC2018 exhibition. I also thank President Xu Zhenhua from Zhejiang Yuexiu University of Foreign Languages for supporting the special industrial design session in his beautiful library building. Please forgive me that I can not mention by name all the important scholars and participants.



IACST wants to contribute to our society by exchanging academic people and research results in convergence discipline, providing advanced and quality education to a young generation, and seeking global cooperation and friendship. While one person's intelligence and understanding is limited in depth and width, much better creativity and excellency can be made through cooperative convergence among people from different disciplines. New ideas and experiments should be tried and exchanged not only between disciplines but also among people having different perspectives. That is why we're having the three events in the same place and at the same time. I hope IACST and these events serve as a practical platform for finding and sharing fruitful culture and convergence technology and thinking.

Please enjoy the ICCT conference and CADI/ISCC Exhibition, having wonderful days full of good memories in Shaoxing. Thank you very much.

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Dr. PyeoungKee Kim  
Honorable Chair of ICCT2018 and President of IACST

## Congratulatory Message

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**Zheng Yaping**

Party Secretary,  
Zhijiang College of Zhejiang University of Technology

On behalf of Zhijiang College, Zhejiang University of Technology, I would like to express my heartfelt congratulations on the International Conference on Culture Technology 2018. We are very pleased and honored to host this international conference at our university. To tell the truth, I'm not sure the definition of "Culture Technology". But I imagine that the "Culture Technology" is something like "Collaboration between Art and Technology". Zhijiang College, Zhejiang University of Technology originated from professional school of photography was a pioneer in combining self-expression through photography (Art) with photographic techniques (Technology). Now Zhijiang College, Zhejiang University of Technology is a unique university in China in that it possesses Faculties of both Engineering and Arts. One of the important policies of me, Secretary of the Party Committee of Zhijiang College, Zhejiang University of Technology, is to enhance further collaboration between "Art and Technology". In this sense, Zhijiang College, Zhejiang University of Technology is really appropriate place to hold this conference on "Culture Technology". I would like to express my heartiest thanks to all the committee members who have been preparing this conference. I hope this conference will provide all the participants with places for active discussion and new ideas. I believe we can contribute to the quality of people's lives through both "Art and Technology", i.e. "Culture Technology"

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Zheng Yaping

Honorable Chair of the ICCT 2018 and Party Secretary, Zhijiang College of Zhejiang University of Technology

# Welcome Message

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**Xia Yingchong**

Organizing Chair of  
ICCT 2018



**Tae Soo Yun**

Organizing Chair of  
ICCT 2018



It is our great honor to welcome all of you to the International Conference on Culture Technology (ICCT 2018) in Shaoxing, China. First of all, We would like to express heartiest thanks to the professor Zheng Yaping, the president of Zhijiang College of Zhejiang University of Technology, for providing us with this beautiful place and supporting us with all her heart. We also give thanks to all the committee members who have been preparing this conference and all participants to present their excellent research results and heated discussion of the culture technology field.

Especially, we are very pleased and honored to host this international conference in three campus, Zhijiang College of Zhejiang University of Technology, Yuanpei College, Yuexiu University of Foreign Languages that play an important role in the development of Shaoxing City. As you know, Shaoxing is a beautiful city with beautiful mountains and rivers, long history and present. The world's largest textile fairgrounds are located, and rice-wine is recognized as the best drink in China.

With this historical culture and industrial base, Shaoxing City cooperates closely with the universities to cultivate the talented people needed in the industry and to become a competitive city through active cooperation with the countries around the world. In this respect, I am confident that Shaoxing city will be one of the most competitive city in China in the future.

We are very excited to hear everyone's presentations and we hope this conference will be meaningful for everyone. We hope all the researchers will be able to perform their best to describe their passions and also develop the knowledge from other researchers' presentations for future works.

Lastly, we would like to express thanks to the president of three university and officials of the municipal government who gave us a lot of support.

Thank you.

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Prof. Xia Yingchong

Organizing Chair of ICCT 2018 and Director of IACST

Dr. Tae Soo Yun

Organizing Chairs of ICCT 2018 and Chief Vice President of IACST

# TPC Chair Message

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**Dongkyun Kim**

TPC Chair of  
ICCT 2018

It is our great pleasure to welcome you to Shaoxing, China from November 15 to 18, 2018, for the International Conference on Cultural Technology (ICCT2018). This year, ICCT has various topics on Design and cultural technologies including information technology, and digital contents and cultural service. We have received about 100 paper submissions from 10 countries (Korea, Japan, Malaysia, Thailand, United States of America, China, Greenland, India, Indonesia and Iran) in the world. Through a rigorous review process, we have selected 82 technical papers for presentation at the conference. The accepted papers were organized into 28 technical oral sessions and a poster session. In addition, we have two more special sessions where we can share idea on Higher Education in the 4th Industrial Revolution Era, and Industrial Design in AI Era. Besides the papers contribution from all over the world, this successful program was made possible by the devoted service of technical program committee members. We would like to express many thanks to all of the TPC members as well as to the Organizing Committee Chairs for their active support and guidance. We hope that all of participants enjoy the excellent program of this ICCT2018 and the beautiful attractions of Shaoxing.

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Dr. Dongkyun Kim

TPC Chair of ICCT 2018 and Vice President of IACST



# Organization

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## Organizing Committee

### Honorable Chairs

- Zheng Yaping, Party Secretary of Zhijiang College of ZUT, China
- Dr. Li Penglin, President of Zhijiang College of ZUT, China
- Dr. Chen Dehong, Deputy Mayor of Shaoxing City, China
- Dr. Yanjin Ma, Mayor of Kechao District, Shaoxing City, China
- Prof. He Renke, Dean of Hunan University, China
- Dr. Pyeoungkee Kim, President of IACST

### Organizing Chairs

- Dr. Xia Yingchong, Zhijiang College of ZUT, China
- Dr. TaeSoo Yun, Dongseo University, Korea
- Dr. Chen Hao, Shaoxing University, China
- President Bill Chen, Zhejiang Creative Textile Industry Research Institute, China

### Registration Chairs

- Dr. Se Hyun Park, Daegu University, Korea
- Dr. Donghwa Lee, Daegu University, Korea

### Local Arrangement Chair

- Dr. Haixiang Heo, Zhejiang Yuexiu Univ. of Foreign Univ. China

### Publicity Chair

- Dr. Eun Yi Kim, Konkuk University, Korea

### Publication Chair

- Prof. Kyung Su Kwon, Dongseo University, Korea
- Ms. Junghye Kim, IACST

## International Advisory Committee

- Dr. Kazuo Sugiyama, Oriental Consultant, Japan
- Dr. Kwangyun Wohn, NST, Korea
- Dr. Chonggi Kim, Shanghai University of Science & Technology, China
- Dr. Tongjin Kim, Purdue University, USA

## Technical Program Committee

### TPC Chairs

- Dr. Dongkyun Kim, Kyungpook National University, Korea
- Dr. Xia Yingchong, Zhijiang College of ZUT, China
- Dr. Rattasit Sukhahuta, Chiang Mai University, Thailand
- Dr. Sungpil Lee, Dongseo University, Korea
- Dr. Hyeyoung Ko, Seoul Women's University, Korea



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## Steering Committee

- Professor, Pyeoungkee Kim, Silla University, South Korea
- Professor, TaeSoo Yun, Dongseo University, South Korea
- Professor, Rattasit Sukhahuta, Chiang Mai University, Thailand
- Professor, Xia Yingchong, Zhijiang College of Zhejiang University of Technology, China
- President, Bill Chen, Zhejiang Creative Textile Industry Research Institute, China
- Professor, Sungpil Lee, Dongseo University, South Korea
- Professor, Fei Hao, Shanxi Normal University, China
- Professor, YongUk Lee, Tokyo Polytechnic University, Japan
- Professor, Hisaki Nate, Tokyo Polytechnic University, Japan
- Principal Researcher, Thepchai Supnithi, NECTEC, Thailand
- Professor, Rolly Intan, Petra Christian University, Indonesia
- Professor, Elena Tsomko, Dongseo University, Russian Federation
- Professor, I Putu Agung Bayupati, Udayana University, Indonesia
- Professor, Yulia M. Kom, Petra Christian University, Indonesia
- Professor, Guydeuk Yeon, Christ University, India
- Professor, Intiraporn Mulasatra, Kasetsart University, Thailand
- Rector, Dam Quang Minh, Western University, Vietnam
- Professor, Ted Shin, Denver Metropolitan University, USA
- Professor, Donghwa Lee, Daegu University, South Korea
- Professor, Sian Lun Lau, Sunway University, Malaysia
- Professor, Hyeyoung Ko, Seoul Women's University, South Korea
- Professor, Jiman Hong, Soongsil University, South Korea
- Professor, KyungSoo Kwon, Dongseo University, South Korea
- Professor, Lee Yun Li, Sunway University, Malaysia
- Professor, Jaeho Pyeon, San Jose State University, USA
- Professor, SeHyun Park, Daegu University, South Korea
- Professor, Dongkyun Kim, KyungPook National University, South Korea
- Professor, EunYi Kim, Konkook University, South Korea
- Vice President, JongSoo Rhee, Pinetree Associates, South Korea
- CEO, SangHyo Lee, Namu Coding, South Korea
- Professor, Soon Ki Jung, Kyungpook National University, Korea

# Keynote Speech

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## **Dr. Pan Yunhe**

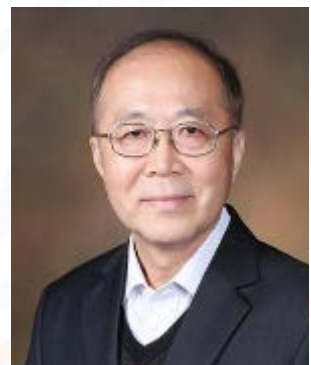
Academician of Chinese Academy of Engineering, China



Pan Yunhe (1946.11.4-), an expert in computer applications. Born in Hangzhou, Zhejiang province. He graduated from the Department of architecture of Tongji University in Shanghai in 1970. 1981 graduated from the computer department of Zhejiang University and received a master's degree, he served as lecturer, associate professor, Department of computer science professor. He was president of Zhejiang University in August -2006. May 1995. Since June 2006, he served as executive vice president of Chinese Academy of engineering. In March 2013, he was appointed member of the Standing Committee of the Twelfth National Committee of the Chinese people's Political Consultative Conference and director of the foreign affairs committee. He is also a member of the academic degree committee of the State Council, an advisor to the China Association of science and technology, and an honorary chairman of the Chinese society of image and graphics. Pan Yunhe is one of the pioneers in the field of intelligent CAD and computer art in china. He has long been engaged in the research of computer graphics, artificial intelligence, computer aided design and industrial design, computer art, intelligent CAD, computer aided product innovation, virtual reality, digital cultural relic protection and digital library and other fields, has undertaken many important scientific research topic, made a number of research results, and has good economic benefits and social benefits. He has published many research papers, and has won many national, provincial and ministerial level scientific and technological awards. In 1997, he was elected academician of Chinese Academy of engineering.

## **Dr. Kwangyun Wohn**

Chair, National Committee of Science & Technology, Korea



Chairman of Korea NST /Professor Emeritus, KAIST, Korea

He used "Culture Technology" first in the world

1986~1990: Professor, University of Pennsylvania, USA

1991~2004: Professor, KAIST, Korea

2005~2011: Founder & Dean, Graduate School of Culture Technology, KAIST

2005~Present: President, HCI Association, Korea

2017~Present: Chairman, National Research Council of Science & Technology, Korea

## **Dean & Prof. He Renke**

Hunan University, China



Professor Renke He, born in 1958, studied civil engineering and architecture at Hunan University in China. From 1987 to 1988, he was a visiting scholar at the Industrial Design Department of the Royal Danish Academy of Fine Arts in Copenhagen and, from 1998 to 1999, at North Carolina State University's School of Design. Renke He is dean and professor of the School of Design at Hunan University and is also director of the Chinese Industrial Design Education Committee. Currently, he holds the position of vice chair of the China Industrial Design Association.

Deputy Chairperson of China Industrial Design Association;

Chairman of China National Instructive Committee of Industrial Design Education;

President of Design Artists Association of Hunan Province of China;

Chairman of Instructive Committee of Design of China Engineering Education Association

Chairman of China-Italy Design and Innovation (Hunan)Centre

# Special Session

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## "Higher Education in the 4th Industrial Revolution Era"

### **Dr. Sangdong Kim**

President of Kyungpook National University, Korea



2013~2015: Director, Next Creative Mathematical Computation Division, BK21Plus/Ministry of Education

2009~2012: Appointed Board Member for Korea Research Council of Fundamental Science Technology, Ministry of Science and Technology Ministry of Science and Technology

2008~2009: Dean of Planning and Strategy, Kyungpook National University

2007~2008: Associate Dean of Academic Affairs, Director of Center for Teaching and Learning, Kyungpook National University

2004~2007: Research Director for World Class Leading Scientist Nurturing Project, Ministry of Science and Technology

2005~2006: Committee Member for National Institute for Mathematical Sciences, Ministry of Science and Technology

2002~Present: Professor of Mathematics, College of Natural Sciences in Kyungpook National University

1993~2002: Full-time Lecturer, Assistant Professor and Associate Professor Kyungpook National University

### **Dr. Rolly Intan**

Former President of Petra Christian University, Indonesia



Prof. Rolly Intan is currently a full professor in Informatics Department of Petra Christian University, Surabaya, Indonesia. He was also rector (president) of Petra Christian University from 2009 to 2017. His Doctor of Engineering degree was obtained in 2003 from Meiji University, Tokyo, Japan. Dr. Rolly Intan has research interests in how to apply Computational Intelligence and Soft Computing methods especially Fuzzy Sets Theory, Rough Sets Theory and Granular Computing in constructing Intelligent Information System. He has already published more than 80's papers in international journals and reputable international conference proceedings.

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## **Xuan Yong**

General Secretary, Zhejiang International Studies University, China



July 1984, graduated from the Zhejiang Institute of Inorganic Chemical Engineering Bachelor of Engineering, he worked in Zhejiang University master's degree in sociology Department of Philosophy of Law, East China Normal University, received a doctorate in education.

In November 1995, he was promoted to associate professor.

In September 2003, he was promoted to professor.

He served successively as deputy secretary of the Party branch of the School of Chemical Engineering of Zhejiang University of Technology, secretary of the Party branch, member of the Party Committee of Zhejiang University of Technology, and director of the organization department. Since 1996, he has served as a member of the Party Committee of Zhejiang University of Technology.

Mainly engaged in the field of public management, he is also a member of the Discipline Planning Group of the National Education Science Planning Leading Group, a member of the Academic Committee of the Chinese Higher Education Society, the Vice President of the Zhejiang Public Management Society, the Vice President of the Zhejiang Administrative Management Society, and the Zhejiang Education Economics. and management of key academic leaders and other staff, was selected first level of 151 talent project of Zhejiang Province and was the focus of funding.

In January 2010, he was selected as a national candidate for the "New Century Talents Project of the New Century" in 2009; enjoys special government allowances from the State Council, and Zhejiang Province has outstanding contributions to young and middle-aged experts. He is the representative of the 12th and 13th National People's Congress in Xiacheng District of Hangzhou.

Since December 2000, he has served as vice president of Zhejiang University of Technology, in charge of infrastructure, real estate, and public affairs.

From May 31, 2010, he served as Secretary of the Party Committee of Zhejiang Agriculture and Forestry University.

In July 2016, he served as member of the Party Committee and Secretary of Zhejiang Foreign Studies University.

# Schedule

Time	Program
<b>November 15(Thursday), Day for Friendship</b> Place: Yuanpei College, Shaoxing, China	
13:00~15:00	<b>Exhibition Setup</b> by CADI / ISCC 2018 Committee @ Yuanpei College
15:00~18:00	<b>Visiting Shaoxing Industry</b> (Jingong Holding Group) (Buses leave from Mirrorlake Hotel) @ Shaoxing Jingong Holding Group
18:30~21:00	<b>Welcome Reception</b> ( IACST directors, VIPs, and all participating professors are welcome to join ) @ Mirrorlake Hotel
<b>November 16(Friday), Day for Excellence,</b> Place: Zhijiang College of Zhejiang Univ. of Technology, Shaoxing, China	
08:00~09:00	Move to Zhijiang College (by bus)
09:00~09:40	<b>Registration</b> @ ZJC(Zhijiang College) Auditorium
09:40~10:40	<b>ICCT 2018 Opening Ceremony</b> - Opening Address (President, IACST) - Welcome Message (President, ZJC) - Congratulatory Message (Vice Mayor, Shaoxing City) - Congratulatory Message (Party Secretariat, ZJC) @ ZJC Auditorium
10:40~11:30	<b>Keynote Speech</b> Dr. Pan Yunhe (Academician, Previous President of China Academy of Engineering, China) @ ZJC Auditorium
11:30~11:40	Tea Break
11:40~12:30	<b>Keynote Speech</b> Dr. Kwangyun Wohn (Chair, National Committee of Science & Technology, Korea) @ ZJC Auditorium
12:30~14:00	<b>Lunch Time</b> @ ZJC Cafeteria
14:00~15:40	<b>Special Session 1</b> "Higher Education in the 4th Industrial Revolution Era" - President of Kyungpook National University, Korea - President of Petra Christian University, Indonesia - General Secretary of Zhejiang International Studies University, China @ ZJC Auditorium
15:40~16:00	Tea Break & Session Preparation
16:00~17:40	<b>Oral Paper Presentation (FR)</b> ( Session FR1~FR5 ) @ ZJC Building 3, Room#: 3C106 ~ 3C131
18:20~19:00	Move to the Hotel(by bus), Dinner for Applicants in the ZJC Cafeteria



Time	Program
<b>November 17(Saturday), Day for Design &amp; Convergence</b> <b>Place: Yuanpei College, Yuexiu University of Foreign Languages, Shaoxing, China</b>	
08:00~08:40	Move to Yuanpei College (for Poster-Paper Presenters, by bus)
08:20~09:00	Move to Yuanpei College (for General Participants, by bus)
08:40~09:10	<b>Setting Up for Poster Paper Presentation</b> @ International Culture Exchange Center(Floor 2), Yuanpei College
09:10~10:30	<b>Poster Paper Presentation (ST-P)</b> @ International Culture Exchange Center(Floor 2), Yuanpei College
10:30~11:00	<b>CADI / ISCC 2018 Opening Ceremony</b> - Congratulatory Message (President of Yuanpei College) - Welcome Address (CADI2018 Organizing Chair) @ International Center for Culture Exchange (Floor 1), Yuanpei College
11:00~11:50	<b>Keynote Speech</b> Dr. He Renke (Dean, Hunan Univ., China) @ International center for Culture Exchange(Floor 1), Yuanpei College
11:50~12:30	<b>CADI / ISCC 2018 Tape Cutting &amp; Viewing</b> - Tape cutting & Viewing (Together) @ International Center for Culture Exchange(Floor 1 & 2), Yuanpei College
12:30~14:00	Lunch Time @ Yuanpei College Cafeteria
14:00~15:40	<b>Special Session 2</b> "Industrial Design in AI Era" - Congratulatory Message (President of Yuexiu University) "Keqiao District Talent Policy" @ Yuexiu Univ. (Library Auditorium)
15:40~16:00	Tea Break & Session Preparation
16:00~17:40	<b>Oral Paper Presentation (ST)</b> ( Session ST1~ST6 ) @ Yuexiu Univ. (Teaching Building 1, 116~131)
17:40~18:40	Move to the Hotel (by bus)
19:00~21:00	<b>ICCT/CADI/ISCC 2018 Awarding Ceremony</b> <b>Banquet &amp; Performance</b> Banquet Hall @ the Mirrorlake Hotel

<b>November 18(Sunday), Day for Culture Experience</b> <b>Place: Mirrorlake Hotel, Shaoxing, China</b>	
09:00~10:30	<b>Industry - Academy Cooperation Meeting</b> @ Seminar Room, Mirrorlake Hotel
10:30~12:00	<b>Evaluation</b> (by Organizing Committee) @ Seminar Room, Mirrorlake Hotel

# Program

## Session FR1 – Digital Contents 1

16th 16:20~18:00, Room#: 3C116 @ ZJC (Building 3)

Session Chair: Prof. Mi Jin, Kim (Dongseo University, Korea)

- #562 "A UI Text Layout in VR Simulation based on Field of View," Youngjick Jang, Nakhyeon Ku and Taesoo Yun (Dongseo University, Korea)
- #474 "Characteristic Components of Meta Rule in Battle Royale Games," Gyuhyeok Choi and Mijin Kim (Dongseo University, Korea)
- #479 "Usability Evaluation of Locomotion Technology for Expansion of Space in Virtual Reality Game," Xuihui Ding, Youngjick Jang, Taesoo Yun (Dongseo University, Korea), Pareena Jirapongsatorn and Sasina Arsingsamanan (Kasetsart University, Thailand)
- #506 "Match move workflow for live-action production using game engine," Zhou Jia Ni, Hyungwoo Jin, Kwangho Baek and Taesoo Yun (Dongseo University, Korea)
- #537 "Mass Cultural Implications of the Affluent Class Characters Recreated in Chinese Dramas," Zongbin Yao and Hyunseok Lee (Dongseo University, Korea)

## Session FR2 – Advanced Technology 1

16th 16:20~18:00, Room#: 3C112 @ ZJC (Building 3)

Session Chair: Prof. I Putu Agung Bayupati (Udayana University, Indonesia)

- #591 "An UWB-based Indoor Positioning System Model and Applications," Junho Seo, Sungwon Lee, Yonghwan Jeong, Yeongjoon Bae and Dongkyun Kim (Kyungpook National University, Korea)
- #568 "Cultural heritage guide system: a combination of augmented reality, deep learning and culture technology," Maryam Shakeri and Abolghasem Sadeghi-Niaraki (K.N. Toosi University of Technology, Iran)
- #619 "Segehan Identification system for Android Using HSV and Invariant Moment," I Made Adi Sedana, I Putu Agung Bayupati and Gusti Made Arya Sasmita (Udayana University, Indonesia)
- #553 "Determinants of Data Quality in an Electric Utility: A Delphi Study," Intiraporn Mulasastra (Kasetsart University, Thailand) and K. Srimoung (Provincial Electricity Authority of Thailand, Thailand)

## Session FR3 – Asian Culture and Design

16th 16:20~18:00, Room#: 3C121 @ ZJC (Building 3)

Session Chair: Prof. Juyoung, Chang (Dongseo University, Korea)

- #587 "The characteristics and changes of modern Korean house design since 1960's," Jiyoung Yoon and Zhangjingyu (Dongseo University, Korea)
- #708 "Characteristics of Korean Webtoon and Its Expandability," Haeyoon Kim (Dongseo University, Korea)
- #439 "A correlation study of appealing characters in Malaysian Animated Film: Perception from Malaysian viewers," Mohd Rosli Bin Arshad (University of Kuala Lumpur, Malaysia)
- #532 "Local content in 48 Group Branding Strategy: Focused on JKT48 as a Case Study," Cindy Muljosumarto (Petra Christian University, Indonesia)
- #465 "Trust and creation, two key words of empathic design tool for the Chinese," Suwen Ma (Jingchu University of Technology, China) and Juyoung Chang (Dongseo University, Korea)

## Session FR4 – Art / Design 1

16th 16:20~18:00, Room#: 3C115 @ ZJC (Building 3)

Session Chair: Prof. Tong Jin Kim (Purdue University, USA)

- #569 "Artificial Intelligence as Designers: Assistants or Substitutes?," Xiao Ma (Purdue University, USA)
- #478 "How to improve the sensation of distance when interacting with objects in VR game," Nakhyeon Ku, Youngjick Jang and Taesoo Yun (Dongseo University, Korea)
- #461 "Industrial Design as an Essential Component for Assistive Technology Development and Business Success," Daniel Fernando Madrinan-Chiquito (Purdue University, USA)
- #527 "Analysis of the narrative elements in the film —discuss violent films of South Korea and China," Zhang Shu and Wonho Choi (Dongseo University, Korea)
- #574 "New design innovation and technology are creating new problems in our community," Min Liu (Purdue University, USA)

### Session FR5 – Art / Design 2

16th 16:20~18:00, Room#: 3C106 @ ZJC (Building 3)

Session Chair: Prof. Rolly Intan (Petra Christian University, Indonesia)

- #552 "Gathering creativity from different specializations in an educational institution: A proposal to design school," Dong Joe Han (Purdue University, USA)
- #621 "The possibility of the content expression of the film with minimalism: Taking "WORK" as an example," Zhao Hongbo and Yonguk Lee (Tokyo Polytechnic University, Japan)
- #463 "Emotion Extraction from paintings based on Luscher Color test and Culture Technology (CT)," Babak Ranjgar, Mahdi Khoshlahjeh Azar and Abolghasem Sadeghi-Niaraki (K. N. Toosi University of Technology, Iran)
- #472 "Maximizing Designer Effectiveness in a Convergent World," Keith Williams (Purdue University, USA) (video presentation)
- #466 "Gamification engages children in UX research," Weilun Huang (Purdue University, USA)

### Session ST1 – Digital Contents 3

17th 16:00~17:40, Room#: 1-116 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Prof. Chul Young, Choi (Dongseo University, Korea)

- #496 "Color characteristics of Mexican afterlife expressed in animated film <Coco>," Xiaoshuang Zhang and Donghyuk Choi (Dongseo University, Korea)
- #572 "Utilization Plan of 3D Digital Actor as Digital Interface," Dongwoo Lee, Hyungjin Jeon and Hongsik Pak (Dongseo University, Korea)
- #551 "Analyzing the Motion Graphics Animation in the MOOC (Massive Open Online Course)," Lin Xiao and Hyunseok Lee (Dongseo University, Korea)
- #548 "Analysis of Anthropology Based on Ethnic Culture - Case Study of <Huayao Bride In Shangri-La, 2005>," Chunliang Zhang and Hyunseok Lee (Dongseo University, Korea)

### Session ST2 – Foundation / Source / Culture Service

17th 16:00~17:40, Room#: 1-120 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Prof. Ted Shin (Metropolitan University of Denver, USA)

- #518 "Temporal Expressions Extraction and Normalization for Cultural Heritage Archive Using Word Vector Representation," Watchira Buranasing, Thepchai Supnithi, Pattaraporn meeklai, Phattarapol Jantarasena and Petchwadee Pattarathananan (National Electronics and Computer Technology Center, Thailand)
- #601 "Considerations on Digital Autobiography of the Elderly in the Digital Age," Seoni Joo, Hanil Kim and Seri Pansang (Jeju National University, Korea)
- #602 "Creative expression of moving images using the interaction between emotion and hue - A case of <peacock > the moving image work," Dong Siyuan and Yonguk Lee (Tokyo Polytechnic University, Japan)
- #1018 "Locating Algorithm for the Indoor Robot based on Li-Fi Using the Multi-Beam," Pham Minh Trung, Minwoo Lee, Jinyeong Choi and Jaesang Cha (Seoul National University of Science and Technology, Korea)

### Session ST3 – Advanced Technology 2

17th 16:00~17:40, Room#: 1-124 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Prof. Rattasit Sukhahuta (Chiang Mai University, Thailand)

- #608 "Hand Gesture Recognition Assisted by Human Pose Information," Eunni Park, Insu Kim and Soonki Jung (Kyungpook National University, Korea)
- #606 "A Deep Neural Network based Environment Emulator in Individual Indoor Environment," Wenquan Jin and Dohyeun Kim (Jeju National University, Korea)
- #618 "Information Technology Governance Audit Using COBIT 5 Framework in the Disaster Management Office," Komang Devi Tripika Dewi, I Putu Agung Bayupati and I Ketut Adi Purnawan (Udayana University, Indonesia)
- #779 "The Effect of CEO Entrenchment on the Relationship between Corporate Governance and Firm Performance," Duangnapa Sukhahuta (Maejo University, Thailand)
- #778 "Thai Khon Skill Assessment Tool," Somchoke Ruengittinun, Jakkapan Klaisuban, Pongsatorn Khunkheeleg, Umaporn Siratharanont (Kasetsart University, Thailand)

#### Session ST4 – Humanity / Social Science

17th 16:00~17:40, Room#: 1-128 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Prof. Jaeho Pyeon (San Jose State University, USA)

- #584 "Zhang Yiqing's Rosewood with Noble Character 君紫檀 : From Zhouzhou to Gu Yongqi," Unha Kim (Zhongnan University of Economics and Law, China)
- #559 "The Transmedia storytelling strategy and structures of heroes in Marvel Avengers films," Jaekyu Kim (Zhongnan University of Economics and Law, China)
- #603 "Critical Success Factors for E-learning: An Indian Perspective," Namitha K Cheriyan (Christ University, India)
- #885 "Disseminating Text through Cultural Technology: An Analysis With Reference To Indian Epics," Deepanjali Mishra and Mangal Sain (KIT University, India)
- #597 "Case Study of Adapting AutoCAD, BIM and VR Software Used in AEC Industry," Jaeho Pyeon, Fatemeh Saffari (San Jose State University, USA) and Joonhee Maeng (Korea Advanced Institute of Science and Technology, Korea)

#### Session ST5 – Art / Design 3

17th 16:00~17:40, Room#: 1-119 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: SungPil Lee (Dongseo University, Korea)

- #482 "Evaluation of Framework System for Making Safety Training VR Simulation," Qiao Xie, Youngjick Jang and Taesoo Yun (Dongseo University, Korea)
- #511 "Aesthetic Effect Expressed by the Theory of Truth and Fiction in CUC Technique: Focusing on Animation Movie," Heqi Geng and Donghyuk Choi (Dongseo University, Korea)
- #529 "Analysis on the Chinese Market of Children's VR books," Ding Zhi Bo and Seungkeun Song (Dongseo University, Korea)
- #775 "Application of Virtual Simulation Technology on the Practical Teaching Platform for Furniture Design," Wang Zheng Zheng (Shaoxing University Yuanpei College, China)
- #468 "IMPROVING CUSTOMIZED DESIGN WITH 3D PRINTING," Pengyu Ren (Purdue University, USA)

#### Session ST6 – Convergence Technology

17th 16:00~17:40, Room#: 1-123 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Fei Hao (Shaanxi Normal University, China)

- #534 "Development of Virtual Reality Training System for steel mill Facility," Eeljin Chae (Zhongnan University of Economics and Law, China), Junho Lee (DAVID LINE STUDIO, USA) and Hosung Myung (Shanghai University of Engineering Science, China)
- #554 "What do pictures say? Secrets and Lies through Image Manipulation," Hyokyung Choi and Eunjung Choi (Seoul Women's University, Korea)
- #727 "Imagining the Future of Foods Through Speculative Design," Clarissa AL. Lee and Sian Lun Lau (Sunway University, Malaysia)
- #848 "Understanding Thai Sentence Structure Using the X-Bar Theory of Phrase Structure," Rattasit Sukhahuta (Chian Mai University, Thailand)
- #556 "Future User Behavior Prediction in the Case of Network Crash under Mobile Internet Environment," Yunran Ju (Purdue University, USA)

#### Session ST7 – Special Session : Higher Education

17th 16:00~17:40, Room#: 1-127 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Intraporon Mulasatra (Kasetsart University, Thailand)

- #586 "What do students expect from us?," Hekyung Kim (Dongseo University, Korea)
- #533 "Smartphone Addiction Among University Students: Problems and Possible Solutions," Elena Tsomko (Dongseo University, Korea)
- #620 "ACHIEVING GRADUATE ATTRIBUTES THROUGH AN INTEGRATED ONLINE PLATFORM FOR INTERNATIONAL COLLABORATION: A NEED BASED STUDY," Guydeuk Yeon and Rinju George (Christ University, India)
- #598 "A Transformative Next-Generation Student Connect and Pedagogy: A Holistic Change Driven Environment. "Engineering-Service Assisted Integrated Learning [E-SAIL]"," Iven Jose, Benny Thomas and M. R. Sudhir (Christ University, India)
- #573 "Design Thinking: Cross-Disciplinary Disintegration Paradox," Jae H. Chae (Purdue University, USA)



**Session ST-P1 – Digital Contents****17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College****Session Chair: Prof. Weeraphan Chanhom (Chiang Mai University, Thailand)**

- #783 "Comparison of Various CNN Models in Railway Accident Prevention System," Ziyu Fang and Pyeoungkee Kim (Silla University, Korea)
- #557 "A Study on Storytelling Directing Method Using Motion Clip of Digital Actor," Gu Jie and Chulyoung Choi (Dongseo University, Korea)
- #536 "Aesthetics of Film Images in Oil Painting Animation-Focus on Loving Vincent," Yijun Cao and Hyunseok Lee (Dongseo University, Korea)
- #782 "A Study on the Story of Gamification to Prevent Equalization of Personal Satisfaction and Self-esteem," Haein Kim, Sojung Lee and Hyeyoung Ko (Seoul Women's University, Korea)
- #558 "Analysis of Influence Factors on VR Animation Viewing Behavior of Chinese Viewers," Hou Zheng Dong and Chulyoung Choi (Dongseo University, Korea)
- #460 "Research on Ethnic Style of Animation Performance Based on Drama Performance," Dong Jiajia and Chulyoung Choi (Dongseo University, Korea)

**Session ST-P2 – Digital Contents****17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College****Session Chair: Prof. Hongsik Park (Dongseo University, Korea)**

- #524 "Analysis of Chinese Public Service Advertisements Based on Narratology," Kejing Wen and Wonho Choi (Dongseo University, Korea)
- #561 "A Study on the Development of One IP(intellectual property) Animation & Game in Chinese Market," Pan Yang and Chulyoung Choi (Dongseo University, Korea)
- #521 "The Proposal of Pipeline for Photorealistic 3D Object Modeling," Qi Zhang, Haitao Jiang, Yun Ji, Linwei Fu and Taesoo Yun (Dongseo University, Korea)
- #507 "Realization of Realistic Wave Effect in Houdini under the Overlooking Angle," Jiani Zhou and Taesoo Yun (Dongseo University, Korea)
- #531 "National Narrative of Chinese Animation: Monkey King vs. Little Door Gods," Ting Wu and Mijin Kim (Dongseo University, Korea)
- #566 "Analysis On The Development Direction Of Chinese Animation In The Animation Market Under The New Animation Industry Chain," Ji Hui Yan and Chulyoung Choi (Dongseo University, Korea)

**Session ST-P3 – Foundation & Source / Culture Service****17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College****Session Chair: Prof. Eunyi Kim (Konkuk University, Korea)**

- #617 "Sunlight Radiation Analysis in Urban Scenario using Layered Accumulative Shadow Map," Woosuk Shin and Nakhon Baek (Kyungpook National University, Korea)
- #781 "Analysis of Success Factors of Korean Web Entertainments and Development Direction," Kiri Kim and Hyeyoung Ko (Seoul Women's University, Korea)
- #593 "Location Estimation Algorithm of Docent Robot in Art Gallery Using Object Detection," Mihyeon Cheon and Donghwa Lee (Daegu University, Korea)
- #604 "Introduction to Coding Education Using an Interactive ALTINO Robot," Jaeson Pyeon (Taejon Christian International School, Korea), Sukbum Kang, Jinhyun Kim and Seyoung Jeong (Saeon Co., Inc., Korea)
- #774 "Initiating Global Service Learning Movement: A Best Practice of Petra Christian University," Rolly Intan (Petra Christian University, Indonesia)
- #932 "Research on the Problems and Measures of the Construction of "Double-Qualified" Faculty in Independent Colleges," Luo Wenhui and Zheng Yaping (Zhijiang College of Zhejiang Unioversity of Technology, China)

**Session ST-P4 – Advanced Technology**

**17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College**

**Session Chair: Prof. Somchoke Rueng-itiinun (Kasetsart University, Thailand)**

- #756 **"Pedestrian Detection using Spatial Haar-like Features,"** Jinxi Li, Daseul Shim, Longbin Jin, Sehyun Park and Eunyi Kim (Konkuk University, Korea)
- #607 **"A Virtualization Approach for Accessing IoT Resources and Appliances Control in Smart Home,"** Muhammad Ali Jibrán, Shabir Ahmad, Wangcheol Song and Dohyeun Kim (Jeju National University, Korea)
- #452 **"CNN-based Single Object Tracking Framework for Autonomous Target Tracking Systems,"** Donghyun Lee (Kumoh National Institute of Technology, Korea)
- #711 **"Voice Recognition Research and Trend Analysis,"** Hyemin Yun and Eunjung Choi (Seoul Women's University, Korea)
- #773 **"Analysis of Artificial Intelligence Speech Recognition Technology,"** Yena Lee, Uijeng Kang and Eunjung Choi (Seoul Women's University, Korea)
- #890 **"IoT-based Space Security Solution,"** Suji kim, Hwayon Park and Minseok Oh (Seoul Women's University, Korea)
- #886 **"Labs and Classes : An IoT Design and Implementation,"** Mohammed Abdulhakim Al-Absi, Kamolov Ahmadhon, KiHwan Kim, Ahmed Abdulhakim Al-Absi, Mangal Sain, Hoon Jae Lee, (Dongseo University, Korea)
- #887 **"General Study of Secure E-commerce Logistics Distribution,"** Rui FU, Mohammed Abdulhakim Al-Absi, Mangal Sain, Hoon Jae Lee (Dongseo University, Korea)
- #888 **"Survey on Digital Signature Algorithm,"** Azamjon Abdullaeva, Mohammed Abdulhakim Al-Absi, Mangal Saib, Hoon Jae Lee (Dongseo University, Korea)
- #889 **"General Study of Digital Signature Schemes,"** Azamjon Abdullaev, Mohammed Abdulhakim Al-Absi, Mangal Sain, Hoon Jae Lee (Dongseo University, Korea)

**Session ST-P5 – Art / Design**

**17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College**

**Session Chair: Prof. Hyunseok Lee (Dongseo University, Korea)**

- #525 **"Analysis of the Functionality and Aesthetic Value based on the Design of Color in Animation,"** Hao Shen and Donghun Lee (Dongseo University, Korea)
- #528 **"Cinematic Space and Mise-En-Scène Focusing on Hitchcock's Movies,"** Shuiqiang Dong and Wonho Choi (Dongseo University, Korea)
- #519 **"A Study of Korea Urban Regeneration from the Perspective of Feminist Geography,"** Shunping He and Kwanseon Hong (Dongseo University, Korea)



# Guide Line for Authors/Chairs

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## Guideline for Authors

### Oral Sessions

#### 1. Duration of the Presentation

The allotted time for each speaker is 12 minutes to present and 6 minutes for Q&A.

#### 2. Equipment in Presentation Room

Each presentation room will have a projector, a screen and a laptop computer running PowerPoint under MS Windows, equipped with USB port.

#### 3. Preparation for Your Presentation Session

Bring a USB memory with your PowerPoint presentation and make sure that your file is copied on the laptop computer before your session starts. Please show up 15 minutes before the actual session starts and introduce yourself to the session chair. Be prepared to give some bibliographic details about yourself to the chairperson so that he/she can introduce you before your presentation.

### Poster Sessions

#### 1. Duration of the Presentation

The poster session has 60 minutes, requiring all presenters to be available at their posters during the session.

#### 2. Poster Specification

Posters must be designed to fit a 841mm wide x 1189mm tall board. Posters may be prepared as a single poster or as several smaller sections mounted together. The heading of the poster should list the paper title, author(s) name(s), and affiliation(s).

#### 3. Poster Set-Up

Posters may be attached to the boards by push pins or tapes, which will be provided. Posters must be set up by presenters 10 minutes before the session starts. Posters must be removed by presenters right after the session is over. Posters not removed by 10 minutes after the session will be removed by volunteers (session organizers not responsible for posters left after this deadline).

## Guideline for Chairs

### Before Your Session

#### 1. Check the Program

Prior to departure for the meeting, check the program on our website (<http://icct.iacst.org/index.php>) to find the time slot for the session that you are chairing.

#### 2. Pick Up the Materials for Session Chair from Registration Desk

Please arrive at the registration desk about 20 minutes prior to the start of the session and pick up the material prepared for a session chair.

#### 3. Check the Meeting Room

Please arrive at the session room about 10 minutes prior to the start of the session and familiarize yourself with the controls for lights, microphones, a pointer, and a projector. If you encounter problems, immediately alert the session staff who is serving your session in the session room. Meanwhile, you have to check the presence of individual speaker in your session.

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## **During Your Session**

### **1. Introduction**

At the start of the session, briefly introduce yourself and explain the timing system to the audience, and as often during the session as you think necessary.

### **2. Time Allotment**

The allotted time for each speaker is 12 minutes to present and 6 minutes for Q&A. If possible, you may give a brief introduction of the speaker to the audience, including his or her affiliation and position, at the beginning of each presentation.

### **3. Absent Speakers**

Should a speaker fail to appear, you may recess the session until it is time for the next scheduled abstract. If you are notified of the absence of any speaker before the session starts, please announce it to the audience. You have to report the absence of any speaker to the secretariat for conference administration at the registration desk.

# Oral Presentation (Session FR1 ~ FR5)

16th November 2018

## Session FR1 - Digital Contents 1

16th 16:20~18:00, Room#: 3C116 @ ZJC (Building 3)

Session Chair: Prof. Mi Jin, Kim (Dongseo University, Korea)

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| #474 | "Characteristic Components of Meta Rule in Battle Royale Games," Gyuhyeok Choi and Mijin Kim (Dongseo University, Korea)  | 6  |
| #479 | "Usability Evaluation of Locomotion Technology for Expansion of Space in Virtual Reality Game," Xuihui Ding, Youngjick Jang, Taesoo Yun (Dongseo University, Korea), Pareena Jirapongsatorn and Sasina Arsingsamanan (Kasetsart University, Thailand) | 9  |
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Session Chair: Prof. I Putu Agung Bayupati (Udayana University, Indonesia)

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# **A UI Text Layout in VR Simulation based on Field of View**

Young Jick Jang, Nak Hyeon Ku, Tae Soo Yun

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## **Abstract**

We propose a UI text layout for VR simulation production and assesses its usability as a means of verifying feasibility. Human viewing angle is considered to select a UI text layout model in an advance study of the field of vision in VR environment and types of layout model based on UX. This forms a guideline for UI text layout for VR which identifies Area A for main content, Areas b for other information and Area c background area. This guideline is then applied to a VR simulation for automobile safety training in order to build a prototype. An experiment is conducted to assess usability and verify reliability. This paper thus provides a useful source for VR simulation design and production.

**Keywords-VR Simulation: Field of View; UI/UX**

## **1. Introduction**

There has been a constant stream of VR simulation for safety education and training. And since VR simulation for safety training has educational purposes such as the provision of basic information, provision of professional information as well as the provision of information on special circumstances, UI/UX design should be capable of conveying accurate information. In particular, UI text design guideline which most effectively delivers accurate information to user is an importance reference source for the design and production of VR simulation. And yet, there is currently UI text guideline to speak for the delivery of text in safety training VR simulation; research in the area is equally lacking. This paper thus proposes a UI text layout as a first step to building UI text guideline; the guideline is then applied to a safety training VR simulation produced by the authors to verify usability through experiment.

## **2. UI Text Layout in VR Simulation**

UI text production for VR simulation must consider human viewing angle. If such consideration is not made in a 360-degree VR environment, the user may suffer from VR sickness and nausea. UI text design should involve layout design based on UX design guideline.

### **2.1. FoV and UoV in VR Environment**

Human Field of View, has a range of 200 degrees horizontally and 130 degrees vertically; but when concentrating on a point, range of cognition narrows down to about 3 degrees. When seeing a display with both eyes, viewing angle is 62 degrees in both left and right directions. Here, viewing angle for character identification is 10-20 degrees; 5-30 degrees for mark identification; 30-60 degrees for color identification. [1] Thus UI text should be placed within the area of character identification (10-20 degrees), mark identification (5-30 degrees) and color identification (30-60 degrees). This is shown in the left diagram in Figure 1 below.

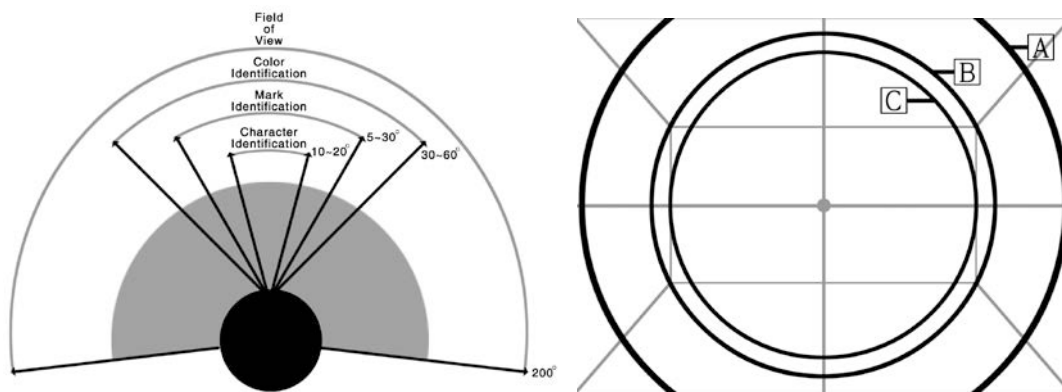


Fig 1. Left) Human FoV, Right) FoV in VR Environment

Based on human field of view, then, field of view for VR simulation which is experienced through HMD should be determined. This is as shown in the right diagram in Figure 1. There, A represents human field of view (FoV) which has a viewing angle of 200 degrees horizontally and 130 vertically. B represents useful field of view (UFoV) which ranges over 30 to 60 degrees where color identification is possible; C is instantaneous field of view (IFoV), ranging over 10-20 degrees left and right, where instantaneous character identification is possible. Thus key content should be placed within IFoV to allow instantaneous delivery of information. Additional information such as marks and colors should be placed within UFoV other than IFoV so as to increase the visibility of IFoV; in other areas of FoV, close and far views can be placed.

## 2.2. Types of Layout based on UX

UI design is effective when based on UX design. It is possible to identify 8 types of layout based on UX. Lateral-downward type provides information in the same way one reads a book; radial type has central element surrounded by sub-elements; top-down type places high-level element at the top and low-level elements underneath; tree type divides elements into categories; central type has key element in the center; upper space type is similar to movie screens at cinema; area proportional type expresses the importance of an element through its size in space; proximity type places elements close or far depending on their qualities.

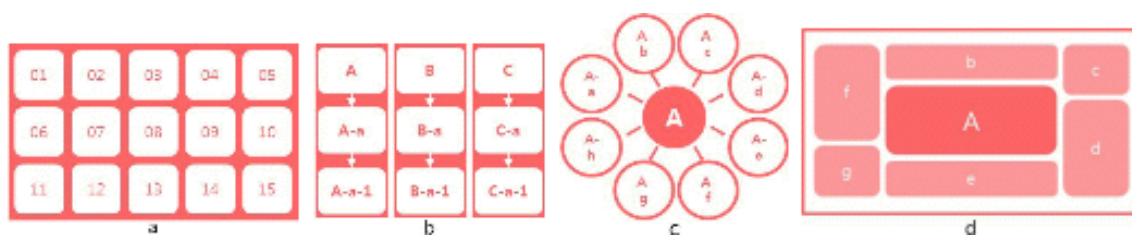


Fig 2. a) lateral-downward, b) downward, c) radial, d) central

Since UX design must clearly define the characteristics of content elements and their relationships so as to determine the type of layout to be used. [2] Thus lateral-downward, downward, radial and central types have been selected because they provide information and encourage action; finally, central type is chosen for UI text layout design because it is closest to the aforementioned human field of view.

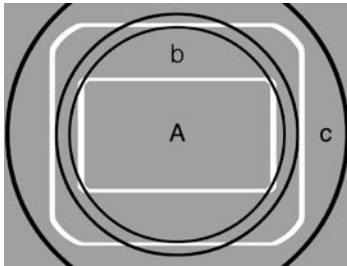
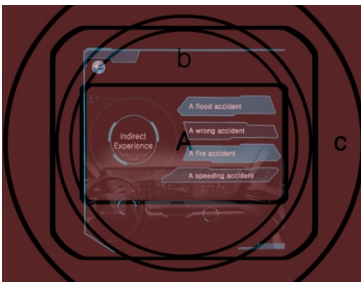

## 3. Vehicle safety VR simulation: UI text layout design

This paper seeks to assess automobile safety training VR simulation. This simulation provides simulated experience of automobile accident situations so as to train the user to respond to such situations. Four accident situations are offered; drowning, accident in the rain, fire and speeding accident. Such VR



simulation, compared to real-life training for automobile accident response, is more efficient in terms of safety, economy and repeatability. The aforementioned FoV and UI text layout based on UX design guideline is as shown in the 'layout' section of Table 1. The area of IFoV, which is A in the UX layout of central type allow for intuitive cognition; thus key information, mostly textual, is placed there. B, which is the rest of UFoV that is not IFoV, is used for supplementary information, mostly marks and colors. The rest of FoV is C where close and far views are positioned. The result of applying such layout design to automobile safety training VR simulation is shown in 'VR Simulation Application' in Table 1. The first photo shows a menu screen where the user can select an accident situation scenario. An area has texts such as indirect experience, drowning accident, accident in the rain, fire, speeding accident. B area has design elements using marks and colors, namely a link to move back. C area is set black so as to increase the delivery impact of A and B. The second photo shows a scene from training for fire accident. An area has the most important piece of information, namely 'how to use a fire extinguisher in response to a vehicle fire situation.' B area contains objects like a car on fire and a fire extinguisher. C area shows close and far views whose chroma is lower than objects in B area so that the user can focus on A and B.

Table1. UI text layout guideline and its application

Layout	Application to VR simulation	
		

## 4. Methodology and Results for Usability Evaluation

The reliability of Vehicle safety training VR simulation, developed using UI text layout proposed in this paper, was assessed through an experiment for usability Evaluation.

### 4.1. Methodology for Usability Evaluation In VR simulation

Methodology for usability Evaluation for training or educational VR simulation was based on walkthrough method set out by Sutcliffe (2000). Here, three categories are proposed; objective-oriented task execution, exploration and navigation in virtual world; and interaction under system design. [3] Questions were developed accordingly with wording modified to relate UI text layout in VR simulation under study. 30 adults with basic understanding of automobile safety and without difficulties in operating VR simulation were chosen to participate in the experiment.

Table 2. Survey questions for Usability Evaluation

Category	Questions
Objective-oriented Task execution	Could you accurately understand the objective of task?
	Could you use task information to respond to accident situation with immediate confirmation and action?
	Could you easily confirm the outcome of task execution?
Exploration and navigation in the virtual world	Was it easy to operate interface with text information?
	Could you accurately recognize positions of text information?
	Could you freely input variables provided by text information?
Interaction under system design	Was text information well delivered visually?
	Could you recognize and operate objects designated by text?
	Weren't there any nausea or VR sickness during simulation?

After working through the VR simulation, participants were asked to answer survey questions on a five-point scale. In order to increase the reliability of survey, participants were also interviewed after survey to hear their qualitative feedback. Table 2 shows survey questions for usability assessment.

## 4.2. Usability Evaluation Results

Scores on usability assessment survey were on a five-point scale down to one decimal point. First, on objective-oriented task execution, understanding of task objective scored 4.6, which points to high usability. During in-depth interview, participants mentioned that basic information, current situation and instructions for response were presented in UI text in a simple manner which allowed for intuitive perception. While they also mentioned that they were able to confirm the outcome of task execution immediately, immediate confirmation and action in response to accident scored a relatively low score of 3.8. On this, participants added that at least of some of this was because they were not familiar with VR environment and hardware. On exploration and navigation in virtual world, when asked about the ease of interface operation participants gave a relatively good score of 4.3. In comparison, cognition of current position and variable input scored rather low at 3.1 and 2.8 respectively. One participant pointed to difficulties in getting used to VR environment as well as an element of panic in response to an accident situation. Finally on interaction under system design, visual cognition of text information and interaction with objects designated by text both scored high at 4.8 and 4.1 respectively. One participant further commented that UI text in simulation was simple, allowing for immediate and intuitive cognition. In contrast, when asked about nausea and VR sickness, participants returned a rather low average of 3.2; but given rather large variance among participants, it may be conjectured that feelings or nausea and VR sickness is largely down to individuals. A summary of usability assessment results is given in Table 3 below.

Table 3. Usability Evaluation Results

Five-Point Scale	Category	Average Score
Very useful - 1 point	Objective-oriented task execution	4.6
		3.8
		4
Fairly useful – 2 points	Exploration and Navigation in virtual world	4.3
Useful - 3 points		3.1
Not really useful – 4 points		2.8
So not useful - 5 points	Interaction under system design	4.8
		4.1
		3.2

## 5. Conclusion

This paper proposed a UI text layout guideline for VR simulation based on human FoV and UX layout guidelines. It was then applied to the development of an automobile safety training VR simulation, subject to a five-point scale usability assessment. The results show that the proposed UI text layout enables accurate information delivery, improves visual cognition and facilitates easy interface operation. It was also noted that, through assessments on adaptability to VR simulation and experience of nausea and VR sickness, there remains a challenge in accessibility, popularity and understanding of hardware. The study also highlighted needs for further research on the elements of UI text guideline other than layout. First, what's the appropriate color for UI text? Second, how should colors be differentiated for key content, sub-elements and background? Such questions will require follow-up research which in turn will make meaningful contributions to developing a UI text guideline in VR simulation.

## References

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# Characteristic Components of Meta Rule in Battle Royale Games

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## Abstract

Gameplay is a main component that distinguishes a specific game from other games. It works as a priority criteria for a gamer to choose a game and used as a measure to highlight the characteristics of a specific game by emphasizing the detail characteristics of the game. This thesis tries to extract common characteristic components from the gameplays of recently attention drawing battle royale games. For doing such, play tests were performed for 10 battle royale games to clarify the meta rule's action and rule of play, in order to propose a category to distinguish a specific gameplay genre. It can work as a helping factor to distinguish the unique play style of battle royale game to offer implications for genre setting and contribute to the differentiation strategy.

**Keywords-***Meta Rule; Rule of Play; Action of Play; Battle Royale Game;*

## 1. Introduction

The battle royale game has drawn attentions from game players by expressing the Japanese movie (Battle Royale, 2000) similarly with the 'Battle Ground (2017, serviced by Steam) [1]. Afterwards, the battle royale games (e.g. Fortnite, Battle Ground, H1Z1, etc.) claiming a new genre called as 'Battle Royale' are being serviced with various platforms (PC, XBox, Mobile, etc.). But there are not enough systematic analyses and characteristic related studies to distinguish the battle royale game as a genre. A specific game genre shares a unique gameplay. Therefore, the unique differentiated characteristic components of battle royale game must be organized for the battle royale game to be made and developed with variety game characteristics.

Gameplay defines the process interacting with game level element [2] or game rules and play patterns generated from the rules to achieve the goal from the player's point [3]. Therefore, the gameplay gives goals to players for interactions and determines the character control, player's behaviors and others. Gameplay can be interpreted as the player's points defined by interactions between the player and game level elements, and game mechanics points defined by rule and action of play [3]. This paper takes a look at the characteristics of the gameplay from game mechanics point. The rules of game inducing interactions between players and game level elements can be categorized into three categories: manipulation rule, goal rule and meta rule [4]. The manipulation rule and goal rule are the unique game title's settings and unchangeable rules; and the meta rules define how to control or modify game, which induces various play actions of players during the process of achieving the game level goals. Therefore, clarifying the characteristics of meta rule can be a specific method to predict a player's gameplay in a specific genre.

Play tests for 10 battle royale games were performed in this paper to distinguish common characteristics of meta rules. The characteristic components of gameplay were extracted by analyzing rule and action of play via play tests and observation tests performed by specialists. Proposing a detailed gameplay range can help people to create new battle royale game and offers implications for setting its genre. And it is considered as able to build plans to emphasizes the differentiation of gameplay as the genre characteristics of battle royale game can be emphasized.

## 2. Battle Royale Game

Various survival games were released since the 'Hunger Games (2012)'. A survival game is a sandbox<sup>1</sup> type game with a goal to survive by acquiring items and fighting each other in a various danger filled game levels. A survival game was designed with PVP as the base, but the sizes and the settings of game level are very widely set to comply with the game world's scenario, which resulted low PVP occurrences. In order to solve the problem, the motive of a Japanese movie made in 2000, 'Battle Royale (2000)', was applied to create a battle royale mode as a survival game mode for frequent PVP occurrences. The battle royale started as a game mode, has gained high interests and was used in various survival games, and this is being serviced as a new genre since the 'Battle Ground (2017, serviced by Steam)'.

A simple summary of battle royale game's basic play rules is the followings. The goal is to be a final survivor just like a survival game. A player selects a surviving point with minimum given equipments and the player is to acquire various items and fight with other players to survive. The necessary information for such survival can be obtained from the game map and the survival advantage points can be preoccupied.

## 3. Play Test on Battle Royale Game




The tests were performed to extract the gameplay of the recently rising game, the battle royale game; and the common points of analysis subjects were extracted by setting game's main meta rule as the category. The meta rule is unlike the manipulation rule and goal rule that cannot be changed as configured from the beginning; it defines the action of play which can affect the game elements to bring the challenges to players to achieve the game goal. Therefore, the in-depth analysis for the meta rule can be an important index to predict the creator's gameplay intention.

### 3.1. Material and Method

The analysis subjects, battle royale games, were selected from the 10 games introduced by PCGAMER (2018 Aug. issue) [5]. The PCGAMER is a most globally sold magazine established in 1993 by UK. The 10 analysis subjected battle royale games were selected from the noticeable top 10 battle royale games of 2018 by PCGAMER. Play tests and observation tests were performed by two specialists for actual analysis.

### 3.2. Play Test and Results

Table 1. Characteristic Components of Meta Rule in 10 Types of Battle Royale Game

Meta Rule	(1)	(2)	(3)
Rule of Play	Starting with minimal equipment	Decreasing in size of safe area	Scattering around the map benefits for combat and survival
Action of Play	Customizing the appearance of player character Combating to obtain equipment from eliminated players	Acquisition the information of random area Moving into magnetic field and out of red zone	Searching the map for beneficial items while avoiding being killed by other players
Example in Game	 <Raptues Rejects : Farming>	 <Fear Wolves : Game map>	 <Fractured lands : Moving>

<Table 1> is the description of the meta rule commonly applied to all 10 battle royale games. The elements those are in some games but not in more than 1 game were excluded.

The meta rule of battle royale game is the rule that induces the challenges and actions of play in order

1. Sandbox: Sandbox game in which the player may include building and creative activities without rules, generally employ an open world setting to facilitate the player's freedom of choice.

to achieve the game goal. The differentiations are emphasized for each game title as its base is the game's base settings or themes, but the characteristics that only the meta rule of battle royale game have 3 clear characteristics. First, all players start the game with equal minimum given equipments. Because of this, the play action of acquiring items (battle equipments, survival kits, etc.) necessary for survival as shown on <Table 1\_(1)> Raptues Rejects (2018, GALVANIC game) occurs. Second, as the playing time gets longer, the size of safety zone gets smaller in order to induce continuous PVP with the prediction of having less number of players. In this process, the players in the game level outside of the safety zone will be given with health penalties, and the players continuously acquire the entire game level, the player's own location, safety zone and danger zone information from the game map. This can be confirmed with the player's behaviors of acquiring game information using the game map from <Table 1\_(2)> Fear Wolves (2018, Vostok games). Finally, the player continuously moves or uses vehicles as shown on <Table 1\_(3)> Fractured lands (2018, Unbroken Studio) to survive and battle with the information obtained from the game map.

#### 4. Conclusion

In this paper, play tests were performed on 10 games to distinguish the characteristics of the gameplay of battle royale games; and the characteristic components of meta rule were extracted. This proposes that the meta rule can be used as the specific category of gameplay to offer implications to improve its playability by emphasizing the genre characteristics of battle royale game. This may provide a meaningful data to set and predict behaviors of players in battle royale game.

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## Usability Evaluation of Locomotion Technology for Expansion of Space in Virtual Reality Game

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### Abstract

We compare the usability of the locomotion technologies on the VR environment to propose a more suitable technology using a VR adventure game created by us. Joystick (JS) and teleportation (TP) are the basic locomotion technologies on VR and can expand a limited space. For the study, we have subjects play a VR game to which the two locomotion technologies are applied and compare and evaluate the usability of them using Simulator Sickness Questionnaire (SSQ) and Slater-Usuh-Steed (SUS) methods. Through this study, we were able to identify a more suitable locomotion technology to expand the space given in the virtual reality on VR games, and believe that these data can be used in the stages for planning and main development of VR games.

**Keywords-** *VR Game; Locomotion Techniques; Expanded Space; Usability Evaluation;*

### 1. Introduction

Interaction between humans and computers is one of the most important factors in VR research. Among them, researches on technologies used when a player makes locomotion on the VR are being conducted steadily. "A locomotion technology on VR is to detect with a tracking system the locomotion of the user who freely travels within the tracked area. [1]" In particular, due to the nature of adventure games where the user needs to navigate their ways, it requires a large space to enhance player's sense of immersion. Securing such a space is neither economical nor efficient. It is possible, however, to create an economical, efficient and immersive VR adventure game by expanding the space in the limited VR environment by applying a locomotion technology, in which we can find the rationale for the researches on locomotion technology when producing VR adventure games. In this paper, we will apply locomotion technologies using JS and TP, respectively, to Treasure Hunter – a VR adventure game that we created in order to experience a VR game with expanded space, and evaluate and compare their usability.

### 2. Locomotion technologies and space expansion of VR games

JS-based control and TP locomotion technology supports locomotion and mobility of players on the VR environment. "Locomotion technology is an important component of virtual reality configuration and is a technology used to move a user's viewpoint in a virtual environment." [2] It is possible to expand the space with locomotion technology in VR games allowing the user to experience a virtual environment that is wider than the actual space. With the JS locomotion technology, the user can make locomotion by operating the touch pad. The TP locomotion technology allows the user to move instantly to a desired position within the restricted virtual points, as presented in the following Figure 1. The player can travel with these two locomotion technologies in the infinite space of virtual reality without actually moving,

which indicates that the limited space can be expanded.

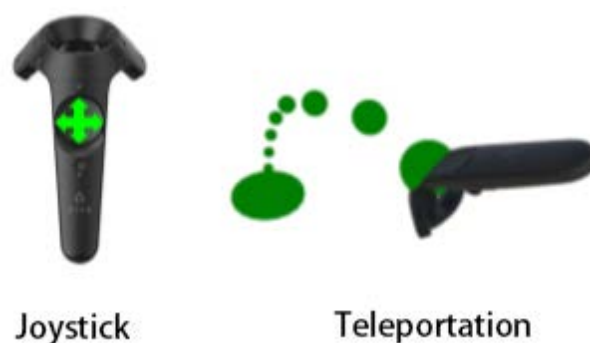




Fig 1. Joystick and Teleportation

The left side of Figure 1 is JS that allows to move any directions to upward, downward, left or right by manually adjusting the control button. The right side of Figure 1 indicates TP that allows to make an instant movement to a specified position. The player can move directly to a selected position from the current position by clicking on the touch button.

### 3. Evaluation target: VR Adventure Game 'Treasure Hunter'

Treasure Hunter is a Unity3D-based VR adventure game that we created. The background of the game is the inside of an Egyptian pyramid from which the player needs to escape after collecting jewel items avoiding the attacking creatures. The player first finds the list of items to obtain, collects all items on the list and then escapes from the treasure room. For the experiment two version of Treasure Hunter were produced using JS and TP locomotion technologies, respectively, as shown in the following Table 1. The left-side image of Table 1 was captured from the Treasure Hunter produced with the JS locomotion technology in which the player makes a movement to a desired position by adjusting the control button of JS. It allows the player to move any desired directions featuring high degree of freedom. The image on the right side of Table 1 was from the Treasure Hunter created with the TP locomotion technology. Player's selection of a position among those set in advance during the production of the VR allows an instant movement, so that it is possible to save the play time.

Table 1. VR environment construction and images from Treasure Hunters to which JS and TP were applied, respectively

VR environment construction		VR environment: Treasure Hunter structure	
Virtual space size	6m x 6m		
Actual space size	diameter50cm		
Experiment space	6m x 10m		

## 4. Experiment method and result

For the experiment, two version of Treasure Hunter – JS version and TP version were produced. Subjects consisted of 30 people who had an experience of playing VR games.

### 4.1. Experiment method

The subjects were divided into two groups from which we collected data with respect to four major

characteristics of virtual environment – sickness, immersion, user preference and user error through the experiment.[3] In order to reduce differences in results caused by proficiency difference, both groups were presented with the instruction to the game prior to starting the experiment. The participants were requested to find items while avoiding monsters' attacks. The participants used locomotion technologies based on their spatial perception in relation to item collection, game space and judgement on attacking targets during the mission. Participants were requested to fill in a Simulator Sickness Questionnaire (SSQ) of Kennedy-Lyan before and after the experience. The SSQ filled in prior to participation can increase the reliability of the experiment because the conditions of the participants can be checked in advance. The participants were asked again to fill in a SSQ after completing the VR game and a questionnaire established based on the Slater-Usoh-Steed (SUS) elements. We drew results from the collected data. The questions of the questionnaire are presented in Table 2.

Table 2. Questions of the questionnaire for evaluation

Categories	Questions
Sickness	Which did you feel more sickness when using JS and TP?
Immersion	Which is more immersive when using JS and TP?
User preference	Which of JS and TP movement technologies is better?
User error	Which of JS and TP was useful to cope with problems?

#### 4.2. Experiment result

The questionnaire consists of four categories – sickness, immersion, user preference and user error, which were selected for the purpose of analyzing spatial perception and movement. According to the questionnaire and in-depth interviews with subjects, the sense of sickness was higher when using JS than TP. On the other hand, the JS method that allows the participants to make a direct control and therefore ensuring more participation in general, was given a higher point than TP in terms of the sense of immersion due to the nature of a VR adventure game. There was no significant difference in the user preference due to difference by each type according to the experience of participants, but TP was preferred a little more than JS. It was identified through the interview that result can be attributed to the emotional burden of participants to the sickness. In other words, the result indicated that participants reacted more sensitively to SSQ questions about sickness than sense of immersion. With respect to this, TP was give more points than JS in the questions about user error.

Table 3. MeanSSQ-scores(M), SUS-scores(M) and standard deviations(SD) before , after the experiment for JS,TP

Article	JS		TP	
	M	SD	M	SD
SSQ	Before 6.07	Before 6.67	Before 12.15	Before 10.16
	After 14.73	After 13.72	After 7.01	After 6.45
SUS	2.82	1.94	3.02	1.81

In conclusion, participants felt more dizziness and sickness when using JS than TP. However, due to the nature of an adventure game, the preference for JS was higher due to higher sense of immersion and tension. However, TP was given more points than JS in almost all items except it. Through this, we have been able to realize that other locomotion technology on VR, which can reduce downsides such as sickness while retaining the characteristics of contents, is required. The points on the left side of Figure 5 were the result of t-test analysis of the difference between the averages of SSQ before and after the

experiment. The used analysis method was SPSS 18 statistical analysis.[4] The intensity of participants' sickness was recorded in four-point scale (0 – No dizziness, 1 – Minor dizziness, 2 - Severe dizziness, 3 – Very severe dizziness). The total points were obtained by adding statistical points and the data points of JS and TP reactions were presented as the (M) value or the average value to provide the SSQ points. For the purpose of comparison, the standard deviation (SD) was also provided. In addition, the result after completing the experience was presented in five-point scale based on SUS questionnaire. This result can be presented by using the result of check items and SUS usability comparison method as shown in Table 3 and Figure 2.

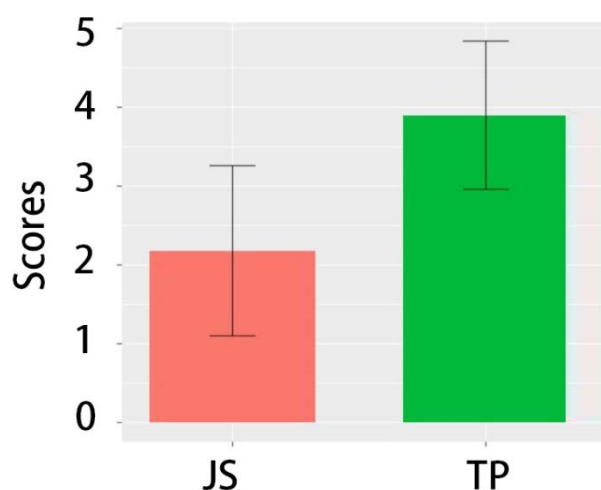


Fig 2. The y-axis shows the score and the x-axis the different locomotion techniques.

## 5. Conclusion

In this paper, we created a VR adventure game and conducted a comparative analysis of the usability of JS and TP through an experiment. To do this, a pre-research on two different locomotion technologies – JS and TP was conducted to examine differences. The result was applied to an adventure game to analyze spatial expansion in the VR environment through locomotion technologies. We compared the usability of these two locomotion technologies through an experiment using the SSQ scale that can quantify the dizziness and sickness of participants and the SUS evaluation method that can evaluate the usability of the targets. The result showed that TP was given higher points in most categories but the direct control of movement using JS could enhance the sense of immersion and amusement due to the nature of an adventure game. These results can be used for producing more enhanced VR adventure games. Following researches will be focusing on the comparison between JS and TP by analyzing Redirected Walking (RDW) locomotion technology that allows spatial expansion, features less dizziness and sickness and enables the player to make a direct walking at will.

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# Match move workflow for live-action production using game engine

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## Abstract

This study suggested a work flow which can apply the match move data to the game engine as a way to utilize game engine in the production of live-action contents. As a result of test, the match move data can be applied to the game engine by creating keyframe to 3D software based on the camera data created from match move data, and delivering this. It was also possible to obtain the same results from 2Dsoftware, 3Dsoftware and game engine. This study is expected to be utilized as a way to use the game engine in order to improve the efficiency of post-production producing live-action contents in the future.

**Keywords** - *component; post-production; matchmove; game engine*

## 1. Introduction

The game engine is the software which was developed for the production of game. According to the development of hardware and software, the utilization range of game engine has increased recently. The merits of game engine have brought the utilization in the digital contents production area.

One of the biggest merits of game engine is real-time PBR (Physically Based Rendering) through capture method. These merits are expected to bring the big change in the video production pipeline in the future.

Machinima manufactured by game engine until now is restricted to the game video and animation, the research about live-action production has not reached to the commercialization stage. This study intends to suggest the workflow which applies match move data to game engine as a way to improve the efficiency of post-production stage in manufacturing live-action using game engine.

## 2. Work flow design

### 2.1. Experiment environment design

In order to compare the data linkage result between software, the test is carried out in 2 methods in total. The former test is a test which applies match existing move data to the game engine directly. The latter is a test which applies match existing move data with the game engine via 3Dsoftware.

For the workflow which this study intends to suggest, the test environment is formed by selecting Post-production software which is most frequently used in actual work. For 3Dsoftware, Maya of Autodesk was used. For match move software, PFTrack of the pixel farm was used. For deliver data between each software, FBX data was used while Unreal4 was used for game engine.

### 2.2. Application of test

As a result of the former, when FBX Data extracted from PFTrack is delivered to Unreal, the animation data of camera was not delivered. That's because the animation of camera created from PFTrack is

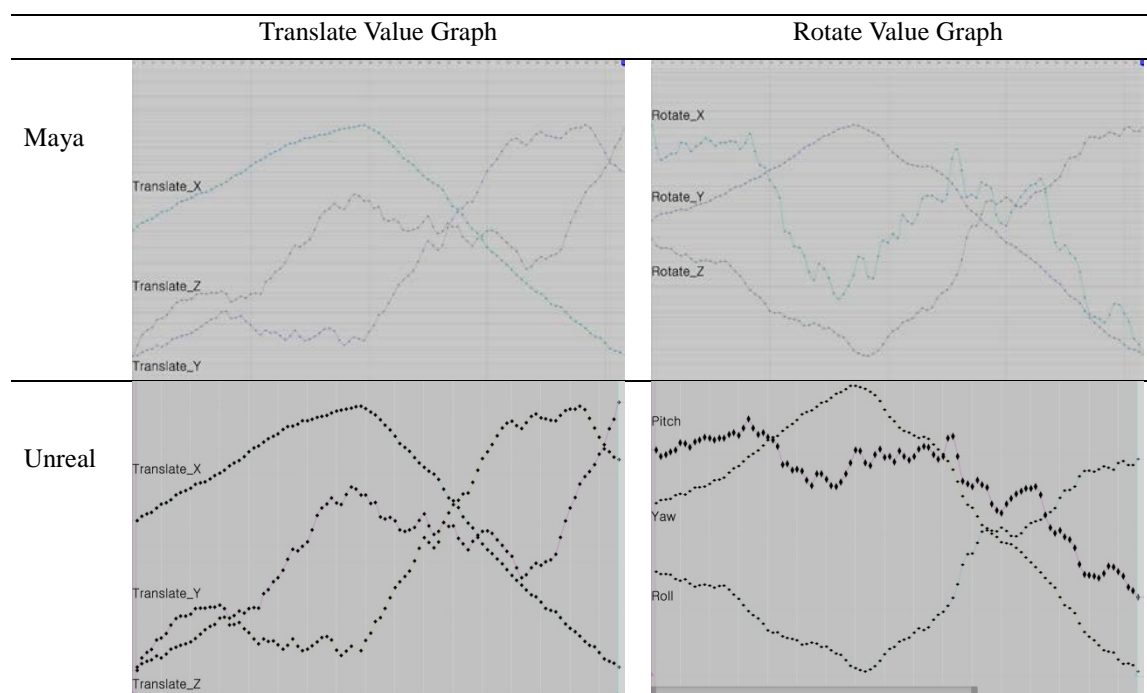
dependent to Interest Point dummy indicating the viewpoint of camera.

In the test of latter, the camera animation, which caused problem in the former, was bake simulated to transform the dependent animation data into independent form. In addition, scene axis of 3Dsoftware and game engine was tested in two ways.

If Maya scene axis is setup into z-up like unreal world setup, there was no problem in import of animation data of camera, it caused the error of axis of scene. If Maya scene axis is setup into existing y-up, camera animation data and scene axis were normal. match move data can be delivered into unreal by bake simulating camera animation data in the basic setup of Maya.

Table 1. shows the comparison of Camera Animation Value between Maya an Unreal.

Table 1. Camera Animation Value Data Graph



Translate Value and Rotate Value were divided and compared. Due to the difference of interface between software, it was shown overall value has the same shape despite of difference in width of graph.

### 2.3. Workflow suggestion

In order to increase the accessibility of worker in the late of existing video, this study maintained existing match move workflow, and focused the stage of deliver scene.

The workflow which this study intends to suggest is as shown in Fig. 1.

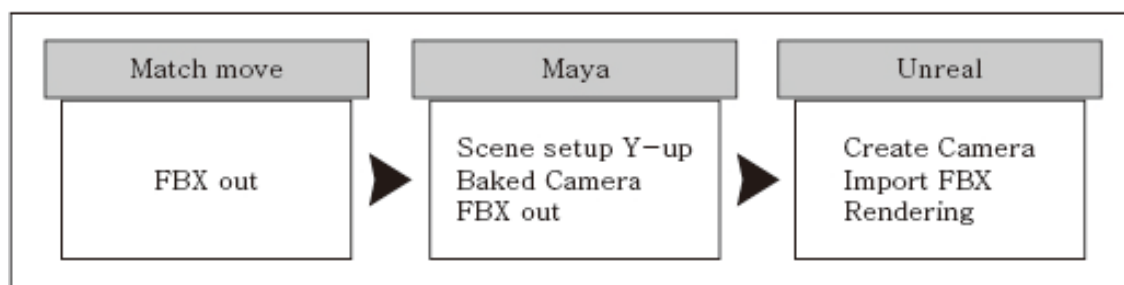


Fig. 1 The proposed match move delivery Scene Workflow

As shown in the result of test, it is possible to match move shooting data, pass through 3Dsoftware and



use in the game engine. Afterward, it is possible to reduce the resource consumed in the rendering by using real-time PBR of Unreal.

Table 2. Comparing the time spent in rendering

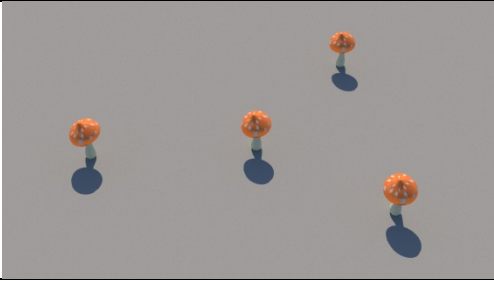
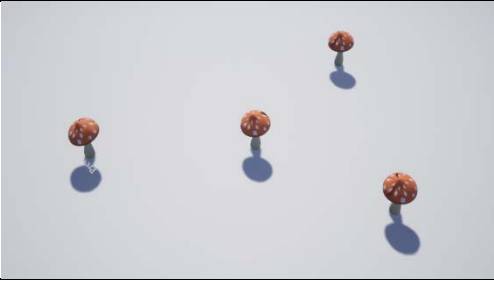
	3D software	Game Engine
image		
Time spent on Render	20 sec / frame 2000 sec/100frames	Under 1sec / frame 4 sec/100frames

Table 2. compared the rendering image which used PBR of game engine with 3Dsoftware, and the time consumed in rendering. Each was rendered at a resolution of 1920 \* 1080. The PBR of software is set based on default setup.

When comparing the consumed hours in rendering of workflow using game engine and workflow using existing 3Dsoftware, it shows the difference of about 500 times based on 100frames. Therefore, if the suggested workflow is used, it is expected that the time consumed in rendering can be used for the improvement of contents detail.

### 3. Conclusion

This study suggested a workflow which can apply the match move data to the game engine as a way to utilize game engine in the post-production of live-action contents.

As a result of test, the match move data obtained from live-action can be used to the game engine, by passing through 3Dsoftware.

In addition, the rendering time consumed in post-production can be reduced through workflow suggested.

The workflow suggested by this study maintained the existing match move workflow, focused on the stage of delivery scene in order to increase the accessibility of work in the post-production. As a result, it is judged to be utilized to the actual work very soon. This study is expected to be utilized as a way to use the merit of game engine to the production of live-action contents in the future.

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# Mass Cultural Implications of the Affluent Class Characters Recreated in Chinese Dramas

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## Abstract

<Ode to Joy, 2016> aired in 2016 caused a lot of social repercussions in China. Audiences have a great interest in the affluent class and polarization between the rich and the poor in the drama. In daily life, ordinary people hardly connect with the affluent class, which is the upper class in modern social stratum. However, TV drama is the media that the public is very easy to reach every day. On basis of social problems, TV dramas usually reproduce character images in order to meet the expectations of the public. Therefore, images of affluent class in the drama not only reflects the understanding of the public but is also the image that the media believes. Targeting at this, this paper examines the characteristics of affluent class in China and public understanding of them by literature research. Additionally, character images of the affluent class in <Ode to Joy, 2016> are analyzed in order to understand mass culture presented by TV dramas in China in the process of cultural reproduction. These results are expected to be baseline data needed to effectively reproduce the images of the affluent class in Chinese dramas depending on social needs or authorial intentions.

**Keywords-***the affluent class; dramas; character; mass culture*

## 1. Introduction

Since the founding of new China, with the rapid growth of the country's economic strength, the affluent class has also grown rapidly. At the same time, the phenomenon of polarization between the rich and the poor has become increasingly serious and has become one of the main contradictions in today's society. The normal public cannot easily reach the world of the affluent class at ordinary times. Therefore, this curiosity turns into an attention economy, and the mass media naturally becomes the channel for the public to know more about the affluent class. Among all the mass media, television is more powerful than any other and is the most common learning environment for the public. Walter Lippmann once put forward an idea of "pseudo-environment". In this idea, people will regard the mimetic environment presented by the media as an objective environment indeed, and audiences will be subtly influenced and changed by the things presented in the media [1]. So, TV dramas are not only a way of entertainment, but also an effective tool for conveying values. Through TV dramas, audience get exposed to the plot but more connected to the ideas, ideologies and implications delivered by the plot. Regarding to this, this paper examines the characteristics of the affluent class in China and public understanding of them in the way of literature research. In addition, character images of the affluent class in <Ode to Joy, 2016> are analyzed as well in order to understand mass culture presented by TV dramas in China in the process of cultural reproduction.

## 2. Theoretical Review of the Affluent Class

The affluent class is a new upper class based on economic wealth since the beginning of modern capitalism. Besides, it is a privileged class with a dominant position in social influence. Affluent class in

modern society is not caused by hereditary bureaucracy in feudal age any more. Instead, they are ordinary people achieve economic success relying on their own efforts, who is also envied by the public.

## 2.1. Affluent Class in Modern China

Affluent class in modern China is the result of the social reform, and it is also changing and developing along with China's political, economic and other national policies [2]. By examining the history of modern and contemporary development in China, this paper summarizes the development background and growth process of affluent class in China, which is shown in Table 1.

Table 1. The Social Background and Development of Chinese Affluent Class

Time	Background	National Policy	Profession	Public opinion
1949-1977	Early days of new China	1) Socialist planned economy 2) Cultural Revolution	1) Senior government officials	Be ashamed of wealth and be proud of poverty
1976-1992	Initial stage for the Chinese economic reform	1) The rich first pushing those being rich later 2) The establishment of special economic zones	1) Senior government officials 2) Business owners 3) Stock portfolio managers	Make money carefully
1992-2005	Mid-term of the Chinese economic reform	1) Determined the market economy 2) Joined the WTO 3) Private property began to be protected by law.	1) Senior government officials 2) Business owners 3) Stock portfolio managers	The public has begun to pay attention to personal wealth.
2005-2017	Deepening period of the Chinese economic reform	1) Scientific Outlook on Development 2) Chinese Economic Stimulus Program	1) Senior government officials 2) Business owners 3) Senior professional officers	Government encourage everyone to get rich.

Through the investigation of the social background and growth process of affluent class in China, we can find affluent class in China mainly appeared after the reform and opening-up. Due to the incomplete policies at that moment, a proportion of affluent class used improper means to acquire wealth in the preliminary period of wealth accumulation. Therefore, the public has a negative impression over the affluent class. In 2007, Social Investigation Center of China Youth Daily carried out a questionnaire survey on the theme of "Impressions for the Rich" towards 7,916 people. As shown in the result, negative factors like luxurious (57.1%), greedy (52.7%) and corrupt (45.0%) ranked in the top three, followed by smart (33.1%) and hard-working (31.7%). Meanwhile, 92.9% of the surveyed population hope to enter affluent class. This paper combines this survey result and <Chinese Mass Affluent Report, 2015> issued by Hurun Research, and makes the Table 2.

Table 2. Status Types and Characteristics of Chinese Affluent Class

	Status types	Characteristics	Public impression
Classify	1) Businessman 2) Government officials 3) Professional workers 4) Star	1) Government officials are socially dominant 2) Most of the rich are self-made 3) General education 4) The Network Culture 5) Young	1) The general impression over affluent class is negative at present. 2) Oneself is possible to enter the affluent class.

Source: Hurun Report Inc. & Social Investigation Center of China Youth Daily, Chinese Mass Affluent Report, 2015 & Survey "Impressions for the Rich"

### 3. Urban TV Dramas

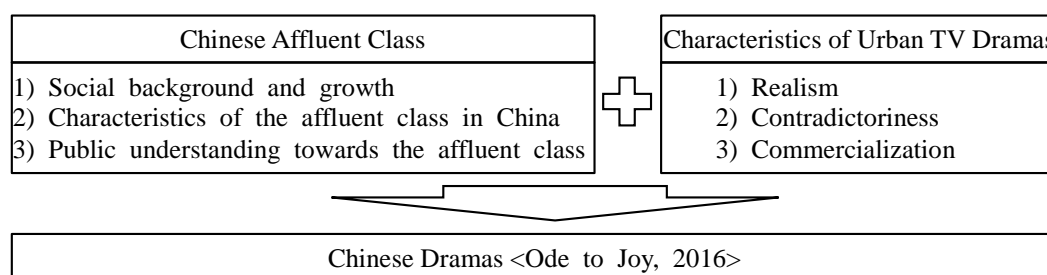
TV drama with urban theme roots in urban life and relies on the urban culture formed by value orientation, living philosophy and aesthetic preference of the citizen class. This type of drama allows the emotional experience of urban crowds as the main narrative [3]. In fact, the development of TV dramas is constantly evolving as the economy develops. With the acceleration of urbanization and the growth of citizen stratum, urban culture has gradually become an important part that influences ethos and cultural trends. In this trending, urban life TV series has become the main type in modern TV series. In modern urban life, affluent class is quite representative, so it naturally appears in urban-theme TV dramas so as to meet the expectations of the public.

Table 3. Characteristics of urban TV dramas

Type	Content
Realism	While the core in the process of TV production is making fictional stories, TV series is based on the real world. Therefore, even a fictional story cannot completely shake off the impact brought by real world. For the reason that TV dramas with urban theme reflects the lives of urban residents and expressing their emotions, this realistic fun leads to the resonance of audiences.
Contradictoriness	TV drama shows differences in rights, economy, status and other aspects between each other through the differences in professions. It is the difference that forms the contradictory structure necessary for TV dramas.
Commercialization	Based on the pursuit of economic interests, popular culture contains a commercial-based consumer character. As a concrete method, in order to obtain as high a rating as possible, the image of roles must fit the preferences of the public.

### 4. Analytical Tool

Table 4. Analytical Tool



### 5. Case Study

#### 5.1. Chinese drama <Ode to Joy, 2016>

This TV drama uses quick switch and clear contrast among scenes to present “the Network Culture” in China, which means that affluent class must rely on social relations and the accumulation of social capital in the growth process. As the result, when Fan Shengmei is frowning for family disputes in rural, the affluent class, represented by Andi, Wei Wei and Tan Zongming, is worrying about intricate social activities (e.g., “Fig. 1”).

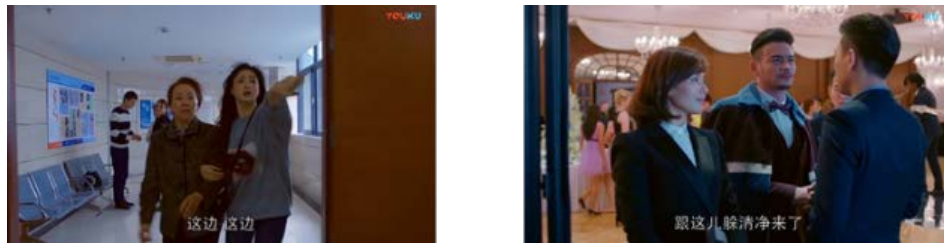


Fig. 1 Two scenes from &lt;Ode to Joy, 2016&gt;

As a role of affluent class in TV drama, Qu Xiaoxiao's 1) social background and growth is the offspring of wealthy families, and her parents aged around forty or fifty years old, earning a large fortune from nothing. From the interaction between Qu and her parents we can see that, although Qu's parents obtained excellent economic conditions, they cannot give "aristocratic" family education to their daughter. Their taste and way of education cannot keep up with the growth of wealth, leading to poor knowledge of Qu. She studies abroad in the United States, but only in an unknown community college. Uncontrolled restraint of parents makes Qu lack the necessary education, 2) Characteristics is be overweening, never consider the feelings of others and have self-centered behaviors. However, apart from these, she is generous and of loyalty to justice. In spite of the tag of well-off second generation, she is not a reckless spender and wants to gain her parents' recognition through her own effort. Similarly, Bao Yifan's 1) social background and growth is another silver-spoon kid. As the only kid in family, he starts to be the deputy general manager of his family group at a very early age. He is bent on converting family business into a listed company. 2) Characteristics is under the slightly frivolous appearance, it is an inner heart of doing things in a down-to-earth manner. All of these descriptions in detail make audiences slowly reduce their psychological defense, begin to accept and be fond of these silver-spoon kids shown in drama.

On contrary, Andi's 1) social background and growth is an orphan born at the bottom of society. Relying on the advantages of high IQ and higher education, she takes a senior position at an investment company in Wall Street. Later, because of the invitation from friend Tan Zongming, she returns to China and serves in Shengxuan Group as CFO. This certain kind of affluent class image represented by Andi meets public expectation that gain a decent life and dignity after education and one's own efforts. In another words, Andi is an idealized projection delivered by the scriptwriter to audiences. Andi is much closer to Chinese audience's desirable and ideal image of affluent class, which is independent, smart, self-disciplined and kind-hearted. Through these subtle changes, <Ode to Joy, 2016> lets audience slowly lower their psychological defense, accepts and even like roles of the affluent class.

## 5.2. The Result of Case Study

Table 5. The Result of Case Study

Type	Content
Objective image	1) Superior living conditions 2) Middle-aged affluent class that began to accumulate wealth in the 1990s 3) the Network Culture 4) Self-made young affluent class with excellent educational background
Audience's psychological cognition	1) Visual satisfaction 2) Economic conditions are the result of their continuous efforts.
Ideology in dramas	1) Self-management and hard work alone can increase your competitiveness and increase your status 2) Weakening internal contradictions in society

## 6. Conclusion

<Ode to Joy, 2016> uses direct visual effects to present superior living conditions of the affluent class in a positive way, satisfying audience's curiosity to the life of affluent class. The gap between the rich and the poor existing objectively in the real society is deliberately faded. Thus, audience slowly lowered their

psychological defense and begin to be in favor of characters of the affluent class shown in the drama instead. Moreover, audiences accept the ideology hidden in this TV series. This shows that Chinese TV dramas, as a mass culture industry, also play a role in guiding the mainstream ideology in society.

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# An UWB-based Indoor Positioning System Model and Applications

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## Abstract

With growing interest in LBS (Location Based Services), demand for LBS is increasing in the indoor environment. Since GPS (Global Positioning System) does not work in an indoor environment, IPS (Indoor Positioning System) is required, which is a positioning system specialized for an indoor environment. Although IPS using Wi-Fi, Bluetooth, RF, etc. have been studied, there are problems such as a large positioning error and a short communication distance. In this paper, we propose an IPS system model using UWB technology and present an example for applications in emergency and non-emergency situations.

**Keywords-** *Location-Based-Service; Indoor Positioning System; Ultra-Wideband*

## 1. Introduction

The importance of LBS (Location Based Service) is increasing [1]. Typically, there are many GPS(Global Positioning System)-based applications such as navigation, which are commonly used in vehicles. Recently, there is a demand for LBS in indoor environments such as buildings. For example, you can find out where you can get your desired items at a large mart or underground shopping mall, what route you need to go from your first visit to your destination, and where to escape if a disaster such as a fire occurs LBS can be utilized in the situation of. However, it is not suitable to use GPS in indoor environment because of satellite signal unreachability problem and intentional error in military reasons [2]. Therefore, it is necessary to use new location tracking technology specialized for indoor environment, and this is called an IPS (Indoor Positioning System). Various researches have been carried out for the IPS using Wi-Fi [3], Bluetooth [4], RF (Radio Frequency) [5] and UWB (Ultra-Wide band) [6].

For IPS, it is necessary to consider characteristics such as infrastructure cost, accuracy of location measurement, and reduction of communication distance due to complex indoor structure. First, Wi-Fi-based IPS [3] has a lot of public Wi-Fi APs, so it can provide location-based services at a relatively low cost. However, there is a relatively large difference in accuracy depending on the indoor structure, and since the positioning error is about 3 to 4 meters, it is somewhat difficult to provide an accurate position in the indoor environment. Bluetooth-based IPS [4] has advantages in terms of cost because multiple sensors can be deployed at low cost. However, this also has a positioning error of about 3 ~ 5meters like Wi-Fi. Since the signal strength is weak, the communication distance is as short as 30m and it is easily affected by obstacles. In the case of IPS [5] using RFID technology, the price of RFID tag is low, and the positioning error is only 0.1m, which is advantageous in that it has high accuracy. However, since the range of recognizing RFID tags is also narrow in units of 1 to 2 meters, there is a problem that an enormous amount of tags are required in a wide room such as a department store. These disadvantages are the obstacles to the development of indoor positioning applications.

UWB uses a wide band of 3.1 ~ 10.6GHz and is a technology capable of transmitting a large amount of information at a high transmission rate even at a low power. UWB has a low error rate of about 20cm in accuracy and has a high transmittance to obstacles such as walls. In addition, Wi-Fi and Bluetooth use the same ISM band, which can cause signal interference with each other. UWB, on the other hand, features very low spectral densities and short pulse widths, making it less susceptible to peripherals. Because of

this characteristic of UWB, it is considered that it is better than the technologies mentioned in the previous paragraph in indoor environment requiring high accuracy and permeability to obstacles.

The following configuration is followed. In Section 2.1, we propose a system model to provide UWB-based IPS, and in Section 2.2, we describe the distance measurement technique to be used in UWB IPS system. In Section 2.3, we give some examples of applications that can use the proposed system model, and conclude in Section 3.

## 2. System Model

### 2.1. Proposed System Model

In this section, we propose IPS model that can support various applications (described in Section 2.3) by using devices equipped with UWB chipset. The system model proposed in this paper consists of at least 3 anchor nodes and 1 tag node. All the anchor nodes and the tag node includes UWB communication chipset and ARM processor. In addition, the tag node is connected to a device (android device) including input, control, and output units that can execute related applications as well as computing and memory unit via USB connection.

In the proposed system, each anchor nodes periodically broadcasts a Range Calculation Messages (RCMs) which contains corresponding information that the tag node can calculate its position. The RCM message is periodically transmitted of whether the tag node exists or not.

In addition, when UWB chipset of the tag node receives the RCM message from the surrounding anchor node, it transmits the received RCM message to the android device connected via USB connection. UWB. The android device that receives the RCM message from the UWB chipset of the tag node comprehend the sender ID of the newly received RCM message. If the RCM message transmitted from the sender node was received before, the profile information of stored anchor node is updated. However, if the RCM message transmitted from the new sender node, the profile information of the new anchor node is added to the table using corresponding RCM message.

The android device that maintains USB connection with the tag node repeats this process and counts the number of the anchor nodes that have sent an RCM message to itself. If the android device receives three different anchor nodes, it uses the profile information of the stored anchor terminal to estimate its location information as Section 2.2. Figure 1 illustrates this system.

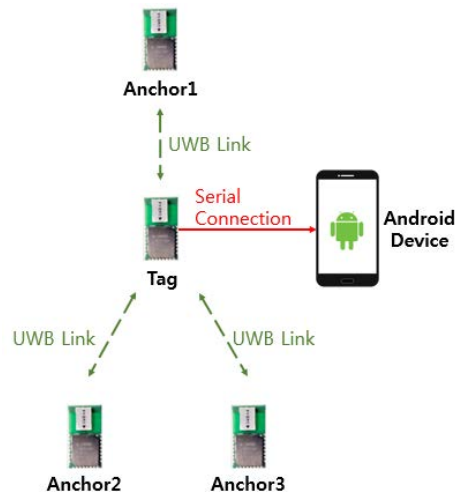


Figure 1. Proposed system model

Therefore, in the proposed IPS model, it is assumed that anchor nodes operate at the stationary position without mobility. Additionally, unlimited power is continuously supplied to anchor nodes. The tag node, on the other hand, are assumed to be mobility and connected to the android device that operate on limited battery. The android device not only run pre-installed applications, but also has sufficient computing ability and memory space. Moreover, it includes the ability to receive real-time data from an external server using LTE and wireless LAN.

## 2.2. Calculate Position of the Tag Node

The tag node measures and stores the distance between the tag node and anchor node whenever a new RCM message is received from the anchor node. The tag node uses ToF(Time-of-Flight) method to calculate distance between two nodes(the tag and the anchor).

In the RCM message periodically broadcasted from the anchor node, time information (Time-of-Departure, ToD) of the message transmission is recorded in the message. Therefore, at the time when tag node receives RCM message can recognize ToD information of RCM message. Also, the tag node acquires the time information (Time-of-Arrival, ToA) of the actual reception of the message from the UWB chipset. After obtaining the two time information, ToF can be calculated by the following equation (1).

$$\text{ToF} = \text{ToA} - \text{ToD} \quad (1)$$

The tag node that computes ToF from at least three different anchor nodes transmits the three ToF information estimated by itself to the connected android device using serial communication. When the android device receives these ToF information, it forwards the information to the installed and running android application. The android application calculates the distance information from the three anchor nodes by using the trilateration method and calculates the location information of the tag node connected to the android device. The calculated location information is used as input for various indoor positioning related applications described in Section 2.3.

Therefore, it is essential to receive RCM messages transmitted from at least three different anchor nodes in order to estimate the position of tag node and support related applications. However, if all anchor nodes transmit RCM message at the same time with same period, the collision among RCM messages occurs which is unable to support the application ordinarily. So, anchor nodes avoid collisions of RCM messages by performing a backoff using jitter determined by their id value.

## 2.3. Application Examples of Proposed System Model

In the previous two sections, we introduced the IPS model to support applications based on IPS model and the coordinate computing function of the tag node. In this section, we categorize and introduce examples that can take advantage of these system and function.

IPS based applications mentioned in this paper can be categorized into emergency and non-emergency applications depending on the QoS(Quality of Service). In case of emergency applications, it has the purpose of minimizing the loss of property and life in the disaster such as a fire or an earthquake. In this case of disaster response coping application, the tag node proposed in this system is connected to android system of the robot which is input for the initial action in case of disaster. The android system receives the RCM message from the anchor installed in the building where the disaster occurred through the UWB chipset of the tag node and calculates its position. The location information is utilized in the following manner.

- 1) It collects its position and disaster situation information at the same time and uses it as basic data to determine the priority of rescue activities
- 2) In case that it is difficult or impossible to enter a location where structural activities are required due to unpredictable obstacles, a dynamic structural plan is established by utilizing its own location information and indoor structure information
- 3) If the robot alone can not perform sufficient disaster response(rescue activities), it will improve the efficiency of rescue activities by specifying the exact location to request additional robot and manpower dispatch
- 4) Log the indoor location information measured by the robot during disaster response. By analyzing the log after the completion of all the rescue activities, the rescue movement of the robot and the time consumed in the rescue activities are analyzed to utilize the rescue robot as the base information for upgrading the system performance of the rescue robot

Meanwhile, in the case of non-emergency applications, it has the purpose of providing various convenience to people who have activities in a wide infrastructure such as a hospital or a department

store. The tag node proposed in this system is connected to android device of the people when they enter to the infrastructure. The android device receives the RCM message from the anchor which deployed widely in the building through the UWB chipset of the tag node and calculates its position. The location information is utilized in the following manner.

- 1) The user of this application is able to search for the desired destination. The application provides the route to the corresponding destination based on the current location information of the user.
- 2) It keeps track of the position of children who are active, so parents can prevent the situation that of missing child. Even though when the parents recognizes their child are missing, they can find the location of children using application without being embarrassed.
- 3) The application is applied to smart building where the light is turned on automatically by the user's location and direction information. In addition, the light is automatically turned off after the user passes.

### 3. Conclusion

In this paper, we propose a system model to provide UWB-based IPS. The system model proposed in this paper consists of at least 3 anchor nodes, 1 tag node and android device. All the anchor nodes and the tag node includes UWB communication chipset and ARM processor. The tag node computes ToF through the RCM message broadcast periodically from the anchor node and sends the ToF information to the connected android device via USB serial connection. The android device estimates the location of the tag with ToF received from tag and the predefined corresponding anchor coordinate. In addition, we discussed the applications that can utilize the estimated location coordinate of the tag into emergency and non-emergency situations.

In the future, we will implement the proposed system model directly and analyze system performance in various indoor environments.

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# **Cultural heritage guide system: a combination of augmented reality, deep learning and culture technology**

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## **Abstract**

Cultural heritage site is a place to learn about the culture and history of a country, however, where nowadays there are no creative ways to attract more visitors. In this regard, augmented reality (AR) technology can be used as an attractive way to facilitate access to cultural and historical information. One of the important challenges in the AR is the object recognition to accurately augment relevant information to real objects. This paper aims to design a guide system based on Culture Technology using AR and a deep learning method for recognizing cultural objects. To this end, first the architecture of the system and convolutional neural networks architecture for object recognition based on MobilNet are designed. Then the proposed system is implemented for the cultural objects of the SaadAbad Palace in Tehran, Iran. At the end, the methodology is benchmarked using confusion matrices

***Keywords- Augmented Reality; Deep Learning; Object Recognition; Cultural Heritage; Culture Technology***

## **1. Introduction**

Iranian cultural heritage sites such as SaadAbad Palace represent the rich and ancient culture of Iran, however, current culture of visiting makes the numbers of their visitors low due to lack of creativity and suitable tools in these places. In these places, usually tour guides explain the cultural objects for several visitors or the visitor read the label of each object. These ways are problems such as a small number of tour guide that makes no ones in some places, inconspicuous and small label of objects that visitors cannot read, and the same explanations guide for everyone that makes people unable to get their desired information. These problems make that the visitors may lose many the cultural and historical information, for example, in the Saadabad palace, the visitor may pass the statue of Arash of Anchor without regard to its history. However, Culture Technology (CT) can provide personalized information and services to the visitor by combining culture and technology.

Augmented Reality (AR) as one of the technologies of CT has an important role in propagating culture in a society. CT is study of interaction between culture and digital technology. CT consists of different technologies including AR. AR is a ubiquitous and interactive interface that adds computer-generated information to objects and positions of real world environment [1]. AR is able to create new value on cultural heritage sites, through which people can gain the rich experience and knowledge of the various cultural objects in an attractive and simple way [2]. Recently, AR are used for cultural heritage either as tools for upgrading scientific work or as guide system providing personalized information to users.

As an essential area of AR research, object recognition and tracking must done accurately to combine real world and relevant information. In general, there are two types of AR: marker-based and marker-less. Marker-less AR which recognize an objects without markers is preferred due to making variety interaction and using unassigned object [3]. Different methods have been used in object recognition and tracking, but recent advances in hardware and algorithms have sparked an interest in deep learning algorithms. Deep learning methods which attempts to artificially emulate the functionality of the human brain via hardware and software have successfully been used in complex recognition tasks such as object classification [4].

Recently, several works were used deep learning methods for object recognition and tracking in AR domain. In intelligent transportation systems, a fast deep CNN method was proposed for obstacle recognition for AR based driver information system [5]. A lightweight CNN object detection method was proposed to develop markerless outdoor mobile AR. Its results were combined with objects' corresponding spatial relationships to achieve the precise registration [6]. Faster R-CNN method was used for real-time object recognition to develop Marker-less AR for 3D integral imaging [3]. DeepAR method was introduced based on AlexNet, well known CNN architecture, and HIPS, an efficient matching algorithm to develop marker-based AR [4].

This paper aims to design a cultural heritage guide system based on AR and deep learning for recognizing and classifying cultural objects. The system enables visitors to searching and browsing large collections of general and cultural heritage information repositories using minimal interaction. In this regards, MobileNet which is depth-wise separable convolutions and is more suitable for mobile applications are used for object recognition. Furthermore, a prototype implementation that can significantly improve tourism experiences is provided using data gathered from cultural objects of SaadAbad Palace based on Keras library and Python programming.

Section 2 presents related works. Section 3 introduce the architecture and structure of proposed system for culture heritage. Section 4 provides experimental results obtained for cultural heritage objects of SaadAbad Palace. Section 5 concludes this paper.

## 2. Cultural Heritage Guide System

The Cultural heritage guide system enhances the visitors experience by combining AR technology and cultural and historical contents of cultural objects. It provides the AR based service to display suitable information to visitors about cultural heritage including “What is the visitor see?”, “How did artists look at this location?”, “What is the history?”, “What kind of stories are related?”, “Which events have taken place?”, “Which persons were involved in this place?” and “What is my next stop?”. These information are augmented to real cultural heritage objects through camera of visitor's smart phone. In other words, when the visitors are in the cultural heritage sites and point to a cultural object through their smart phone, the cultural objects is recognized and then suitable information of it are displayed on camera.

Fig. 1 shows the client-server architecture of the system. There are two main parts for this system, android side and server side. Android side is an AR application which recognizes cultural objects and display information according to object recognition. The server side consists of databases that store information about cultural heritage objects. The application will be start by opening camera of smart phone and get each camera frame as an image. Then the image send as an input of object recognition method and the application will run it by using the trained deep learning method. After the cultural object is recognized, its id send to the server to retrieve right information. The server retrieves information based on objects' id and send result back to the user.

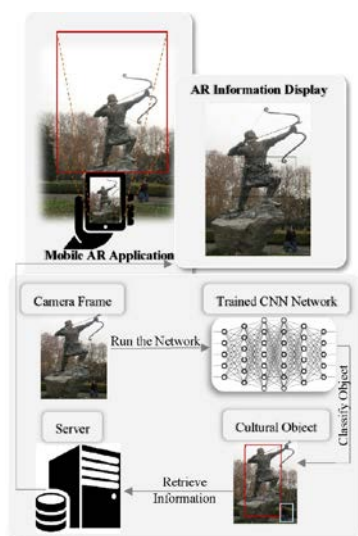


Fig. 1 Cultural heritage guide system



Fig. 2 shows the algorithm flow for the object recognition method based on the client-server architecture explained above. It starts with AR application and ends with displaying information on camera frame of smart phone. Only object Id and information transfer between the client and the server.

For object recognition and classification, a deep convolutional neural network detector is introduced based on MobileNet CNN architectures. MobileNet is an efficient network architecture and in order to build very small, low latency models which is suitable for mobile and embedded vision applications. It is based on depthwise separable convolutions [7] and have totally 3,233,989 parameters. Fig. 3 shows the MobileNet architecture.

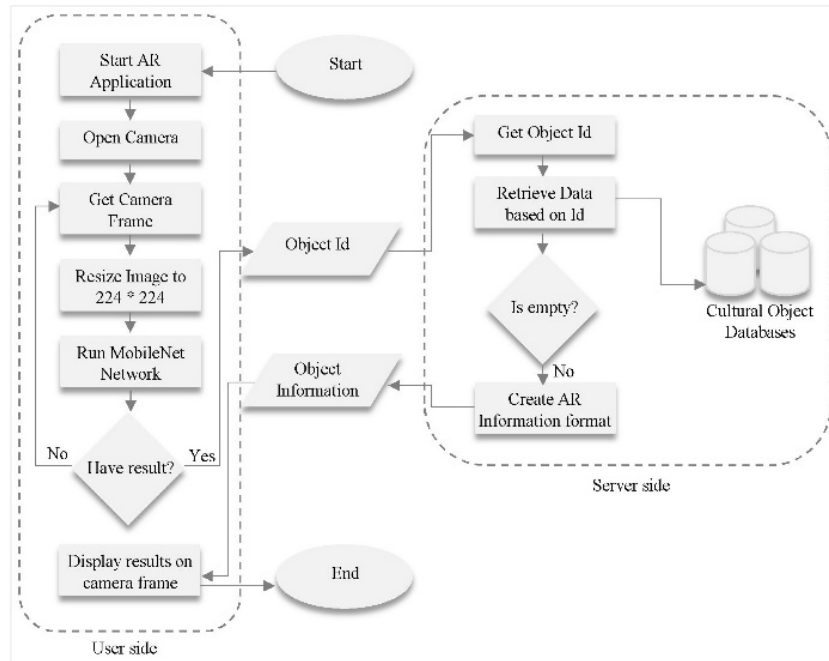


Fig. 2 Flowchart of the client-server model based object recognition

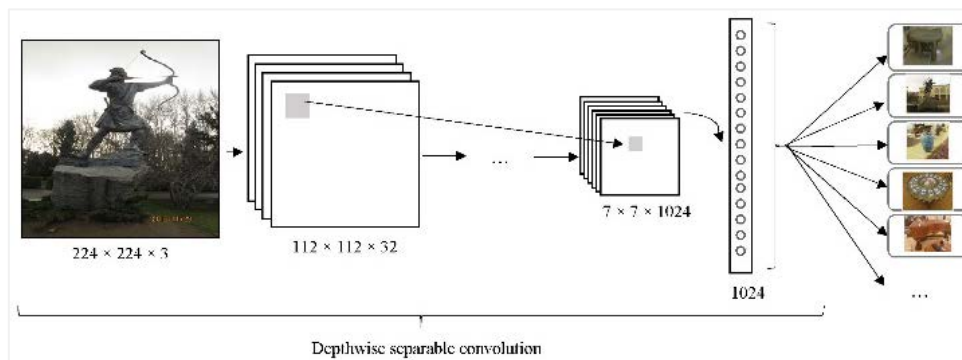


Fig. 3 MobileNet Architecture

### 3. Experimental Results

SaadAbad Palace was selected as a case study to implement and test the method. The cultural and historical complex of Saadabad covers an area of 110 hectares and was built by the Qajar and Pahlavi monarchs. Today it is used as a museum in which various cultural objects are kept that each of them reflect Iran's history and culture, for example the status of Arash. Arash the Archer is remains a popular name among Iranians. Arash the Archer is a heroic archer of Iranian who sacrificed his life to preserve the territorial integrity of Iran in the war between the Iranians and Turanians. In this paper, five cultural objects were selected (Fig. 4)

To implement the model, images were gathered from the five cultural objects (Fig. 4). For each object, about 110 images are captured from different views. The 80 reference images of the objects in Fig. 5 have been used to train the model. 20 and 10 images per object are used for validation and test respectively. The images were captured from different viewpoints of each cultural object. The images are given in Fig. 5 to provide the reader with an idea about the variation in viewpoint and imaging conditions.



Fig. 4 Cultural objects of SaadAbad Palace

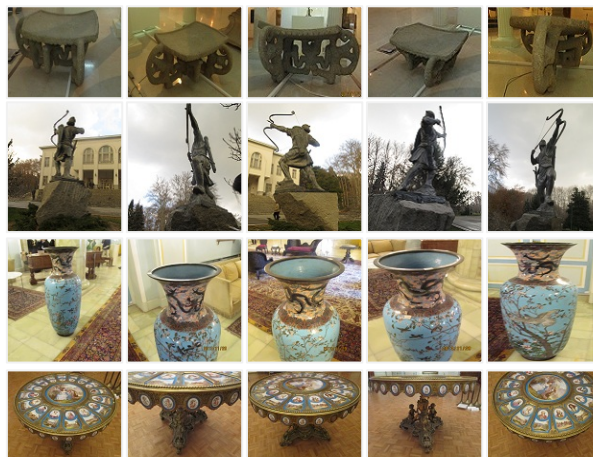


Fig. 5 Images from different viewpoint and illumination conditions of cultural objects

To develop this research, we used a laptop with setup of Intel® Core i5-3210M ~ 2.5 GHz processor, 64-bit operating system, and 8.0 GB memory. Tensorflow platform, Keras library and python programming were used to write the program. The model was run in 100 epochs and test was run in 5 epochs.

The detection results are displayed via confusion matrices in Table 1. The overall correct classification accuracy (the average of the diagonal elements of the confusion matrix) is 0.92, which indicates good results.

Table 1. The confusion matrix for average of five cultural objects

	C1	C2	C3	C4	C5
C1	80%	0	20%	0	0
C2	0	100%	0	0	0
C3	10%	0	90%	0	0
C4	0	0	0	100%	0
C5	0	0	0	10%	90%

## 4. Conclusion

Using CT, we could change the culture of visiting cultural heritage sites to create more attractive environment to attract more visitors. In this regards, the cultural heritage guide system was designed to provide personalized information about cultural objects. The system facilitate real-time access to cultural and historical information such as texts, images and films by pointing cultural objects. This way makes it possible for the user to concentrate more on cultural content than the way information is presented.

For the object recognition in the system, the convolution network based on MobileNet model was designed and implemented for cultural objects of SaadAbad Palace. The overall correct classification was obtained 0.92 which is good result. This good result may be due to a small number and variety of cultural objects and a small number of test data.

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## Segehan Identification system for Android Using HSV and Invariant Moment

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### Abstract

Segehan is a small level offering for the God by Hindu religion in Bali Island. Segehan composition consists of banana leaves, janur, rice, onion, ginger, salt and flowers. Segehan has different features so that it is difficult to remember and recognize each type. The implementation of digital image technology can be a solution to identify the types of Segehan. The use of digital image processing technology by using HSV (Hue Saturation Value) method, Color Histogram method, Invariant Moment Method and Euclidean Distance Method can be used to solve this problem. HSV is useful as a method in order to do segmentation of objects Segehan by utilizing color space which is then filtered according to the reference limits for selected color selection and the use of the Color Histogram method as a process for color feature extraction. The Invariant Moments method is used for extracting feature shapes then the Euclidean Distance method is used to calculate the similarity in the form of training data with test data. The final processing is the identification of Segehan types based on color characteristics and shape features. This study has a percentage of success in recognition of Segehan type is 75%, not recognized is 25%.

**Keywords-Computer Vision; Segehan; Android; Hue Saturation Value; Color Histogram; Invariant Moments; Euclidean Distance**

### 1. Introduction

Bali is one of islands in Indonesia which has many cultures. Bali is not only enriched by its natural resources, but also by its cultures which holds life values with Hinduism nuance. Bali is enriched by its diversity, such as tradition which is owned by each region in Bali, religion and belief, arts, peculiar culinary, traditional house, traditional clothes, and religious places in Bali. Balinese life is strong with its religious tradition, thus, Balinese people do activities of worship or ritual ceremony peacefully in certain days. In conducting the ceremony, it is symbolized by ritual offering called banten to be delivered to the God. Banten is an offering as a mean for Hindus people to be close with God. Banten also as a mean of gratitude, feeling of love, and grateful to the God. Banten itself is categorized based on its functions, one of it is Segehan. Segehan is used for a ritual ceremony for Bhuta Yadnya, in which a ritual ceremony dedicated to the Bhuta or supernatural beings. The purpose of Bhuta Yadnya is neutralizing negative power in the nature to be positive power. Segehan is a symbol to keep the harmonious relationship between human beings and supernatural beings in the environment of human beings.

The researches related to Balinese culture had been conducted in many studies, such as: [1] this research was focused on the identification of Balinese traditional snacks by using Tree Structure method and Recursive Algorithm based on Android system, in which the purpose is to assist the society which have difficulties in finding information about the ingredients of Balinese traditional snacks, [2] this research also discussed about Balinese culture which focused on the basic of Balinese choreography by using Augmented Reality based on Android system which is used to introduce Balinese dance to attract the larger society, [3] in addition, this study discussed about the identification of the ceremony of Balinese traditional anniversary by using Augmented Reality based on Android system to introduce it to the large society, because there still many people who do not aware about that tradition. Those studies are related to the identification of Balinese culture. However, there is no study about the identification of

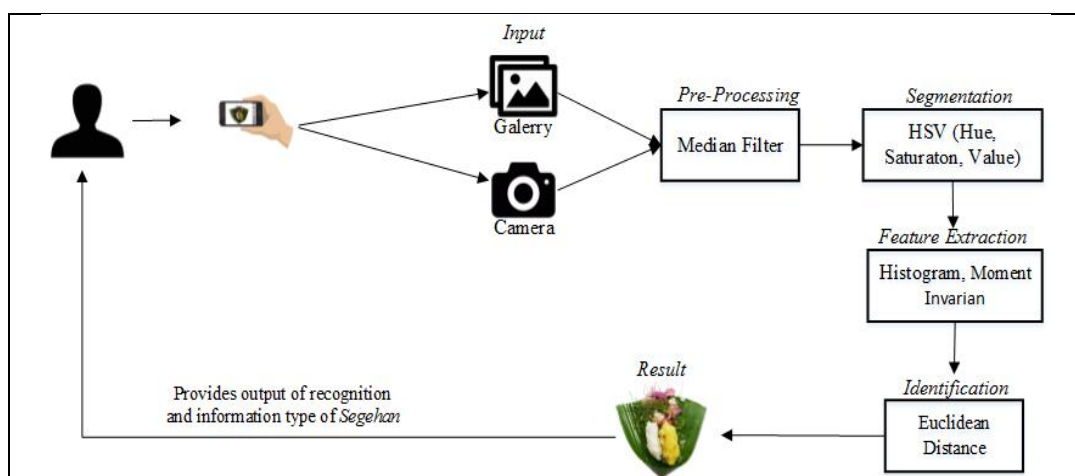
Segehan which becomes daily offerings in Hindu's tradition in Bali. Moreover, the use of digital image is rarely used to introduce the existence of the culture.

This study was conducted to solve the problems of the lack of information for young generation and today's society about Segehan. The use of image processing technology has become the solution which is used to introduce Hindus tradition in Bali. Nowadays, an identification system that is effective and efficient to be used by many people is Android based smartphone. The development of Identification System of Segehan Based on Android can assist the society to identify the types of Segehan in which it is a medium of Hindus ritual ceremony. It used digital image technology based on Android that can be an access to know the information about Segehan easily. The identification of Segehan used several methods and features that were used to identify each type of Segehan, and the result of the identification is displayed to the users. In addition, there are also several menus that can be used by the users, they are list of information about the location, function, and meaning of each type of Segehan.

Color and shape is used as the main feature to identify the types of Segehan, both of the features can be identified by using HSV method and Invariant Moment. The research related to the use of HSV method had been conducted in many studies, such as [4] utilizing HSV method to detect the texture of an image. HSV method is used to identify the quality of an application in detecting a texture if it is changed into HSV color. The result of the study showed that the quality in identifying the texture of an image by using HSV method was 87.9% with 72.5% of accuracy rates, [5] this study also discussed about the ability of Android application in detecting an object in the pictures that are saved in the cellular gallery, based on the color, shape, or feature. The pictures are processed in the HSV color domain for a better color detection. The round shape is detected by using Circular Hough Transform and the other shapes are detected by using Algoritma Douglas-Peucker. Based on the experiment, the application is able to detect eleven different colors, two geometries dimension including round shape, rectangle, triangle, and square correctly based on the local feature of the object and view of the pictures in any condition. The identification feature with HSV method by using parameter of color is a reference in identifying Segehan. The use of HSV is better than RGB color space because HSV has more color spaces, therefore it is easier in classifying the color of Segehan. Shape feature can be identified by using Moment Invariant Method. There are previous studies which were success in using Invariant Moment, such as [6] the study that used Invariant Moment based on Racah Polynomials to classify a picture and the combination of KNN method to identify the pattern, [7] this study also discussed about the efficiency of the use of Invariant Moment Method and Principle Component Analysis (PCA) in the technique of picture identification by analyzing the speed of calculation efficiency of each value of Invariant from different picture.

## 2. Application's Overview

Identification System of Segehan using Android is an application which is able to identify the types of Segehan and provide information about the function and meaning of Segehan. The users only need a smartphone that is already installed with the application. The followings are the overview of the application:



**Figure 2** Application Overview



Figure 2 is the overview of how the system is running. In using the system, there are several steps that have to be followed: first, the users input the image by using camera in the smartphone or taken from the gallery. Then, it is followed by pre-processing step and segmentation process to separate the required image. After that, the extraction of color characteristic extraction of image is conducted. If the information of color and shape are available, the verification and identification are done to get result the type of Segehan.

### 3. Research Schematic

Each type of Segehan has its unique feature. These features will be used to distinguish each type in training data. In this study, Segehan has several types as follows:

**Table 1:** List of Segehan Type

Segehan Type	Segehan Name	Composition
<i>Segehan Sasah</i>	<i>Sasah Putih</i>	White rice contains flowers, onions, ginger and salt
	<i>Sasah Kuning</i>	Yellow rice contains flowers, onions, ginger and salt
	<i>Sasah Hitam</i>	Black rice contains flowers, onions, ginger and salt
	<i>Sasah Merah</i>	Red rice contains flowers, onions, ginger and salt
	<i>Sasah Putih-Kuning</i>	White and yellow rice contains flowers, onions, ginger and salt
	<i>Sasah Putih-Hitam</i>	White and black rice contains flowers, onions, ginger and salt
	<i>Sasah Pancawarna</i>	White , yellow, black and red rice contains flowers, onions, ginger and salt
<i>Segehan Kepel</i>	<i>Kepel Putih</i>	White rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Kuning</i>	Yellow rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Hitam</i>	Black rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Merah</i>	Red rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Putih-Kuning</i>	White and yellow rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Putih-Hitam</i>	White and black rice with oval shape contains flowers, onions, ginger and salt
	<i>Kepel Pancawarna</i>	White , yellow, black and red rice with oval shape contains flowers, onions, ginger and salt
<i>Segehan Saiban</i>		Rice, vegetables, fish or meat and salt
<i>Segehan Agung</i>		Rice, an egg, candlenut
<i>Segehan Wong-Wongan</i>		Rice shaped like a human

Identification system of Segehan using Android used several steps and methods to make sure the type, the HSV and Invariant Moment methods have an important function for managing Segehan by using shape and color features as data reference to get the appropriate identification results. HSV (Hue Saturation Value) provides color space in the form of three main components, namely color, saturation, and value. Hue is an angle from 0 up to 360 degrees. Usually 0 is red, 60 degrees is yellow, 120 degrees is green, 180 degrees is cyan, 240 degrees is blue, and 300 degrees is magenta. Color saturation is the size of the color genuineness. Saturation is usually 0% to 100%. The value or intensity is the size of color brightness or the light that comes from color. The Value is usually from 0% to 100%. HSV has a role in the process of segmentation which used color reference value that is determined previously, and it will separate the information that is needed and not needed, then the color extraction process is performed using the Color Histogram method. Color Histogram is a method of color extraction by calculating the number of color distributions with the number of pixels of each color portion. Generally a normalization of histogram is done by dividing each value from its gray depth to the number of pixels in the picture. The



Invariant Moment method is used for extracting the Segehan feature. Invariant Moment is a method of finding characteristic from an object. The characteristics that are considered are in form of positions, areas, relationships, and characteristics that produce 7 Invariant Hu Moment Values to be used as keypoint values. Euclidean Distance is a metric that is commonly used for calculating the similarity of two vectors. The method is used in training data in order to get a correct segehan type.

#### 4. Result and Discussion

Identification System of Segehen using Android was arranged in the Android platform and using library OpenCV. The application would be running if the OpenCv Manager was already installed in the device to make the functions in the library running. The main process in the library is identifying types of Segehan and displaying the result to the users.



Figure 4 (a) Main Menu (b) Input (c) Result (d) Information feature

Figure 4 (a), (b), (c), and (d) are the screenshot of features in the application. The features are the main menu that is used to show the other menus in the application, the identification process with input from camera or gallery, showing the identification result to the users, and the information which is used to show the information of Segehan type. The detail process of the identification of Segehan types shown as follow:

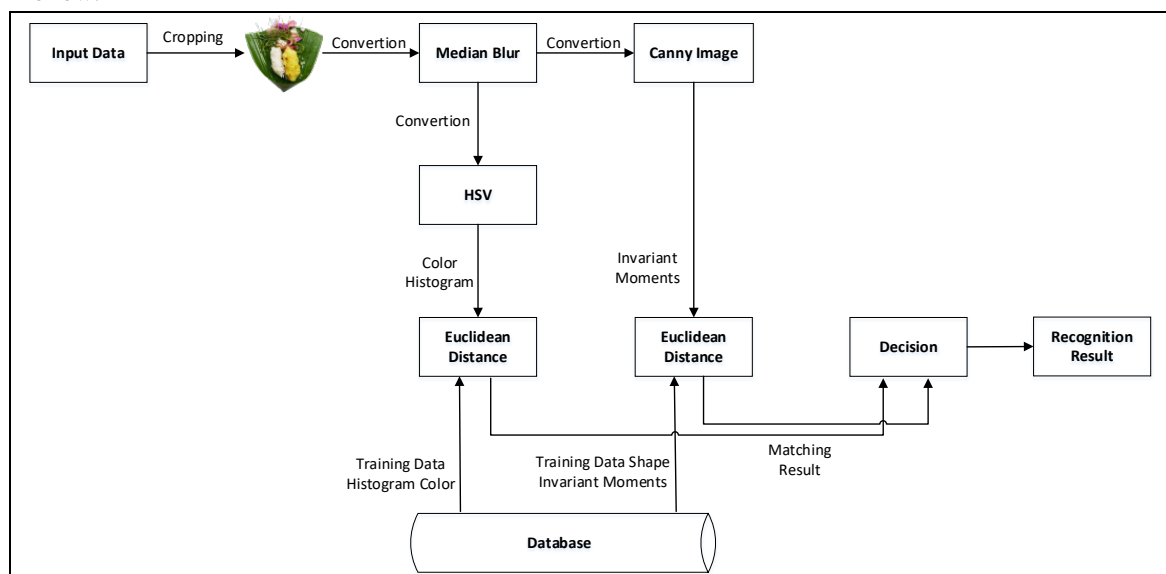


Figure 5 Detail Process of Recognition

Figure 5 shows the Segehan identification process, there are several steps that are running in order to recognize an Segehan, data acquisition from images input by the user and the source of the image can take from the camera or gallery and the cropping process used to take the required part of the image. The preprocessing stage have functions to improve image quality so that it is easier to process later, the image is converted to smoother to reduce noise using the Median Filter method, the Median Filter method is one of the most effective methods for reducing image noise. Segmentation process used to separate the required image information and from those that are not needed using the HSV method, the HSV method is a useful method for color segmentation by changing the image to the HSV color space then a color filter will be segmented. Extracting color features from the results of segmentation using the Color Histogram method, the Color Histogram method functions to extract color characteristics based on the values of Hue, Saturation and Value to be compared to the data in the database. The process of calculating the similarity between training data with test data using the Euclidean Distance method, the Euclidean Distance method is a method that can be used to compare the similarities of 2 different data, if the results of the calculation are close to 0 or equal to 0 then the data is the same. Matching data will be the result of the color decision that is owned by the image and the final decision will be combined with the shape matching result.

The form identification process after the preprocessing stage is continued with image conversion using the Canny method, the Canny method functions to get the edges of the image and convert the image to binary, the edges of the image make it easy to identify the shape features because the shape can be recognized by using the image edge forming pattern. The next step is to extract the characteristics of the form using Invariant Moment method, Invariant Moment method can extract the shape and generate 7 keypoint values that will be stored in the database, keypoint data in the database with keypoint on the test data will be matched using the Euclidean Distance method, method Euclidean Distance is a method that can be used to compare the similarities of 2 different data, if the results of the calculation are close to 0 or equal to 0 then the data is the same. Matching data will be the result of the decision form that is owned by the image. Both color and shape decisions will be combined to produce a final decision of the Segehan according to its type.

**Table 2:** Recognition Result of Segehan

No.	Segehan Name	Sample Total	Recognized	Unrecognized
1	<i>Sasah Putih</i>	4	3	1
2	<i>Sasah Kuning</i>	4	4	0
3	<i>Sasah Hitam</i>	4	4	0
4	<i>Sasah Merah</i>	4	4	0
5	<i>Sasah Putih-Kuning</i>	4	2	2
6	<i>Sasah Putih-Hitam</i>	4	2	2
7	<i>Sasah Pancawarna</i>	4	2	2
8	<i>Kepel Putih</i>	4	3	1
9	<i>Kepel Kuning</i>	4	4	0
10	<i>Kepel Hitam</i>	4	4	0
11	<i>Kepel Merah</i>	4	4	0
12	<i>Kepel Putih-Kuning</i>	4	2	2
13	<i>Kepel Putih-Hitam</i>	4	2	2
14	<i>Kepel Pancawarna</i>	4	2	2
15	<i>Saiban</i>	4	3	1
16	<i>Agung</i>	4	3	1
17	<i>Wong-Wongan</i>	4	3	1
<b>Success Rate</b>			<b>75%</b>	<b>25%</b>

Table 2 shows that by using combination of shape and color features provided 75% success in identification and 25% failed.

## 5. Conclusion

Identification System of Segehan using Android is able to identify types of Segehan. The development of application used HSV method, Color Histogram, Invariant Moment, and Euclidian Distance to identify the types of Segehan with success rate is nearly 75%. Successful of identification depends on the lighting and the way of taking the picture, because it can affect the shape and color feature detection from the picture.

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## Determinants of Data Quality in an Electric Utility: A Delphi Study

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### Abstract

This study investigates the determinants of data quality in a geographical information system (GIS) by conducting a Delphi study in an electricity utility in Thailand. A literature review was conducted to preliminarily investigate determinants of GIS data quality. The Delphi technique was then, used to gather convergent opinions concerning data quality determinants from engineers and technicians who are experts in GIS data production. The results revealed new data quality determinants in an electric utility context; these factors are supporting equipment, geographical factors, and human resource management. The other seven factors are common with previous studies in typical information system contexts. These are top management awareness, system quality, system usefulness, data quality control, training, data source quality, system support. These findings suggest that this electric utility should develop strategic data quality management and plans to ensure high-quality data across the organization.

**Keywords-** *data quality management, GIS data, Delphi method, power distribution system, electricity utility*

## 1. Introduction

Studies conducted on empirically examined determinants of data quality in typical information systems (record based data) show that both organizational and technological factors influence the quality of data. These factors are top management commitment/support, data quality control, data quality improvement, data quality policies, incentives, information system supports, useful systems, and education and training [1-5]. However, few studies have empirically examined the determinants of data quality, particularly for engineering assets which are mostly stored in geographic information systems (GISs).

Thus, this study aims to find the determinants of GIS data quality in a utility industry. By applying a Delphi technique, we conducted a research on a major electric utility, in charge of a power distribution network covering large areas of Thailand. This utility employs GISs to store geographical and distribution network maps as well as engineering asset data (e.g., transformers, electric breakers, and poles).

The rest of this paper is organized as follows: We first discuss the issues of GIS data quality in engineering asset management and then describe the critical factors influencing GIS data quality from the literature review. Next, the research methodology is presented. The findings are then discussed and summarized. Finally, the paper concludes with theoretical and managerial implications and directions for further research.

## 2. Background

### 2.1. Use of GISs in Utility Industries

Utility companies need to manage engineering assets (e.g., facilities and equipment) “to optimize the lifecycle value of the physical assets by minimizing the long-term cost of owning, operating, and maintaining, and replacing the asset, while ensuring the required level of reliable and uninterrupted delivery of service” [3]. For supporting engineering asset management (EAM), GISs have been widely used in utility industries. “A GIS integrates hardware, software, and data for capturing, managing,

analyzing, and displaying all forms of geographically referenced information” [6].

In electric utilities, electric networks can be modeled by using a GIS in order to manage and map the location of equipment in the network. There are two types of data in a GIS for power distribution networks. One is map data, which is spatial data depicting roads and buildings, and distribution lines installed with electric equipment. The other is attribute data, which is non-spatial data describing physical characteristics of equipment, such as attributes of transformers and circuit breakers.

## 2.2. Impact of GIS Data Quality on Utility Industries

With the high quality of GIS data, a utility organization can produce useful information for decision-making, maintaining the health of the assets, reducing risks to the organization and the system, optimizing operations, better service, and cost efficiency [12]. However, low-quality data impacts the performance at all levels of the organization and substantially increases many organizations’ operating costs [13-15].

Quality data are critical for utility industries worldwide. For example, according to the Federal Highway Authority (FHWA) of the U.S., missing or inaccurate information about the location of underground utilities is a leading cause of highway construction delays [16]. In addition, it costs the U.S. economy at least \$50 billion annually plus 1,906 injuries and 421 deaths over the past 20 years [16]. In Brazil, electric utilities are required by regulation to supply precise geographic information about the location of cables, transformers and customer metering points so as to be the world leader of reliable digital models in network infrastructure [17].

## 2.3. Determinants of Data Quality

Several factors relating to people, technology, and management could impact data quality during system development, system implementation, and system operations [1]. Case studies and data-quality expert recommendations suggest several data quality management practices that influence data quality, such as top management commitment/support, data quality control, data quality improvement, data quality policies, incentives, and education and training [1-5].

In the EAM context, Lin, et al. [3] propose a data quality framework that incorporates these key factors: system integration, training, management support, employee relations, and organizational culture. This model has been validated by conducting a case study of two large Australian engineering firms. A quantitative study by Mulasatra and Krairit [1] found that data quality control, information system support, and system usefulness significantly influence data quality in hospital information system operations in the Thai public healthcare context.

A case study by Orwattana [18] that investigated factors affecting quality of GIS data in the same organization as our study. Through in-depth interviews with management personnel from two provincial branch offices and two regional branch offices, he found five main factors affecting GIS data quality including 1) insufficient personnel for GIS data entry 2) insufficient software licenses to meet the need of system access 3) inadequate training of GIS data entry 4) inefficient GIS hardware devices causing delayed data processing 5) inefficient workflow between departments, causing huge backlog of work. However, the results were not standardized for testing with GIS data collectors in various branch offices.

## 3. Methods

There is a lack of existing empirical research conducting on finding data quality determinants in the GIS context. This study aimed to find the determinants related to GIS data collectors working in a utility industry. We approached this problem by applying a Delphi survey technique to aggregate expert opinions in GIS data collection.

### 3.1. Research Design

We conducted a study on an electric utility in Thailand. The justification that we studied only this electric utility is that this company is Thailand’s largest electric utility which operates a power distribution network covering almost all areas of the country. The company’s headquarters are located in Bangkok, with more than 200 branch offices located in most provinces and cities. All offices use a GIS to support their main operations. By conducting a single case study, we can perform careful study and deeply understand of the subject [20].

There are three main methods that can be used to collect data from experts: group discussion, expert interview, and survey [19]. This study employed a Delphi survey because the same questionnaire can be filled out several times from several experts. In the subsequent rounds, the respondents can clarify or change their views after receiving feedback on the earlier answers [19]. By using Delphi techniques, this study could receive consensus about data quality determinants from the GIS data collection experts.

Both authors of this paper used to work in the same project relating to GIS data cleansing as a part of industry-university collaboration, hence we used this long established relationship to ask permission from the company to conduct this research. Other utility companies in Thailand either have different operations or operate in different areas with a greater population density.

### 3.2. Data Collection

The panelists consisted of 26 engineers and technicians who had backgrounds and experiences related to GIS data quality issues [21]. They were all GIS data observers and data entry operators working in different branch offices having different geographical factors that typically play a major role in collecting data of engineering assets. The number of panelists in this study is appropriate; according to the suggestion of Delbecq, Van de Ven, and Gustafson (1975), “ten to fifteen subjects could be sufficient if the background of the Delphi subjects is homogeneous” as cited in [21]. The details of each method are explained as follows:

#### o Delphi processes

All the processes were administered to the panelists in one place, which was completed in three days during a training session at a headquarters’ office. All panelists were explained about the objectives of the study and encouraged to freely express their opinion based on their true perceptions concerning the study issues.

**Round 1:** We begin with the traditional Delphi process by distributing hard copies of the open-ended questionnaire to the panelists with a list of data quality determinants that we discovered from the literature review. The panelists were asked to add more statements concerning the factors that they thought might impact GIS data quality. We then analyzed the results by categorizing the data quality determinants to form a set of well-structured questionnaires for the next round survey.

**Round 2:** We asked the panelists to rate a set of statements relating to data quality factors on a 7-point scale (1 = lowest impact to 7 = highest impact). The panelists were also allowed to add more statements relating to factors influencing GIS data quality. The results were used to establish preliminary priorities among the statements (Ludwing, 1994 as cited in [21]).

**Round 3:** We adjusted the set of questionnaires by adding new factors discovered from the second round. In this round, we asked the panelists to rate this set of statements again and they were allowed to change their judgments. In addition, by calculating the results in round 2, we also presented the statistical values measuring the central tendency (mean, mode, minimum, and maximum) as supportive information for making decisions in this round. According to Ludwig (1994) as cited in [21], the use of mode is also suitable when reporting data in the Delphi process.

### 3.3. Data Analysis

#### o Consensus

In Delphi studies, consensus measurements are varied. Some studies have used subjective criteria or descriptive statistics to indicate consensus and to quantify its degree [21, 22]. This study used the *F*-test to evaluate consensus of responses. If there were no change in group consensus from round  $n$  to round  $n+1$ , then we would have stopped the processes after round  $n+1$ .

#### o Degree of Consensus

We also adapted the concept of Kapoor’s majority agreement as cited in [7] for quantification of the level of consensus, not for providing a cut-off rate. In our study, we defined ‘Average Percentage of High Agreement’ (APHA) as the total number of responses, indicating ‘high agreement’ with statements, divided by the total opinions expressed. In our case, ‘high agreement’ includes the responses rated from 4 to 7 in a 7-point rating scale (1 = lowest to 7 = highest). Unlike, Kapoor’s majority agreement, we do not include the number of disagreements in the APHA. ‘Total opinions expressed<sub>*i*</sub>’ is the total number of opinions on each statement.



$$APHA = \frac{\sum_{i=1}^n \text{High Agreement}_i}{\sum_{i=1}^n \text{Total opinions expressed}_i}$$

In the APHA formula, we calculate the sum of 'High Agreement<sub>*i*</sub>', as the number of responses indicating high agreement on statement *i*, for all statements. For comparison purposes, we also calculate a percentage of high agreements (PHA) for each statement *i* as follows:

$$PHA_i = \frac{\text{High Agreement}_i}{\text{Total opinions expressed}_i}$$

After each round, we calculated the APHA and PHA in order to present the degree of consensus. By using these figures, we can compare the relative importance of data quality determinants indicated by the GIS data collectors.

#### 4. Results

**Round 1:** We received some feedback from the open-ended questionnaire. We analyzed the results and formed a set of well-structured questionnaires consisting of 34 statements concerning data quality determinants for the next survey round.

**Round 2:** The APHA in the second round was calculated from 602 majority agreements (rating scores above 3) divided by the 747 opinions, which equates to an APHA rate of 81%. 16 out of 34 statements were rated above the APHA. Three statements were added by panelists.

**Round 3:** By conducting one-sided F tests on the responses of each statement in rounds 2 and 3, we found that the variation of group responses in the third round was equal or less than the variation of group responses in the second round survey ( $p=0.05$ ) for most statements. There were significant changes in responses from round 2 to round 3 only for the three statements that were just added in round 3 (in system quality and human resource management categories).

Hence, we terminated these Delphi survey processes after round 3. Three iterations are sufficient to collect the needed information and to reach a consensus in most cases [21]. The APHA for the third round is 86%, greater than the second round APHA. Twenty out of 37 statements were rated above the APHA. The PHA values of all statements are above 66%, reflecting quite a high degree of agreement (greater than 50%) that all the determinants are critical for data quality among panelists. We conceptually categorized the statements into ten factors and calculated the mode values of each factor by counting the frequency of statement ratings in each category. The results are shown in Table 2.

**Table 2.** Determinants of GIS Data Quality

Factors Affecting GIS Data Quality	Mode	% of High Agreement*	Factors Affecting GIS Data Quality	Mode	% of High Agreement*
Top Management Awareness	7		System Usefulness	7	
Realization of the importance and benefits of GISs	7	79%	Usefulness of a system from users' perspectives	7	100%
Human Resource Management	7		Training	6	
Adequate knowledge of GIS data entry personnel	7	94%	Effectiveness of user training	6	100%
Relocation of GIS data collectors	5	92%	Sufficient training for each user	4	92%
Appropriate skills of GIS data collectors	5	92%	Adequate training arrangements	6	88%
Age of GIS data collectors	5	83%	Data Source Quality	5	
Incentives for GIS data collection	6	83%	Quality of GIS initial data (data after implementation)	7	100%
Specific position of a GIS data collection job	4	79%	Data consistency between related systems	5	92%
Appropriate job assignment	4	75%	Supporting Equipment	5	
Adequate number of personnel for each task	7	67%	Effectiveness and availability of vehicles	6	83%
System Quality	7		Effectiveness and availability of computers	4	83%
Effectiveness of computer network	7	100%	Effectiveness and availability of GPS devices	4	83%
System reliability	4	96%	Effectiveness and availability of computer peripherals	5	83%
Effectiveness of GIS servers	7	95%	System support	5	
Accessibility (sufficient licenses, usage time)	7	94%	User support for operating GIS	5	88%
Easy to use	4	71%	Geographical Factor	4	
Response time of a GIS	7	67%	Difficulty in accessing data of electronic devices	4	96%
Data Quality Control	6		Geographic location impacts operational effectiveness	4	83%
Regular improvement of data quality in a GIS	6	87%	Weather impacts operation and GPS device effectiveness	4	83%
Regular check of GIS data quality	5	83%	Long distribution lines impacts operational effectiveness	4	79%
Regular feedback of data quality level	5	83%	Note: *percentage of responses with ratings above 3 (1-7)		
Average Percentage of High Agreement = 86%					

## 5. Discussion

As shown in Table 2, we can see that almost all categories of data quality determinants have critical issues rated with very high agreements among the panelists, having PHA values greater than the APHA (86%). Only supporting equipment and top management awareness of the importance of GIS data quality have all statements with the PHA rate below the APHA. However, this does not mean that supporting equipment or top management awareness is not important. In fact, the mode value of top management awareness is 7, the highest value. In addition, the geographical factor concerning difficulty in accessing data of electronic devices is considered very significant for GIS data quality, hence it is essential for the organization to provide effective and adequate tools for supporting data collection.

In addition, this study revealed new data quality determinants which have never been found in studies conducting in other information system contexts. They are geographical factors, supporting equipment, and human resource management (with specific GIS issues).

Geographical factors refer to the weather and geographic locations of equipment in power distribution systems which affect data collection and GPS device performance. In addition, equipment installation locations, such as on high poles, create difficulty in data observation. As a result, the quality of GIS data could be incomplete, not up-to-date, and inaccurate.

In a GIS context, supporting equipment is important for data observers who need to survey engineering assets in power distribution lines; such necessary equipment includes GPS devices and vehicles for surveying. In addition, the availability and effectiveness of computer facilities are important for supporting GIS data entry. The results conform to another study in human performance research which states that environmental supports influence performance improvement and that employees need the necessary tools to perform their jobs effectively [8]. In particular, the GIS environment is more complex than typical business information systems; sources of GIS data are usually disparate and difficult to obtain [11].

Managing human resources is imperative in the utility industry, since using GISs in both observing real world data and operating data entry, is comparatively more complicated than using other types of information systems. In an electric utility, technicians and engineers usually work in the fields or at construction sites; they are less likely to accept new technology with high complexity [9]. Hence, appropriate job assignment according to employee abilities is essential as is the allocation of adequate personnel for each task. Also, creating specific GIS data entry jobs is another choice that can increase the effectiveness of GIS data entry. In addition, relocating GIS personnel should be carefully managed; new staff needs sufficient training and support in using a GIS.

The other factors (top management awareness, system quality, system usefulness, data quality control, data source quality, training, and system support) have been indicated in previous studies as being important for maintaining high quality of data in other contexts [1-5]. However, some issues in each category of data quality determinants are different from those in the previous studies.

System quality was found to be very important in this GIS context as well, especially in the effectiveness of computer servers and computer networks. In general, processing geospatial data needs high performance computational infrastructure. System accessibility (software license and available usage time) was highly regarded as essential data quality determinants. If a GIS system is not available for users as required, data will not be entered in time nor completely.

The quality of GIS data source (data after implementation) was found essential for subsequent use of a GIS system and for maintaining quality of data after operating the system. Data consistency among GISs and other related systems (e.g., SAP and transformer system) is critical for GIS data quality as well.

System usefulness, the perception of users toward a GIS, was stated as an important factor conforming to a result of the previous study by Mulasastra and Krairit's [1] that system usefulness significantly impacts data quality in a healthcare context. It is obvious that if users perceive that a system is beneficial such that it can make him work more efficiently, then they would be willing to collect or enter data appropriately. The last factor is data quality control where the majority of the panelists agreed that regular improvement, quality checks, and feedback of data quality can influence data quality, in accordance with the study by Mulasastra and Krairit [1].

## 6. Conclusion

Despite the importance of data quality, there has been little empirical research on the factors

influencing GIS data quality, particularly in the electric utility context. This study conducted research using the Delphi technique for aggregating expert opinions in a Thai public utility. Three iterations of Delphi surveys were conducted. Consensus measurement was determined by a decrease in the deviation of responses from round 2 to round 3.

The analysis results reveal that technological, management, and geographical factors are very essential for GIS data quality. These technological factors concern system quality, system usefulness, and data source quality. The management factors relate to effective and adequate training, knowledge and skills of GIS data collectors, relocation of GIS data collectors, system support, and data quality improvement. The geographical factor relates to difficulty in accessing data of electronic devices.

The new GIS data quality determinants have been discovered in this study. They are geographical factors, supporting equipment, and human resource management (with specific GIS issues). The other determinants, common among the results of previous studies, are top management awareness, system quality, system usefulness, data quality control, data source quality, training, and system support.

This finding suggests that this electric utility should develop a data quality management strategy and plans to ensure high-quality data across the organization. This suggestion conforms to Thailand's digital government policy which encourages all Thai government agencies to implement data governance. For this utility, attention should be paid to all ten determinants revealed by this study.

We derived all the factors from opinions gathered from experts in GIS data collection in a single utility company. Hence, a quantitative research should be conducted to develop valid and reliable measurement instrument for these factors. Then, they should be quantitatively tested across all branch offices in this utility industry to determine the association between the determinants and their effects on GIS data quality.

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# **The Characteristics and Changes of Modern Korean House Design Since 1960's**

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## **Abstract**

This study attempts to analyze the characteristics and changing trends of the design of modern Korean houses since 1960s, and to understand the impacts of Western architecture and design on modern Korean house design. The photos of 101 houses were selected from the magazines published since 1960s. The data collected were analyzed via frequency, percentage, and average.

The result reveals that the interior design of the living room in modern Korean house has undergone lots of changes in finishing materials, window treatments, types of cabinets, and use of lighting fixtures. It can be concluded that 1960-1970's is a period of introducing Western design as a superior, while 1980's is a period of exploring various ways toward harmony between Korean style and Western style, and 1990's is a period of settlement of Koreanized modernism style, differentiated from the Western style of 1980's.

**Keywords-** *modern; Korean; house design; characteristics; changes*

## **1. Introduction**

House design is one of the most essential cultural standards. It connotes view of value, lifestyle, aesthetic consciousness and technology in the same age, reflecting strong cultural identity physically. However, modern Korean house design seems to be discontinued from the tradition with sudden introduction of Western architecture form, material and technology.

The purpose of this study is to analyze the characteristics and changing trends of the exterior and interior design and floor plan of modern Korean houses from 1960's to 1990's and to understand the impacts of Western architecture on modern Korean house design. Also, this study is to reveal the characteristics of Korean design shown in modern Korean houses.

## **2. Objectives and methodology**

### **2.1. Specific objectives**

The specific objectives are the followings;

- 1) To analyze the characteristics of the exterior design of modern Korean houses including the form, material, dominant style and image.
- 2) To analyze the characteristics of the interior design of modern Korean houses including architectural interior components such as ceiling, wall, floor, window and interior elements such as furniture, furnishing, lighting and accessories.
- 3) To analyze the characteristics of the floor plan of modern Korean houses including relationships among the living room, dining room, kitchen and entrance.
- 4) To analyze the impacts of Western architectural design on Korean house design.

## 2.2. Methodology

Photos and plans were used for content-analysis approach that yield qualitative and quantitative data. The photos of 101 houses including exterior, interior and floor plans were selected from all the architectural design magazines published since 1960 in Korea. 16 houses for 1960's, 20 for 1970's, 30 for 1980's and 35 for 1990's were finally selected according to the criteria that those were published in more than 2 architectural magazines or got a prize as good design. The data collected were analyzed in both qualitative way including the form, material, style and image and quantitative way via frequency, percentage and average.

## 3. Findings

The results reveal several important findings.

### 3.1. The characteristics and changes in the exterior design

The exterior design of modern Korean houses has been continuously changed in use of materials, roof form and style. The change in use of materials is related to the development of technology and new materials. In the roof form, a flat roof and a gabled roof are most popular in modern Korean houses. Several variations in the roof form began to appear since 1980's and the mixed roof in one house such as a combination of flat and semi-circled roof began to appear in 1990's. Modernism, the most popular exterior style in 1960-70's has been replaced by late-modern style since 1980's. Also, post-modernism style became more popular in the exterior design since 1990's. This means that the exterior design of modern Korean houses reflects a global trends of deformation and variation in style.

### 3.2. The characteristics and changes in the floor plan

The most popular floor plan in modern Korean house design are '□' and 'L' shape. This reveals that '□' or 'L'-shaped floor plan, one of the major characteristics of traditional Korean houses remains unchanged. Houses with openness among living room, dining room and kitchen increases in 1990's, compared to the previous decades. Also various connections among these three areas since 1980's reflect diversity in lifestyle and traditional preference for open interior space.

### 3.3. The characteristics and changes in the interior design

The interior design of living room in modern Korean houses has undergone lots of changes in finishing materials, window treatments, types of cabinet, and use of lighting fixtures. The configuration of furniture including sofa shows the trend of each period. Modernism is the most popular dominant style in the living room from 1960's to the present. Also, neo-classic and traditional Korean styles are revealed as the most common sub-dominant style of living room.

A shift from modernism to other style such as late modernism, post modernism and de-constructivism shown in the exterior design do not appear in the interior design of modern Korean houses.







Figure 1. Changes in the interior design of modern Korean houses from 1960's to 1990's

Table 1. Changes in the characteristics of modern Korean house design

category	items	1960-1970's	1980's	1990's
exterior	roof	Roof-tile, concrete Flat roof, gable roof	Less use of roof –tile More use of slate roof Flat roof, gabled roof	Less use of slate roof More use of Asphalt shingle
	wall	Brick, stone, mixed use of materials	More use of brick Less use of stone	More use of concrete Less use of brick, stone
	style	Modernism	Increase of Late modernism	Late modernism de-constructivism
	image	Masculine, urban, simple, unified	Unified, closed	Light, decorative, comfortable
floor plan	LDK	L-D-K arrangement	A variety of LDK type	L-DK
	connection	Independent living room	A variety of connection among living R & others	Open living room to the entrance
interior	layout	ㄷ –shaped	ㄱ, ㄷ –shaped	ㄱ –shaped
	finishes	Floor: carpet, parquetry Ceiling, wall: wood	Floor: p-tile +rug Ceiling, wall: less use of wood, more use of wall-paper or painting	Floor: wood, wood +rug Ceiling, wall: wallpaper, or painting
	window	Window treatment: curtain	Double curtain system with balance decoration	Vertical blind
	furniture	Sofa: textile Fixed furniture, chair	Sofa: use of leather More use of low- heighted cabinet	Sofa: more use of leather Furniture: less use of tea table and chairs
	style	Modernism	A variety of style	Modernism With unified style
summary		Imitating period of Western style	Exploring period	settlement period of Korean modernism

#### 4. Conclusion

The results show that modernism is the most popular style in modern Korean house design. It can be interpreted that traditional Korean design is characterized by unornamented minimal design, openness and flexibility in use of space, which are also the characteristics of modernism. This commonness seems to make modernism easily accepted and settled down in modern Korean house design. It is concluded that 1960-1970's is a period of introducing and imitating western design as a superior, while 1980's is a period

of exploring various ways toward harmonious combination between Korean traditional style and Western styles. 1990's is a period of settlement of Korean modernism style as a result of various exploration of 1980's, which is differentiated from Western house design.

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# Characteristics of Korean Webtoon and Its Expandability for Media Mixed and Globalization

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## Abstract

The definition of “webtoon” is comics that are distributed and consumed through the Web. The webtoon is a new genre invented in Korea for online comics, and it is considered a unique kind of comic in the global cartoon market. The solid infrastructure of the Internet and increase of digital cultural consumption created the possibility to provide a platform for webtoons and its production. Webtoons have become popular among Koreans. They have caused a cross-media phenomenon, which means webtoon content is transformed to other content in such industries as movies and TV dramas. Cross-media phenomena of webtoons have developed since the middle of the 2000s. A characteristic of Korean webtoons is high-speed production. The viewers of webtoons read daily webtoon series and share their opinions simultaneously. This could influence the webtoon artists and their stories. This is one of the unique characteristics of Korean webtoons. The goal is to study the characteristics of the Korean webtoon and its expandability for globalization.

**Keywords-component;** *webtoon, Hallyu, Korean wave, Korean pop culture, web comic*

## 1. Introduction

In the 1990s, the Korean government recognized the potential of the cultural industry and started to focus on culture as an exportable product. From this turning point, Korean pop culture has begun to spread vigorously to China and other Asian countries and then throughout the world. Korean TV drama first started Hallyu and influenced the success of K-pop and K-movies. As successful Hallyu that began from Korean TV drama, K-pop and K-movies expanded to games and webtoons. The webtoon is a unique form of online comic strips created in Korea. Webtoons, online Korean comics released on a regular schedule, much like tv programs or dramas, started in South Korea in the early 2000s. Since then, they have garnered great popularity not only in South Korea, but abroad as well, sparking the trend of translated webtoons in languages such as English, Mandarin, and Indonesian (<https://www.10mag.com/10-korean-webtoons-everyone-should-read>). Because the webtoon is considered by the Korean government as the next “killer” content, it has started to invest in webtoons, as well as investing in cultural industry since the 1990s. Webtoons have been successfully reproduced in TV dramas, movies, or musicals to generate additional revenue. In this work, the characteristics of the webtoon and its mixed-media expandability and globalization are studied.

## 2. Characteristics of Webtoons

### 2.1. History of the Webtoon

A webtoon is a digital cartoon that is designed to be viewed in Internet media. “Webtoon” refers to

digital comics seen on the Web, and it is a term created by combining the words “website” and “cartoon.” The difference between the type of the format and the way of viewing distinguishes web comics and web cartoons. In recent years, “web cartoons” and “web comics” have been used interchangeably to represent the digital comic book. Webtoons were launched in 2003 on a portal site in Korea called Daum, after providing a digital comic service. In 2003, Daum turned a corner with “Cartoon in the world,” and, with the launch of large portal sites in the webtoon market, WebtoTun is coming to another turning point (<https://www.joinusworld.org/community/9156-webtoon-a-new-trend-in-korea-thanks-to-the-internet>). It was designed for reading on the Web and was the first digital comics to be read in a way involving scrolling down with no borders between cuts. In 2008, the number of high-speed Internet subscribers in Korea was more than 15 million, and the number of smartphone users exceeded 10 million in 2011. As the webtoon infrastructure emerges, webtoon viewers have dramatically increased in Korea. Since 2014, webtoons have begun to expand to global market to become a vital killer content. The webtoon industry in South Korea was estimated to be worth \$153.5 million in 2014, according to an estimate by the Ministry of Culture, Sports and Tourism. Research shows there are 4,661 webtoon artists drawing 4,440 webtoons and publishing them through online platforms, such as the country's largest portal services Naver and Daum (<https://www.aljazeera.com/blogs/asia/2015/06/korea-latest-cultural-phenomenon-150630055653457.html>).

## 2.2. Characteristics of Webtoons

Webtoons, which originated in Korea, are different from the United States and European webcomics. All of them are designed to publish digital comics on the Internet. However, the webtoon develops and produces a new comic format based on the characteristics of the Internet media. For this reason, the webtoon is considered one of the unique Korean types of content. The most significant feature is the touch scrolling in the way of reading it.

In the early 2000s, people began to scan published comic books and share them illegally through file-sharing websites. The image quality of scanned comics was not satisfying, but they were free. It was a significant blow to the already faltering comic industry, with the market shrinking to \$389 million. Fortunately, the industry began to see business opportunities. Cartoonists started to draw bespoke, original content specifically for online consumption — designed in a way that people can easily read by scrolling down the screen. Now, a new generation of webtoons, taking full advantage of the digital space, features sound and visual effects (<https://www.aljazeera.com/blogs/asia/2015/06/korea-latest-cultural-phenomenon-150630055653457.html>). Webtoons update the story daily, weekly, or monthly, like a TV drama. The users can freely comment on the board. Webtoon creators reflect users’ opinions on webtoon stories. One of the most outstanding features of webtoons is that users can be involved in the process of creating storytelling.

One of the webtoon characteristics is that the genre has a broad spectrum. It can also be characterized by the vast audience of the users' target layer. The strength about webtoons is that they are not limited to one genre. There are numerous attempts to create a new webtoon in a different format. ([http://www.hani.co.kr/arti/culture/culture\\_general/746428.html#csidx80d570b90e64861bb3ae5c4ced46fbf](http://www.hani.co.kr/arti/culture/culture_general/746428.html#csidx80d570b90e64861bb3ae5c4ced46fbf)). The main genres shown in webtoons are drama, fantasy, comedy, action, a slice of life, romance, heartwarming tales, thrillers, sports, sci-fi, etc. Also, webtoons are free and have the advantage of being easily accessible from a smartphone, regardless of time and place. Webtoons also use the media feature of digital comics to include sound effects or multimedia effects. These features are a significant factor of success in developing the format and content of digital comics in the global market. They are normally free, because portal sites just want to increase the view rates, which influences advertisement profits. Because they were fun and free, there was huge popularity among not only Koreans, but also people worldwide (<https://www.joinusworld.org/community/2263-the-way-to-view-official-webtoon-of-korea/>).

## 3. Webtoon Expandability for Media Mixed

The modern comic industry is not only generating direct revenue from selling the content, but also expanding industrial values to produce more-substantial amounts of income. For example, there are approximately 50 movies produced by Marvel Comics, with a \$29,629,193,449 film turnover. With the big success of Marvel, the webtoon industry is focusing on extending its content from webcomics to

television dramas, movies, games, and musicals. The government hopes that webtoons will become the next generation of killer content and used as a medium for one-source multiuse (OSMU). More than 50 webtoons has been recreated into more value-added dramas and movies, with some even remade into games. According to an industry report, the sales of character products and office supplies went through the roof after the drama went on air (<https://www.aljazeera.com/blogs/asia/2015/06/korea-latest-cultural-phenomenon-150630055653457.html>). The first intellectual property rights movie "Apartment" was created in 2006 by the webtoon artist Kang Full. In 2010, the webtoon "Moss" was the first to be successful in recording the box office, which was 3.3 million tickets sold. Since then, with the increasing number of successes in webtoon intellectual property (IP) movies, the webtoon has become a major source of revenue creation. Webtoon IP TV dramas, which began in 2006, have been growing into reproducing 15 webtoon IP TV dramas in 2015. Webtoon IP games began in 2007. The success of the webtoon IP game in 2015 is the most active extension of webcomics. Webtoon IP is also actively expanding into the fields of publishing, animation, theater, musicals, and advertising. In the early days, the expansion of IP was carried out in a single shipment, which spread radially over a certain point, transforming it into a stereoscopic webtoon IP content. Webtoon IP is the beginning of cultural values and constitutes an extensive content ecosystem encompassing the meaning of industrial, social, and technological values (according to a 2017 graphic novel industry white paper).

Table 1. Webtoon IP media mixed-content production by year

## webtoon IP movies

2006	2008	2010	2011	2012	2013	2014	2015	2016	2017.8	total
2	2	1	2	2	5	1	4	1	2	22

## webtoon IP TV drama

2006	2007	2010	2012	2013	2014	2015	2016	2017.8	total
1	1	1	2	5	6	14	9	1	40

## webtoon IP games

2007	2008	2012	2013	2014	2015	2016	2017.8	total
1	1	1	2	5	6	14	1	27

Source: 2017 graphic novel industry white paper

The expansion of webtoons to other media has proved to be a good practice over the past decade. Webtoons extend to mixed media and have the following strengths. First, they can choose the storytelling that has been verified by the webtoon, with proven maturity and production. Second, considering the diverse genre selection in webtoons, the range of creating new content is broad. Third, the subject matter of the work is high quality because the poetry of the theme is higher. Finally, because the webtoon is a visual storytelling method, it is beneficial to extend it to visual media. Because of the proliferation of the webtoon's industrial value, the characteristics of the content of webtoons are becoming pervasive in society. The cycle of the work series is unique to the culture of webtoons, with a consumption environment that touches social poetry and enables countless readers to enjoy the story and interact at the same time. The reason for the development of webtoons is to connect with the culture of network communication, such as unconventional reproductions and the proliferation of multilateral content, and it showed remarkable adhesion to genres and media (according to a 2017 graphic novel industry white paper).

#### 4. Webtoon Expandability for Globalization

Based on the growth of the domestic market, the Webtoon industry has begun to expand its boundaries since 2014 to the global market. The global expansion of webtoons first started in China and Southeast Asia, and the webtoon is now showing its achievements in Japan and the United States. In 2015, the exports were \$25,560,000 USD. In the past four years, exports increased by 20% each year, spreading the

format of digital comics, which previously was almost never in other countries ([http://www.hani.co.kr/arti/culture/culture\\_general/746428.html#csidxa6ec6cadcdca9f490829cf2fda23dea](http://www.hani.co.kr/arti/culture/culture_general/746428.html#csidxa6ec6cadcdca9f490829cf2fda23dea)). Naver, one of the largest portal sites in Korea, started to provide Line Webtoon services for the globalization of the webtoon. The webtoon products, which were becoming known to foreign viewers, were translated into English and Chinese. Starting on April 1, 2014, the global users of Line reached approximately 400,002,000 people. There are more than 50 million Japanese users, and 24 million people are following in the United States. Lately, new subscribers from Asia and South America appear to be excellent candidates for using the function of the Hallyu content network (Kocca FOCUS, Volume 2014-09).

Table 2. Global market sizes of printed cartoons and webtoons (unit: million USD)

Year/market size	2011	2012	2013	2014	2015	2016	2017	2018	2109
Printed cartoon	72.01	71.08	64.79	63.51	61.97	60.36	58.65	56.87	54.97
Webtoon	3.30	4.26	4.57	5.38	5.91	6.47	7.07	7.71	8.40

Source: Mang, Ha Kyung, "Webtoon Hallyu will win over global comics market."

Table 2 shows that the market for webtoon continues to grow by comparing them with comics published in the global market. As the global market for webtoons rises, domestic webtoon content service providers are actively expanding into the global market by providing platform services or providing webtoon content. Global expansion is inevitable, because the webtoon industry is one of the most rapidly growing types of content in the world. The webtoon is a uniquely Korean culture, which has quickly developed into a "snack culture" that consumes cultural content. The term "snack culture" refers to the cultural behaviors of "consuming information and cultural contents in a short time rather more engaging in deep reading," and this snack culture has been the representative cultural scene of Korea (Wonho Jang, Jung Eun Song, "Webtoon as a New Korean Wave in the Process of Glocalization," *Kritika Kultura*, 29 (2017): 187). These different webtoon cultures can be an important element of competitiveness in the global marketplace. The success of webtoon IP movies, TV dramas, and games will increase the interest in and awareness of webtoons. This synergy can be expected in the global expansion of the webtoon.

The potential growth in the webtoon market has been deemed immeasurable, because other media outlets, such as movies, dramas, books, and more, take webtoon stories and reinvent them. The K-drama "Misaeng" was based on a webtoon with the same title. With their ever-growing global popularity, webtoons may just be the next Korean cultural phenomenon to take over American society after K-pop (<https://www.koreaboo.com/stories/americas-new-cultural-take-manhwa-aka-korean-comics/>).

Smartphone usage for reading webtoons is constantly increasing. As users in the global market increase their smartphone usage, they are addressing important infrastructure issues that enable them to enjoy webtoons. According to the KT Economic Research Institute's 2015 1st half IT Report, Korea has a smartphone diffusion rate of 83.0%, 4th in the world after the United Arab Emirates (90.8%), Singapore (87.7%), and Saudi Arabia (86.1%). Other countries with significant consumption of comics have lower diffusion rates for smartphones: Hong Kong (78.9), Taiwan (78.3), China (74.0), U.K. (71.1), U.S. (70.7), Germany (64.7), France (62.0), and Japan (33.5) (Research Center for Korean Studies vol. 16, "Korean webtoons: Explaining Growth"). The diversity of the webtoon genre is also one of the key factors in gaining a competitive advantage in the global marketplace. Each country has a different culture and preferred genre of webtoon. With the expansion in Asia, the domestic webtoon is centered on romance and fantasy; in North America and Europe, it is expected that the genre of webcomics will be different, because the perspective is different from that of Asia. One of the webtoon characteristics is that the viewers can be involved in the storytelling by commenting on the board. This interaction between Webtoon creators and viewers can make the viewers be immersed in the content. This creative way of using this characteristic is not being utilized in the global market because of its practical limitations. This interactive process of creating webtoons can be a competitive element to expand to a global market through a localization strategy. The webtoon is a product of Korean popular culture that is made in Korea and has a very high potential for global expandability. If the global strategy and the government's support to maximize the potential are realized, webtoon content will grow in the future, as did such content as K-pop.



## 5. Conclusion

The webtoon is unique Korean public content, created using the Korean Internet infrastructure and its flexible cultural characteristic that it quickly embraces the digital culture. It has seen a remarkable industrial growth in the more than 10 years since the webtoon began. Successful webtoon content proves the potential for media expandability, because it can be reproduced in movies, TV dramas, and game formats to generate secondary revenue. The growth of the domestic webtoon industry has expanded from 2014 to the global market. Despite the different languages and cultures in many countries, webtoon content is growing in global markets. A webtoon is a form that is optimized to be enjoyed on a digital device. It has formed a new digital culture phenomenon called "snack culture" in which cultural content is quickly consumed. The interactive webtoon environment of webtoon artists and viewers is unique. This characteristic of webtoon culture is an essential factor to expand globally. If webtoon content providers and governments can maximize these characteristics of webtoons for industrial competitiveness, the webtoon should become a killer content for the next generation.

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## **A correlation study of appealing characters in Malaysian Animated Film: Perception from Malaysian viewers**

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### **Abstract**

This research investigates the observation of Malaysian youth, to understand on how they feel about Malaysian animated film characters. This paper will highlight the design aesthetics of the characters and factors that affects emotions among Malaysian viewers. In this study, a correlation statistical test will be used and respondents comprised of 104 youth from Peninsular Malaysia age between 20- 27 years old to categorize the perception of Malaysian animated characters. Results indicates that correlation between variables are moderate ( $r = .306$ ) and ( $r = .282$ ) but shows high significant values ( $p < .05$ ) which mean the possibilities of Malaysian animated characters is appealing and attractive is true and give a pleasantness feeling to the Malaysian viewers.

**Keywords-** *empathy; emotion; animation; human perception ; character designs; design aesthetics*

## **1. Introduction**

Animation films has played an important role in entertainment contents that influences many people in any respective society. Having a good animated film, create cognitive and conative response to the animation viewers and its potential audience. The importance of animated character in animation film also supplements the animation contents in which indirectly affect the emotion of the animation viewers. Animation is a pop culture that aroused significantly from Disney and Anime. They are the key influence for many animation moviegoers around the world. It has not only inspired the style and animation art form but it also affects the humanity and lifestyle [1].

In this study, we explore the empathy on how Malaysian animated characters has affected and induced the feeling of the Malaysian animated film viewers. Empathy research is a growing field nowadays with an abundance of studies ranging from philosophy and psychology. The term refers to everything that is connected with the relationship between memory and emotion, a topical matter that filmmakers approached, consulting with neuroscientists and psychologists [2]. Therefore, we will investigate the perception and the design aesthetics that affects the psychological experiences in emotions to recognize empathy among Malaysian animation viewers. This paper explains the role of visual appearances in Malaysian animated characters and how its strategic creation able to stimulate the sensory perception of pleasure and excitement. We argue that it is highly likely that the character designs in Malaysian animations visual reinforcement has become one of a cinematic tool, and plays an important role to connect with the audience. It represents a way that empirical experience accumulated by the audience and will draw upon an evidence that reflect their human perception and cognition.

## **2. Literature Review**

### **2.1. Character Design in Animated Film**

The creation of character design in animation is closely related to many aspects in human society. The process of designing the animated character has become an important process not only for visual but also bounded to

many specifications that advent from myths and legends and inspired from society throughout centuries. From the development of the storytelling in animation, designing good animated characters requires a coherent and consistent character design skill and the artist need to consider many restrictions to develop suitable characters in the story. Most of the successful animation films are inspired from myths, fantasies, lifestyle and superheroes from storybooks or comics that are being visualized through the art of digital animation [3; 4]. Designing a good game or movie character requires more than only having an idea nowadays. Creating an appealing character design in animation has been both a distinct challenge as well as a space for exploration for animators throughout animation's history. It is through the Character Design that physical and psychological characteristics are presented; giving the character depth and making it connects with the audience [5]. As described by Bryan Tillman [6], in order to achieve a satisfactory result, a character designer needs to combine different elements in character design. These elements are the psychological and physical aspects of the character and the story that revolves around it. Other importance aspect is the elements of shapes and colors, the significance of these factors may have an indirect impact on the emotion of the viewers. Sajjad agreed that design and color in animated film is very significant in order to portray a specific mood or emotion to the audiences [7].

In Malaysia context, culture plays an important role that affect any media contents. From the history, famous traditional culture 'shadow puppet play' or 'Wayang Kulit' has been around for many years. It is a traditional Malaysian theater staged opera which combination of verbal narratives and performing arts [8]. It was believed that Walt Disney learnt the 'shadow play' before coming out with his own animation [9]. Animation is also a creative way to preserve culture with computer animation to portray stories and tales about any given society. Storyline is the most essential part in any development of animation contents. Visual culture in some ways influences people's knowledge, affects their construction and shape their aesthetics sensibilities. Beside the storyline, character design has become a backbone of successful animation. Character design developed complete with costume, accessories or weapon where all the characteristics that are usually inspired from culture experiences for example local traditional clothing and sword used by the warrior represent the character's stature [10].

## 2.2. Empathy (Emotion)

The rise of animation contents tends to drive them away from understanding what lies behind it that affect their emotion and thought. Keen's, as cited in [1] put forward a claim that, the relationships between narrative fictions, emotions and empathy have received attention from many scholars that generally supporting the claim that 'quality' fiction leads to the development of 'theory of mind'; human ability to comprehend other people beliefs and desires, that may differ from others. According to Raz & Hendler [11], empathy originates from the German notion *Einfühlung* (inner feeling) created by Robert Visser in 1873. In Visser's theory, he defined as the projection of human feeling toward external world, including aesthetic objects. The notion refers to situation in which what we feel something that occurs within our own body, but we attribute it to something outside of ourselves. From previous study, animation is considered as a visual display that relates to cinematic empathy. Previous study suggested that cinematic empathy is related to the role in eliciting a spectator's emotional engagement with cinematic content and hardly be considered as esoteric or marginal issue in film studies.

## 3. Method

### 3.1. Procedure and Materials

In order to investigate whether the character design aesthetics contribute to people's perception and emotion, we conducted a questionnaires survey to 104 Malaysian at 2 HEI (Higher Education Institutions students located in Kuala Lumpur, Malaysia. 80 respondent ages between 20-23 years with majority 80.8% from multimedia academic background were selected for this particular study. The second population was 20% from 24-27 years old. A set of questionnaire were use consists of 9 items with categorical and five-point Likert scale session ranging from (1- Strongly Disagree to 5- Strongly Agree). Statistical analysis were performed in order to examine the difference characteristics in emotion and design aesthetics in animated characters.

### 3.2. Justification

This study involved nine selected titles of Malaysian animated films with the character lineup to give an emotional responsiveness to the respondents. These animation films are *Upin dan Ipin* (2007), *Bola Kampung* (2007), *Super Tots* (2010), *Boboiboy* (2011), *Dunia Eicak* (2012), *The Amazing Awang Kehnit* (2014), *Puteri*

(2014), *Rimba Racer* (2015) and *Ejen Ali* (2016). These titles are selected based on their popularities and highly praised from the Malaysian viewers. For examples, *Bola Kampung* (2007) became the first local animation win the Malaysian viewers heart and break into the international market broadcast network. In November 2007, it aired in 16 Asian countries over the Disney Channel [12]. *Upin and Ipin* (2007), which became a huge phenomenon especially in South East Asian countries that shared similar cultures and language [13]. Similar like *Boboiboy* (2011), a boy who became a superhero to fight aliens that is very famous among children. This title came into highlight when the fully animated film *Boboiboy the Movie* (2016) break the record and collected almost RM 14 million nationwide. Followed by *Rimba Racer* (2015) with their stylized designs and won many awards in Malaysia. *Ejen Ali* (2016) which is following the footsteps of *Boboiboy* (2011) that use superhero as a theme and has won Best Short Animated Film in Malaysia Film Festival in 2016. As a result, these animation products has led the way and give inspiration to many other local animation contents.

### 3.3. Analysis

The survey employed in this study is divided into three groups of questions that asked respondents perception on local animated characters, character design aesthetics and psychological effects towards animated characters. In order to estimate the result, first we will use a frequency table for three items regarding the respondent perception about selected case studies for this research purposes. Next, the Spearman's rank correlation coefficient is used to determine the correlation between independent and dependent variables groups in this paper. The rank statistical tests, is conducted to examine three categories name as perception, character design and character design affects emotion.

### 3.4 Definition: Spearman's rank Correlation Coefficient

$$r_s = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

Correlation is a statistical method used to assess a possible linear association between two continuous variables. The stronger the correlation, the closer the correlation coefficient comes to 1.0. We will use the Spearman's rank correlation coefficient to determine the strength of the relationship between two variables. Spearman's correlation coefficient using Spearman's rho ( $r_s$ ) for sample statistic [14]. It is appropriate for non-parametric correlation test when ordinal variables is used. The correlation coefficient has been provided using data from statistical simulation collected from the survey questionnaires. The purpose of this paper is to identify an appropriate use of correlation to highlight the factors that related to character design aesthetics that evoke human emotion and to recognize empathy among Malaysian animation viewers.

## 4. Result and Findings

### 4.1. Post processes and loadings

The analysis was performed in SPSS software and tested using correlation analysis. The goal of the current study was to examine the design aesthetics and perception from the animation viewers that affects the psychological experiences in encouraging positive emotions that determine the pleasantness feeling. The first data in Table 1 were analyzed in frequency table to show the differences between gender and age to obtain numbers of participation in this research. Table 2, indicate reliability analysis for Cronbach's Alpha report.

### 4.2. Descriptive & Cronbach's Alpha

Table 1: By frequency ( $n = 104$ ) for Gender and Age

Gender		Age	
	Frequency & (%)		Frequency & (%)
Male	53 (51 %)	20-23	84 (80.8%)
Female	51 (49 %)	24-27	20 (19.2%)
Total	104 (100%)	Total	104 (100%)
$M = 1.49, SD = 0.50, n = 104$		$M = 1.19, SD = 0.39, n = 104$	

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
.769	6

#### 4.3. Perception on Malaysian animated characters

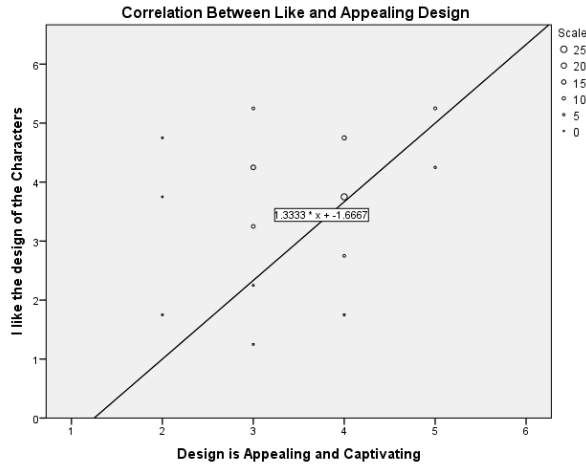


Fig 1: Scatter Plot (correlation within 2 variables)

Table 3: Spearman's rho (Appealing)

		I like the design	Design is Appealing
I like the design	Spearman's rho Correlation	.1000	.306**
	Sig. (2-tailed)	.	.002
	N	104	104
Design is Appealing	Spearman's rho Correlation	.306**	.1000
	Sig. (2-tailed)	.002	.
	N	104	104

Table 1 and Figure 1 shows results from Spearman's rho and scatter plot for two variables which is Like the design ( $M = 3.66$ ,  $SD = .758$ ) & Design is appealing ( $M = 3.93$ ,  $SD = .958$ ). For this particular analysis, it will identify perception from the animation viewers. Based on the statistical results, we found it is moderate correlation  $r = .306$  based on the correlation formula  $0.30 < |r| < 0.70$  and range from  $-1$  to  $+1$  correlation. However, the results show a good indication level of significance which shows  $p = .002$  (2-tailed) which is smaller than  $p < .05$ . We use the exact the  $p < .05$  to determine our results, and reject  $H_0$  (null hypothesis) of the p-value if smaller than 0.5. If  $p > .05$ , we fail to reject the  $H_0$  (null hypothesis) and accept  $H_a$  (alternate hypothesis) if greater than 0.5, that indicates there is statically significant correlation between two variables. We conclude that there is moderate correlation and it statically significant between the respondents who loves local animation characters and agrees that Malaysian animated character is appealing.

#### 4.5. Psychological effects to emotions

Table 4: By frequency ( $n = 104$ ) Key factor respondent's like the characters

Key Factor Why I like the Characters (Perception)	Frequency & (%)
Character's role in the story	21 (20.2%)
Character's Personality	22 (21.2%)
Dialogue Styles	11 (10.6%)
Character's theme	43 (41.3%)
None	7 (6.7%)
Total	104 (100%)

Further analysis in Table 4 is to identify the key factor that contribute to their personal preferences of why they like the characters in the animation ( $M = 2.93$ ,  $SD = 1.30$ ). The data revealed that character's theme shows the highest percentage 41.3% ( $n = 43$ ) compared to others. While data from character's personality and character's role appears to have a 22.1% ( $n = 22$ ) and 20.2% ( $n = 21$ ) that have not so much different percentage which strongly suggested that character personality and its role indeed play an important factor in animation films. Besides, the results can be related back to the "design of the character is appealing" which majority of the respondents strongly believe that characters in local animation is attractive in-term of the appearance that effects their viewers' emotion. We believe character's role and the personality is a vital element that related to the appealing factors that makes audiences feel close to the characters.

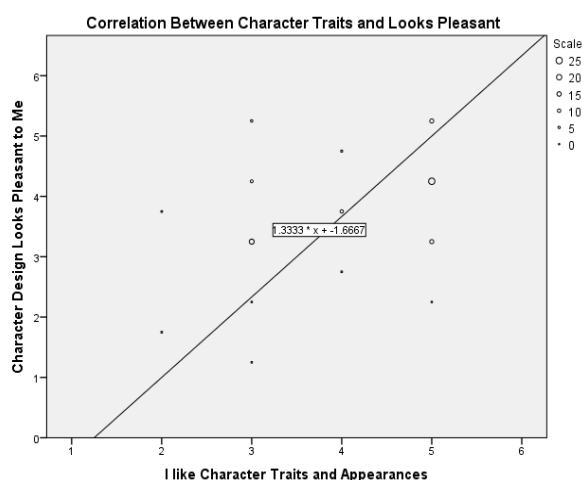


Fig 2: Scatter Plot (correlation within 2 variables)

Table 5: Spearman's rho (Emotion)

		I like character traits	Design looks pleasant
I like character traits	Spearman' rho Correlation	.1.000	.282**
	Sig. (2-tailed)	.	.004
	N	104	104
Design looks pleasant	Spearman' rho Correlation	.282**	.1.000
	Sig. (2-tailed)	.004	.
	N	104	104

Data from Figure 2 reveal the results about character design aesthetics in Malaysian animated characters. Based on the data presented in scatter plot, we found that the correlation between character traits and pleasantness feeling ( $M = 3.2$ ,  $SD = .837$ ) shows a lower and very close to moderate correlation. More evidence can be seen in Table 5, where by the correlation of  $r = .282$  is considered lower correlation. Yet, the level of significant indicate  $p = .004$  (2-tailed) has strongly demonstrate highly significant score based on  $p < .05$ . From this finding, we think the character traits and appearances and the feeling of pleasant towards character designs does have significant score and able to reject the null hypothesis. Here, we conclude that the alternate hypothesis is true and indicated enough evidence to accept that there is statically significant correlation between these two variables. Additionally, from the observation, we can suggest that there is a positive correlation between pleasantness feeling and excitement among respondents although the score of  $r$  is considered lower to moderate level.

## 5. Conclusion and discussion

The strength of this paper is to highlight the importance of understanding human emotion towards local animated film characters. By examining the feeling of “pleasant experiences”, we tried to understand what lies behind their feelings that stimulate the sensational feeling of pleasure when watching local animated characters among Malaysian youth. Interestingly, the finding suggested moderate relationship ( $r = .306$ ) on perception of Malaysian youth towards liking local animated character and do they think the design is appealing to them indicates that the quality of local animated characters has given some hedonic experiences to the local viewers. Secondly, we found that character's theme is the key factor when associating with the appealing designs. The meaning of character's theme in this study is more related to character's appropriate costume, accessories, outfit designs, colors used, types of clothes and ‘wow’ factors that complement the character to fit in the story. Moreover, character's role and the character's personality portrayed in Malaysian animated film has given an impact to Malaysian viewers. As mentioned in literature, visual culture in some ways influences people's knowledge, affects their construction and shape their aesthetics sensibilities. Selected animation titles that used for the purpose of this study are rich with visual culture elements that teach positive values to each other's. Lastly, from the correlation study to identify whether character traits have anything to do with feeling pleasant and enjoying watching Malaysia animated character; we found the correlation is quite low ( $r = .282$ ) but yet quite highly significant to shows that the correction between character trait also played an important factor that induce the feeling of pleasant among Malaysian youth.

Thus, this study may be important for the exploration of relations between emotion and the animation content to the local animation makers. We try to extinguish how the viewers feel about local animated characters. By defining the importance of understanding animation viewers, it symbolizes an extended meaning to the animation makers and the animation industries to know their audiences. Malaysian animated makers' needs to be brave enough to produce more animation with varieties of styles to specified viewers. Currently, most of the Malaysian animation contents aims for children viewers. With the exploration to different target audience, it may attract more Malaysian viewers to watch Malaysian animated contents. As mentioned previously, Anime and Disney are the most watchable animation contents in the world. Not only the animation has a good stories and beautiful character designs; it also offers animation contents that catered for all ages. Moreover, previous



study also suggests that animation can positively influence viewers' attention and increase consumers' intention to purchase the animated brand [15]. These include merchandising, packaging and products branding. Therefore, we hope that this study will benefit the creative content creators to understand how Malaysian animation viewers felt about local animated characters. In the end, digital creators must consider the impact on consumers' evaluations and considerations, ultimately, their satisfactions.

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## Local content in 48 Group Branding Strategy: Focused on JKT48 as a Case Study

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### Abstract

Girl group development as a brand, lately is a fascinate object to be examined, and one of them is AKB48. AKB48 has many brand derivatives with diverse concepts to answer the needs of its target audience. This study examined how AKB48 as a brand develop their brand and creates their brand architecture as a part of their brand strategy. This study focused on JKT48 one of AKB48's sister group to understand how AKB48 trying to expand their market, using hybridization and cultural content to match with the target audience preference. Hopefully, this finding could give a new perspective in branding strategy for other brands especially in music industry or entertainment industry in Indonesia.

**Keywords - AKB48; JKT48; branding; brand architecture; hybridization; cultural content**

### 1. Introduction

AKB48 whose received a Guinness World Record as the most members girl group in 2013 has been proving to the world about their existence as an artist and as a brand [1]. Recently, there are a lot of girl band and boy band groups that being develop and give a quite contribution to the recent trends, especially to the younger audience. Their existence could be a thread to AKB48 as a brand, but AKB48 manage to be an acknowledged active girl group up until now, which is a great achievement for AKB48. For example, in the recent event of MAMA 2017 "Mnet Asian Music Awards" that was held in 3 locations, Vietnam, Japan and Hong Kong, AKB48 was invited as one of the performer [2]. MAMA is an annual music awards and global music festival that being held by Mnet one of well known music television channel in South Korea. AKB48 was performed a collaboration song with some Korean's girl group such as I.O.I, PRISTIN, Weki Meki and Fromis\_9. In this event, Akimoto Yasushi, AKB48 group producer got an "Inspired Achievement" award and AKB48 also got an award as "Best Asian Artist Japan" which they also won it in 2009, 2012 and 2015 [2]. Moreover, in this event Mnet and AKB48 group announced that they will collaborate to create a project called Produce48. This is very interesting to examine how AKB48 groups could manage their popularity among others girl groups with the tight competition between girl groups not only girl groups from Japan but also from Korea (K-Pop), and even with other country pop group, which share the same target audience as them. This study will also examine AKB48 group's brand strategy to increase their brand awareness toward the audiences.

#### 1.1. AKB48 and 48 Group

As mentioned above, AKB48 has a lot of members and even get a Guinness World Record for that, but actually right now, it even bigger than what was mentioned on the Guinness World Record. AKB48 has 11 sister groups according to their official website, and there is 6 overseas sister groups among them [3]. AKB48 also have some more other sister groups which still in development progress. According to Ueda, this sister groups emerge because of the popularity of AKB48 and collectively called "the AKB48 group"

or AKB48G [4]. These groups also called “the 48 Group” by the fans to distinguish them with their rival “the 46 Group” which created to be the official rival of AKB48 Group, although they have the same producer, Akimoto Yasushi. The detail about 48 Group will be explained in the next chapter.

## 1.2. Research Focus and Methodology

This study focused on one of their overseas sister group in Indonesia, JKT48. JKT48 is a good example to explain how AKB48 strategy to expand their market and gain awareness through its 48 group. Another reason to choose JKT48 is because this group is AKB48’s first overseas sister group which already gain acknowledgment in their home country and recently gain awareness outside their home country such as Japan and other sister group country.

This research will examined collected data from various fans pages, official social media account and published data from journalism reports also supported by primary and secondary data research that collected from interview data, previous journal or literature. Using hybridization theory combined with brand architecture theory to analyze and examined the data. First, examined AKB48 and its sister group using brand architecture theory. Then finding its branding strategy through it. Second, examined the market and specify its target audience, then using hybridization theory to analyze the strategy to penetrate this foreign market, in this case is Indonesian market. Third, create a conclusion as a result to this study. The objective to this study is to examined 48 group branding strategy through JKT48 that might give a new perspective or ideas for others brand especially for Indonesian artists, other cultural product or Indonesian entertainment business.

## 2. AKB48

Akimoto Yasushi is a songwriter and producer that has produced a lot of TV programs, and hit songs for some popular Japanese singer and idol groups. In 2005 he got an idea to create an idol group that has different concept among others. If the others idol group perform occasional concerts and appear primarily on television and seems ‘un-reachable’ by their fans, he wants to create an idol girl group that has ‘reachable’ concept. He wants to reduce the distance that created between idols and their fans. From this idea, the concept of “idol you can meet” was born and AKB48 is the name of this idol group. Using this concept, he creates a theater concept performance, where AKB48 could perform everyday and their fans could come to see them directly. They also have a “handshake” event, which enables their fans to come and meet their idol personally.

The name of AKB48 named after the Akihabara district in Tokyo, where AKB48’s theatre is located which in 8<sup>th</sup> floor of Don Quixote shopping center. Later on this naming system will be followed by its sister groups. Although their first performance was only attended by 7 audiences, AKB48 keeps improving and developing their skill. They also gain more members that split up into a team. Up until now AKB48 has 6 teams which are A, K, B, 4, 8 and team *kenkyūsei* (trainee team who are understudies for the group). By splitting members into different groups it will allow them to perform and doing the events almost daily, because they can rotate performances and perform simultaneously at several events. These team system also adapted by AKB48’s sister groups along with others mechanism.

From 2012 until 2018 this group is included in one of the top highest-earning musical performers in Japan by their album sales. This could happened because one of their event, which is *sousenkyou* (general election). This general election event was invented by Akimoto Yasushi in 2009 to answer the fans complaint about their system to choose which member that would perform in their singles. In every AKB48’s single, around 16 members were elected by the management to perform. Before the general election event was held, the management will choose which member that could perform in the singles, music videos and other promotions, based on their performance. But apparently the management hand picking choices were not really satisfied the AKB48’s fans; therefore, Akimoto lets the fans to choose their own members to be the *senbatsu* members (chosen members). This general election is using voting system that allows anyone who has the ballot ticket to vote, and there is no limitation of using the ballot ticket for each person. Fans could get this ballot ticket though the CD singles that they sold before the election event [3]. Therefore, hey manage to sold more than one million copies particularly for every general election singles. For example, in 2018, their single “Teacher Teacher” which sold over 3 million according to Billboard [5]. This could happened because, in this general election, they included their

entire sister group which increase the euphoria of their fans; moreover their international fans who could participate in this event. Every year this event manage to gain media attention in Japan especially this year because it is the first international fans related event for them, they called it the 'world general election' event.

## 2.1. AKB48 as a Brand

As cited on Keller, the definition of brand according to AMA (American Marketing Association), is a "name, term, sign, symbol, or design, or a combination of them, intended to identify the goods and services of one seller or group of sellers and to differentiate them from those of competition." It is including a name, logo, or symbol for a new product. However, many practicing manager refer a brand as more than that. According to them brand is something that has actually created a certain amount of awareness, reputation, prominence, and so on in the marketplace [6]. Meanwhile, branding is a process to create an entity in the consumer's mind so that they can see it. They can see a representation but behind this representation what they actually have is a whole series of images, beliefs and actions. According to Wheeler, an effective branding is when a brand created properly, therefore it can survive longer in a market and keep profitably [7].

According to the definition above, AKB48 could be described as a brand and their marketing strategies which already mentioned in previous chapter such as 'handshakes' and 'general election' serve as a part of branding strategies because AKB48 is an entity that has specific identity that could be called as a brand. AKB48 build their brand equity towards their core value "idol you can meet" as a part of their brand identity, and later supported by other marketing action with a long-term strategy to implement the core value [8]. To develop their brand equity, AKB48 also create some brand activations as a part of those long-term marketing strategy, using brand activity or events that created based on their core value. All of those activities are created to develop an intimate bonding between the idols and their fans or their target audiences.

## 2.2. Architecture Brand AKB48 (48 Group)

According to Junior, AKB48 is the corporate brand in the 48 Group, and the main brand portfolio strategy is the branded house strategy [8]. Which in this strategy AKB48's sister group serves as its product, because as mentioned in the previous chapter, the brand value of AKB48 and its strategy are inherited to its sister group or its derivative brands.



Fig. 1 The official AKB48 group

Each sister group has a specific concept and target audience based on their location. This is a brand portfolio strategy of AKB48 which explain as; a) Competition, which to secure their market share between others girl group. They develop those sister group which share the same value as AKB48 to maintain their consumer loyalty; b) Financial performance, with some join events such as world *senbatsu sousesenkyou*, brand could gain more profit because of the increasing of target audience (the participation of overseas fans), while brand could also reduce marketing expenses for promotion; c) Brand extension, AKB48 trying to increase their brand capacity towards 48 group. With brand extension, AKB48 could fulfill the needs of different consumer in different area or even in international markets; they also could increase their consumer awareness [8].

### 3. Market

Market is a various grouping of customers that have various preference and liking [9]. The segmented market or called target market is a group of market who share common interest and needs [10]. In idol world, fans are the important element in the idol group branding strategy, because those fans are also acted as their target market.

AKB48 whose become more popular lately because of the development in digital media information. The rapid information and easily access to gain them is one of the benefactors to gain consumer awareness about AKB48 group. Produce 48, a collaboration project between AKB48 and Mnet is one of the recent example. According to Kizgin, Jamal, Lal Dey and Rana, online communication connects individual and business related connection. They also mentioned, social media is a place to share knowledge and information that can be major drivers for social learning [11]. Those people who involved in and the user of this media called as a media fans. According to Burgess, this media fans is a hardcore fans, gullible and easily manipulated by dangerous mass culture but they also have an important role in a brand development [12].

#### 3.1. Indonesian Market and Hybridization

The recent music trend in Indonesia is still connected with the recent pop culture. The reason behind it is the xenocentrism believe inside Indonesian market. Xenocentrism is a believe that common in postcolonial societies like Indonesia, that a foreign culture (especially belong to the former colonizer) is superior rather than one's own [13]. Therefore, Indonesian market are easily to accept the adapted version of Indonesian songs or music that already mixed with the world pop trend, such as K-Pop. K-Pop phenomenon and its popularity in Indonesia give a lot contribution for Indonesian music trend, for example, the emerging of local group boy band and girl band with Korean style and moods. Although their existence is not long lasting, but the audiences still have the same preference as before. Which, they prefer international or world trend of pop rather than Indonesian original culture. This practice is also a form of cultural hybridity, which formed because of the mimicry process from target audience towards the dominant pop culture. In the process it could develop to be an ambivalence tendency towards the dominant pop culture, because this target audience tends to combine their own pop culture and the dominant pop culture in order to match with their preference. In this situation this target audience showed some resistance towards the dominant culture, because they not really adapting all the dominant culture and sometimes still showing their own nature [14]

### 4. JKT48

JKT48 was born in 2011 during a discussion between Dentsu Indonesia an advertising agency and Akimoto Yasushi, after Dentsu Indonesia team learn through AFA X event where Akimoto Yasushi was invited to talk in a Cool Japan forum. At that time Akimoto Yasushi mentioned that he intended to do an expanding strategy for AKB48. Moreover at the same time, Dentsu Indonesia team also searching for a new business content which suitable with the idea of creating an idol group. In Japan, AKB48 is also collaborating with Dentsu Japan, therefore the collaboration between these two companies is quite feasible. This is also confirming the AKB48's portfolio brand strategy that mentioned on the previous chapter.

JKT48 got their final member for their first generation in November 2011. Their first debut on TV was in 20 December 2011 and receives good response from the audiences.

#### 4.1. Indonesian Fans

The question is why Indonesia was chosen as the first overseas sister group for AKB48? According to Mr. Genjek Pok, the Associate Creative Director of JKT48, it was because the perfect timing between this two company and the condition of Indonesian market that suitable for this project. Actually, there were another candidate from another countries to be an AKB48 sister group, but at that time they haven't prepare their market yet [15]

JKT48 got warm welcome because of the previous fans from AKB48 in Indonesia, therefore this idol concept is not really surprising for the 'old' fans, they even very enthusiastic waiting for this project.



Another factor is because the Japanese culture that already blooms in Indonesia through manga and anime [16]. These factors become important to penetrate Indonesian consumer or fans.

## 4.2. Hybridization and Local content in JKT48

Although Indonesian market have xenocentrism believe and tends to follow the recent pop trend, but they also got some preference and limitation because of their life as a part of society which has certain social value and culture. Consequently, JKT48 which a derivative brand from AKB48, could do something different in their strategy or brand activation according to their target audience preference.

JKT48 try to answer this needs through various project, one of them is the JKT48 sub unit, JKT48 Dangdut, is a sub unit using dangdut genre from Indonesian original music genre. Another interesting fact is this unit member that consist Rina Chikano (Chikarina) a Japanese transfer member from AKB48, whose later change her name to Siti Rinayanti to match with the Indonesian culture. The numbers of songs that they sung were from AKB48 singles and those songs were modified into Dangdut music.



Fig. 2 JKT48 Dangdut sub unit

AKB48's sister group use a franchise system, which means its brand value and main concept will follow the masterbrand. However, JKT48 still got freedom to create their own image according to the market condition while still maintaining their parent brand's value. For example, the recent Re:Boost campaign. This campaign was created based on the fans discontent of JKT48. They complained about the JKT48's event and performance, which mostly held on the capital city (Jakarta) and neglected their sub-urban or smaller city fans. It was contradicting with JKT48 motto who wants to be a national idol. The JKT48 management team with the JKT48 member creates this project to answer this problem. Through this campaign JKT48 renewing their slogan from "idol you can meet" become "idol that will come to meet you" so instead of fans who come to meet JKT48, JKT48 member will come to their fans area. One of the activation is called JKT48 Circus. It was a program that allow JKT48 member to create a carnival like event, such as mini stage performance, two shot, handshake event and other special program. Through this event JKT48 try to reach out their fans and strengthen the bond between fans (consumer) and JKT48 (brand).

Another precedent is the costume alteration for JKT48. AKB48 was well known of their amazing costume as mentioned in a Japanese TV program Tanken Bakumon AKB48 Group Ishou Koubou [17]. Most of their costume have cute and girly image, with short skirt above their knees. In Indonesia, this kind of costume could create a controversial issues especially social norm and religious issues. In the recent JKT48's music video "UZA," JKT48 members dancing in a shirt with hot pants that show a quite a lot portion of their legs.



Fig. 3 JKT48 "UZA" music video costume



This could be a problem if they use this kind of costume for a live performance; therefore, they got another variation of costume for this song. Genjek Pok said, they did this to protect the member [15].



Fig. 4 JKT48 “UZA” performing costume

Another exhibit is the “Kimi Wa Melody” costume. “Kimi Wa Melody” is the graduation song that chosen by Melody Nurramdhani Laksani the ex-JKT48 captain and now she is the JKT48 general manager. The music video and costume concept was made by request from Melody herself, which to inject it with a lot of Indonesian culture, and the result is a mix between the idol culture and Indonesian culture. Batik pattern from Madura and Bali was chosen because of its colorful characteristic. According to Genjek Pok, the colorful Batik could build a cheerful mood and match with the idol characteristic itself [15].



Fig. 5 A comparison between AKB48 and JKT48 costume for “Kimi Wa Melody”

## 5. Conclusion

From the case study above, we can see that although JKT48 following AKB48's brand value, but they could still do some alteration to match with their audience needs and social culture condition. Hybridity condition was found in those cases. For example, in the "Kimi Wa Melody" costume alteration, this could be a case of ambivalence, because there is two culture that mixed together but the dominant culture (in this case is the AKB48 culture or J-pop culture) have not overshadowed the secondary culture (Indonesian culture), even though they still sung the song with the same song composition as the Japanese version of "Kimi Wa Melody." Audience could still see the harmony between these two cultures from the costume and the moods that created. Therefore the ideas or strategy for a brand is should follow the target audience social culture needs. It is easier to penetrate the foreign market using the same 'language' as them and to understand them better to gain more empathy that could lead to brand loyalty.

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## Trust and creation, two key words of empathic design tool for the Chinese

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### Abstract

Empathic design aims to establish deep emotional resonance with users to complete the data exchange between research subject and investigators through appropriate research tools. It has developed several investigative tools in the West through borrowing different methods from different subject. The main target of the empathic design tool is to find the hidden needs of the users. The study shows that obstacles exist when applying the same investigation tools to users from non-Western cultural backgrounds. However, most empathic design research in China follows the Western developed protocols. The discussion of the application of empathic design tools from the view of the Chinese cultural background remain void. This article tries to analyze the key points of empathic design from the perspective of cultural background. It offers a reference point to the development of empathic design research in Asia.

***Keywords-Empathic design; Investigation tools;Chinese cultural background;***

### 1. Introduction

Design study is a discipline which researches artifacts within the context of the relationship between designer, users(stakeholders), and manufacturers(maker), as Jacques R. Giard described in his book, 'Designing, a journey through time'[1]. Based on this relationship, the focus of design changed and transformed along with the development of the industrial revolution. The focus of current design research has moved from makers to users.

According to Segal and Jane Fulton Suri, methods which borrow from an anthropology perspective only focused on the commonalities rather than the unique characteristics of user's behavior, thus ignoring the emotional drivers in human behavior (the perception of users). Empathy was introduced in the design field [2] make up for the ignored perspective. Rifkin believes that the global communication networks promoted the level of empathy, and that global empathy is forming [3]. Pink described empathy as one of the six aptitude in the future [4]. Patnaik of Jump Associates describe empathy as the necessary ingredient that precedes massive growth and change, and that could deepen the connection between producers and users in the industrial revolution [5].

Since the key of empathic design tools is to acquire the user 's emotional data, the research mainly adopts qualitative research methods. In literature review, some researchers have noticed differences when applying same tools in different cultures. This inspired me to explore empathic design research tools from the perspective of cultural backgrounds. I found there are two problems: 1. Existing empathic tools usually borrow methods from other fields which are not convenient for designers. 2. The research of

empathic design tools in China are borrowed from Western research and therefore of the cultural background of the West.<sup>[1][SEP]</sup>

The research of empathic design in China has just started and thus have very few systematic tools. Under the influence of the holistic world outlook of Confucianism, Chinese and other East Asians are naturally born with a cultural tradition of caring for others. Chinese designers have the advantage of empathic thinking. Behavior and modes of thought are different between people who lived in different cultural backgrounds. The current concepts and tools of empathic design were created and developed in a Western cultural background. In order to apply empathic design tools in Asia, it may need to consider the factor of cultural context. This paper will discuss the existing popular tools and discover the cultural factors of the Chinese.

## 2. Empathic design tools

### 2.1. The definition of empathic design tools

According to the classification of tools / techniques of Sanders[6], the methods used to obtain or generate stakeholder data in empathy design studies are categorized as empathic design tools since empathic design is a human-oriented design method..

### 2.2. Two types of empathic design investigation tools

The empathic design process can be divided the into two stages: the stage of problem identification (SPI) and the stage of problem solving (SPS). SPI is a crucial stage in the empathic design research because SPI is the premise of SPS. Designers and researchers try to define the problems which relate to design through various investigation tools associated with users/stakeholders in SPI then propose solutions of those problems found in SPI during the SPS. The main aim of the tools used in the SPI are to obtain the emotional data of users/stakeholders when the tools in SPS are mainly to help designers generate solutions and ideas. Therefore, the tools in the SPI could be called as the empathic design investigation tools.

According to the classification of the Kouprrie [7] and Hosking [8], the typical tools in SPI were classified by the contact mode: direct contact and indirect contact. The current tools could be classified as table 1.

Table 1. Classify the current empathic design tools

Stage	Tools		Type of tools
SPI(the stage of problem identification)	Investigation tools	Observation	Direct contact
		Focus group	
		Half-opened interview	
		User simulation	Indirect contact
SPS (the stage of problem solving)	Solution tools	Storytelling	Indirect contact
		Personas	
		Scenarios	
		Scripts <sup>[1][SEP]</sup>	
		User journey map	

Current tools are developed from a Western background. There is literature showing the obstacles that exist when applying the same investigation tools to users from non-Western cultural backgrounds. Under this situation, for designers, an appropriate tool could be helpful in getting key data. China's culture is distinctly different from the West. The discussion of cultural background may become the key factor to offer designers a fresh view to meet the real needs of Chinese users.

### 3. Two key words of empathic design tools in SPI for Chinese

Everyone is a child of their own culture [9], cultural background has been taken into account in various ways and affected ways of investigation in design. Based on the theory of guanxi(关系), a new paradigm of Chinese social relationships, there are two key factors of investigation tool in empathic design for the Chinese: trust and creation.

#### 3.1. Trust

China is a collectivist culture that divides social groups into different circles(圈子)(Fig.1). The key of a good investigation tool in empathic design for Chinese is to build trust. Which means to be the insider of the circle.

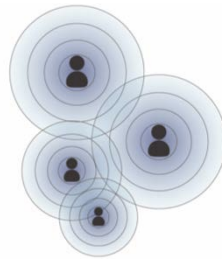


Fig.1 The circle of Chinese

Unlike contracts-based cultures in the West, Chinese people associate others based on 'guanxi'(关系). People in the circle are insiders while others are outsiders. (Fig.2)

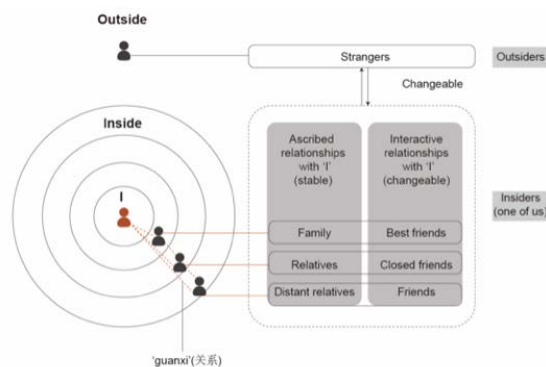


Fig. 2 The relationship in and out of circle

People use distinct methods of communication for insiders and outsiders. For insiders, people are more likely to open their hearts and talk about everything because he/she is 'one of us'(自己人). They communicate based on affection(情). For outsiders, people tend to be polite, and avoid the expression of negative emotions. Because they are strangers, they communicate based on propriety(礼). Therefore, entering the circle becomes the key. To become an insider, it is necessary to build a relationship with the insiders. An introducer from inside is the key of becoming a member of the circle. (Fig.3)

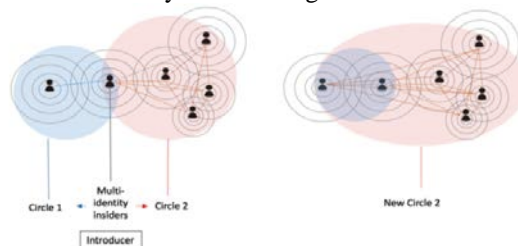


Fig. 3 The relationship in and out of circle



### 3.2. Creation

The tool need to help the Chinese to express their emotion well by ‘doing’ than ‘saying’. Creative activities such as building an ideal product or model with art materials does such that. There are some reasons why this is important. First, researches encouraged designers using art based way to build the empathy [10]. The Chinese have characteristics of self-adaptation, restraint, and low-sensitivity. Compared with Westerners, they are less likely to express opinion. Second, creation is not only an easy way to accepted by other participants, but also makes the tool interesting. Participants feel more comfortable to talk about their feelings via their work, which avoids embarrassment of showing private emotions. When they explained their ideas, they acted more confidently and are more willing to be involved in the conversations of others. Third, the empathic design tool is designer-oriented. It does not only need to generate graphical data, but also requires the users to participate in the design process and share the role of designer. Creations may also help producing intuitive graphic data (photograph, video and picture), which shorten the translation from text data for finding hidden problems.

### 4. Conclusion

This article discussed the keys of investigation tools in empathic design from the perspective of cultural backgrounds of China. It analyzed the empathic design process into two stages: the stage of problem identification(SPI)and the stage of problem solving (SPS). Then, the current tools used in SPI have been classified into two parts: direct and indirect. Based on the previous literatures, culture may affect the data collection with the Chinese. Two cultural keywords have been proposed based on the analysis of the Chinese cultural background: trust and creation. Those two keywords have been ignored by the current tools in SPI. It considers the characteristics of the Chinese due to their cultural factors. It may offer a reference to relevant research and help designers build empathy with Chinese users in empathic design.

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# Artificial Intelligence as Designers: Assistants or Substitutes?

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## Abstract

Though Artificial Intelligence technology is widely used in daily life, the long-standing concept is it is impossible for AI to be creative. However, on the contrary, some AI programs are already developed and used in some creativity required areas, like graphic design, composing and cyber gaming areas. Based on the analyzation of the machining learning style and theoretical basis behind those programs, a discussion is put forward about how Artificial Intelligence technology could contribute to the design field, what change would happen in the work content and job responsibility of designers, and what role designers would play in the predictable future. In short, Artificial Intelligence technology has the possibility of replacing designers' position on cumbersome low-end tasks and enabling designers to focus more on evaluating and decision-making

**Keywords-** *Artificial Intelligence, Design Process, Creativity*

## 1. Introduction

### 1.1. Current application of Artificial Intelligence technology

Artificial Intelligence technology is not an unfamiliar term to people nowadays, since it is broadly used in our daily lives. For instance, laptop battery optimization, customized advertisements on Facebook and Google, daily recommendation on Spotify—those are all achieved based on Artificial Intelligence technology, and from this aspect, Artificial Intelligence technology is providing great help on increasing human's life quality. However, the development of Artificial Intelligence technology could also threat human in some ways. Rather than what Hollywood movies depict that Artificial Intelligence would form an iron army, defeat human and conquer the world<sup>1</sup>, the real threat lies in the possibility of Artificial Intelligence technology could replace workers due to its high efficiency, productivity, learning ability, and “unlimited energy”. Automation technology has already been widely used in manufacturing industries, causing the unemployment of assembly line workers. Self-driving cars have gained much popularity and are becoming a hot future trend, led by Tesla Inc. What's more eye-catching, the computer Go program AlphaGo developed by Google Deepmind beat Jie Ke, the world No.1 ranked player at the time at the 2017 Future Go Summit<sup>2</sup>, which triggers the argument of if Artificial Intelligence could surpass human's ability in some certain areas and replace the human working positions.

### 1.2. Artificial Intelligence technology in the creative area

The same kind of threat has seldom been mentioned in design or other creative areas since there exists a long-standing concept that AI could only learn from existing human works and could never have the

<sup>1</sup> Avinash Royyuru, “AI, humanity and the future of product design”, <https://hackernoon.com/ai-humanity-and-the-future-of-product-design-4dc566be372e>, Sep 14, 2017.

<sup>2</sup> Wikipedia contributors, “AlphaGo”, Wikipedia, The Free

chance to be creative. However, the appearances of several AI “artists” shake this solid idea. Grid or Wix are using simplified AI in the field of web design to help users come up with their website design conveniently and efficiently. The AI graphic designer “Luban” customized and generated 170 million banners on one night in 2016 according to the preference of each user. In the interview, the developer said it is still far away from its capability limit—if there exists one—and has the potential to become a “real designer” in the future. What’s more, in the songwriting area, Sony Computer Science Laboratories developed Flow Machine, the AI music maker, who has already composed its first single “Daddy’s Car” in the style of the Beatles, and their goal is to research and develop Artificial Intelligence systems able to generate music autonomously or in collaboration with human artists. All these examples prove that AI programs could gain the ability to generate artworks, and it is more thought-provoking that whether this ability equals the creativity of AI programs.

Generally speaking, machine learning is the basis of Artificial Intelligence development, and the evolution of AI programs’ creativity is largely dominated by the progress of machine learning. Therefore, studying the theoretical basis of those “creative” AI programs would help indicate the limitation and bottleneck of AI programs’ creativity developing. In this article, two AI programs in the design areas are analyzed and generalize to show how AI programs generate artworks, how Artificial Intelligence technology would affect the design area and how the working focus of designers would change in the predictable future.

## 2. Methodology

First, the research about the basic concept of machine learning reveals how the machine gains the ability to “learn” from the external input and to what extent the machine relies on human’s feedback. Then the theoretical basis and design generating process of two specific Artificial Intelligence programs in creative fields—Luban and Flow Machine—are evaluated to show the specific steps for programs to generate artworks and the role human plays in the whole process. Based on that, the limitation of AI programs’ artistic creation ability is generalized.

After that, the AI design model and human design process are compared from multiple aspects to show the similarities and differences, and the capacity limit of AI programs is taken into consideration of which part of human design process could be assisted by AI programs and which steps could not be substituted. Also, the subject matters of researching papers and books talking about the Artificial Intelligence’s development on creativity are studied and inducted to see the potential design ability that machine could achieve in the predictable future. At last, a whole new design process of human designers collaborating with AI programs would be modeled, and a conclusion of what would be the future role of designers with the development of Artificial Intelligence technology would be put forward.

## 3. Main Body

### 3.1. Theoretical Basis of Artificial Intelligence Technology

To have a better understanding of how Artificial Intelligence could affect the current design process, one important point is that if it is possible for Artificial Intelligence programs to generate its creativity. To answer this question, it is necessary to understand how those Artificial Intelligence programs “learn” the knowledge and become independent in working. Generally speaking, the theoretical basis of the Artificial Intelligence technology is Machine Learning. It is one certain field of computer science that studies the practical and efficient way to give the programs ability to “learn” without specially programmed. Based on the availability of training labels in the training process, machine learning methods could be divided into two categories: supervised learning and unsupervised learning<sup>3</sup>. For supervised learning, the program is

<sup>3</sup> Wikipedia contributors, "Machine learning," Wikipedia, The Free Encyclopedia, [https://en.wikipedia.org/w/index.php?title=Machine\\_learning&oldid=860632691](https://en.wikipedia.org/w/index.php?title=Machine_learning&oldid=860632691) (accessed September 25, 2018)

provided with examples or templates and the desired goal. It is like the program is given a “teacher” to help it learn the process of how to arrange the given “materials” to achieve expected results. This kind of machine learning relies largely on the external input and human’s feedback to improve and refine the process. On the contrary, for unsupervised learning, no examples or desired results are provided. The computer program needs to find the relationship and structure of external input on itself, and there is no desired or “planned” result given.

The success of AlphaGo, which might be the most well-known Artificial Intelligence program in the past few years, shows the theory is applied well to practice. According to its introduction on Google Deepmind and the researching paper Deepmind has published, Alpha Go is presented with 30 million games played by human Go players from the database at the beginning<sup>4</sup>. AlphaGo would study and analyze how human experts would play under certain circumstances and try to imitate human experts’ movement in the real game. What’s more, it would also play with itself and calculate the winning rate to evaluate what move would most likely to lead to win, like establishing the “policy” of the movement in the Go game. Meanwhile, the value network of AlphaGo is trained to predict the outcome from the certain position by applying the “policy” to both players, and output a prediction based on the value function to guide the game.

It is clear that the research team is using supervised learning principle to train AlphaGo in the process of development, and researchers’ task is providing a large number of examples for AlphaGo to study and integrate, and provide the feedback on AlphaGo’s Go skill (compete with AlphaGo in the real game). For AlphaGo, it learns and imitates human experts’ movement in the real games, and also gain the ability to predict the future movement by practicing with itself. More simply, AlphaGo generates the work while human input data, set the desired result, and evaluate the result.<sup>5</sup>

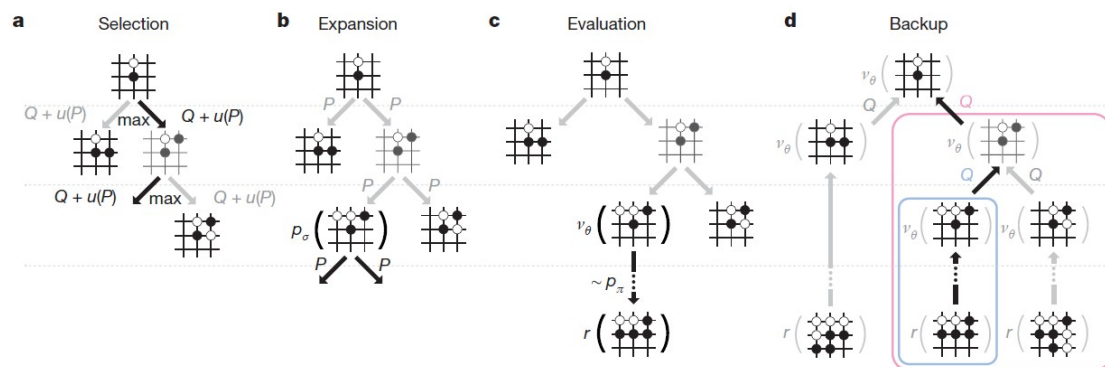


Fig. 1 Monte Carlo tree search in AlphaGo.

Similarly to example, the type of machine learning methods could also imply the possibility of creative ability of the Artificial Intelligence design programs indirectly. One significant feature is that for programs using supervised learning, they are actually “learning” from human’s work and learn the method of how human create artworks. Therefore, those AI programs may become a designer with super high efficiency but could never create works that surpass human’s art pieces (according to human’s definition of “good” art). In other words, the machine learning type of the AI programs in the creative

<sup>4</sup> Deepmind, “Exploring the mysteries of Go with AlphGo and China’s top players,” <https://deepmind.com/blog/exploring-mysteries-alphago/>, April 10, 2017.

<sup>5</sup> David Silver, Aja Huang, Chris J. Maddison, Arthur Guez, Laurent Sifre, George van den Driessche, Julian Schrittwieser, Ioannis Antonoglou, Veda Panneershelvam, Marc Lanctot, Sander Dieleman, Dominik Grewe, John Nham, Nal Kalchbrenner, Ilya Sutskever, Yimothy Lillicrap, Madeleine Leach, Koray Kavukcuoglu, Thore Graepel & Demis Hassabis, “Mastering the game of Go with deep neural networks and tree search”, *Nature*, Vol. 529, pp. 484- 489, Jan 28, 2016.

field would reveal if the program is only mimicking human's work or generating its unique artworks under no set criteria.

### 3.2. AI programs in Creative Field

There are already some well-developed Artificial Intelligence programs in the design field, or more broadly, creative fields, and two of them, Luban and Flow Machine, are selected for analyzation and evaluation to show the design algorithm and process of programs.

To begin with, the Artificial Intelligence graphics program, Luban, is very eye-catching in the creative field. It is an AI graphic design program developed by Alibaba AI Design Lab to support Alibaba's online marketing (Alibaba is one of the biggest e-commercial companies in China). After Luban showed its excellent efficiency by creating 170 million advertising banners in one night on the "Promotion Day" in 2016, there are even some frightening hearsays discussing if this program owns the ability to replace graphic designers and influence the overall design market. According to an interview with one of the Luban project researchers, the inspiration of Luban is their marketing strategy about providing customized products recommendation for every user with the help of the algorithm and big data analyzation in 2015. After that, the team was considering if it would be possible to customize stronger marketing oriented advertising resources, like posters and banners design, for every user based on their preference. To accomplish the enormous design task following this plan, they decided to develop the Artificial Intelligence program Luban to help.

Generally speaking, the development of Luban consists of 4 main steps.<sup>6</sup>

Step 1. To let machine understand the elements of design. The research team divide the original design into layers to assign labels to different elements and summarize the design styles for the program to learn how elements could be arranged.

Step 2. Establishing the design database. After the machine understands the basic design framework, a design database is established for the machine to extract features from design elements and classify them.

Step 3. Generating designs. The machine would try to put design elements into the templates that the team imports. In this step, the team adopts the reinforcement learning method, while the machine serves as its own "teacher" and improve through continual trying.

Step 4. Evaluating design works. The machine-generated design works are evaluated by experts from its aesthetics and commercial values.

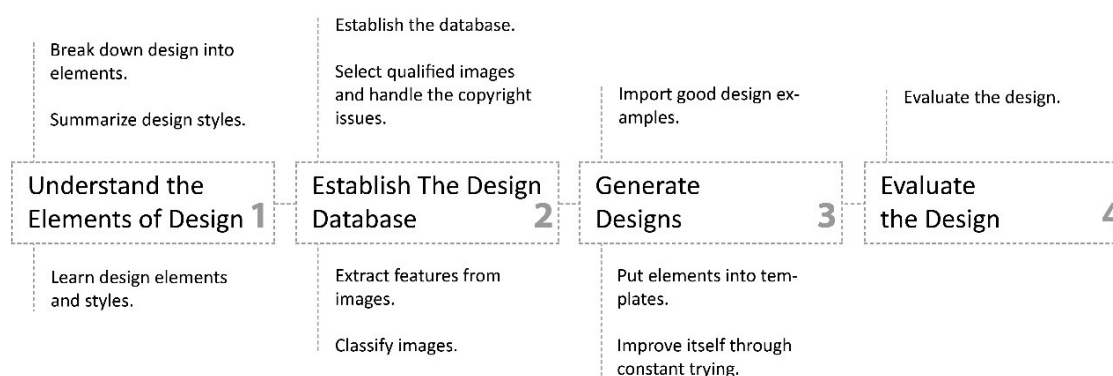


Fig. 2 **Human's and AI's role in the design process of Luban.** The top half contains the activities of design team and the lower half contains the activities of Luban. Created by Xiao Ma on Sep 15, 2018.

<sup>6</sup> Yuan Cheng, "1.7 billion banners are created by 'Luban' AI design system", UISDC, <https://www.uisdc.com/alibab-a-luban-ai-banner>, April 20, 2017.

The design process model of Luban in figure 2 is created to classify the activities of Luban and design team. In the whole design process, the main work of Luban is trying to arrange design elements with templates imported, while design team is in charge of providing samples, evaluating the design works, and making the final decision.

Another example selected is the Artificial Intelligence “Composer” Flow Machine. According to its introduction on the official website, the key idea of the Flow Machine is to relate the notion of creativity to the notion of “style”<sup>7</sup>. If the machine could understand the style of a musician or a certain kind of music, then it may be able to understand the creation behind that style and gain the ability to create something based on that. So far, Flow Machine could not compose as an individual composer since it still needs musician’s help on polishing and improving the demo. Instead, it fits better with the position of the musician’s assistant. For instance, if a musician wants to compose a new song, he could select the style and let Flow Machine compose a rough demo first, then improve on the demo or get inspirations from it.

Technically speaking, the songwriting process of Flow Machine is similar to the creating process of Luban. It is given more than 15000 songs to learn from and analyze. What’s more, since the rhythms and arranging for each song have its special characteristics, songs are presented in the category of styles to Flow Machine, like Jazz database, Rap database, Pop database. Then Flow Machine would analyze the songs in the same style set, figure out what is recurrent, and establish its composing logic, like what kind of chord progressions and melodic sequences should be arranged with what kind of chord<sup>8</sup>. For short, it is like Flow Machine generalize and collect all the composing probabilities for the specific style.

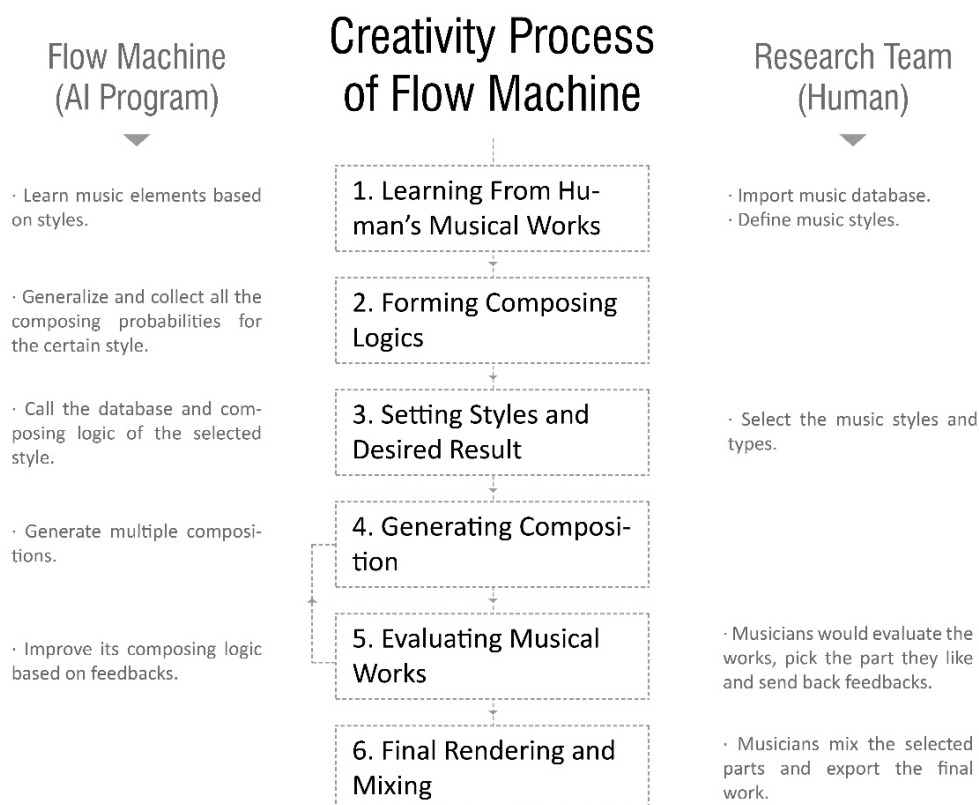


Fig 3. **Human's and AI's role in the creativity process of Flow Machine.** AI's activities are listed on the left and the research team's activities are listed on the right. Created by Xiao Ma on Sep 15, 2018.

<sup>7</sup> Sony CSL, Flow Machine, <http://www.flow-machines.com/#>

<sup>8</sup> Lucy Jordan, “Inside the lab that’s producing the first AI-generated pop album”, Seeker, <https://www.seeker.com/tech/artificial-intelligence/inside-flow-machines-the-lab-thats-composing-the-first-ai-generated-pop-album>, April 13, 2017



The next step in the songwriting process requires human's intervention. Though the flow machine could work autonomously on its own, to write a song of high quality it still needs the feedback from human experts. Since a song consists of various parts—verse1, pre-chorus, chorus, verse 2, bridge, etc—the researcher would work with musicians and let Flow Machine know which part is qualified or which part still needs to be improved. In this process, the role of composer changes from writing a whole new song from scratch to picking up great parts of the song. Benoit Carre, the composer who worked with the Flow Machine research team on its first piece, has stated that “The machine pushes you to your limits. The melodies generated confront you to a choice. The machine helped me to create a song for it. There are no limits to you ‘creativity’, it’s up to you to give it your choices, to establish benchmarks. Once the framework is defined, if it is sufficiently coherent, the melodies generated can be very inspiring.”<sup>9</sup>

In conclusion, the flow machine could learn how to compose based on human musical works and generate composing works, while human provide good examples to flow machine and make the final decision on the quality of the song. It is similar to human's role in the designing process of Luban, and the commonality of these two Artificial Intelligence programs is they are mimicking human's work and generating artworks with extremely high efficiency, while human makes the final decision of if the artwork is qualified and could be adopted. To have a clearer view of what's human's role and what's AI program's role and how they affect and assist each other in the overall process, human's and AI program's behaviors are put in categories in the following figure. From the chart it is clear that human's role is more about defining the problem, providing instruction to programs, evaluating and finalizing works, while AI program's role is more about practically learning samples, generating and improving works. After comparing this chart with human designers' design process model nowadays, it would be easier to see how would the role of designers be affected in the future.

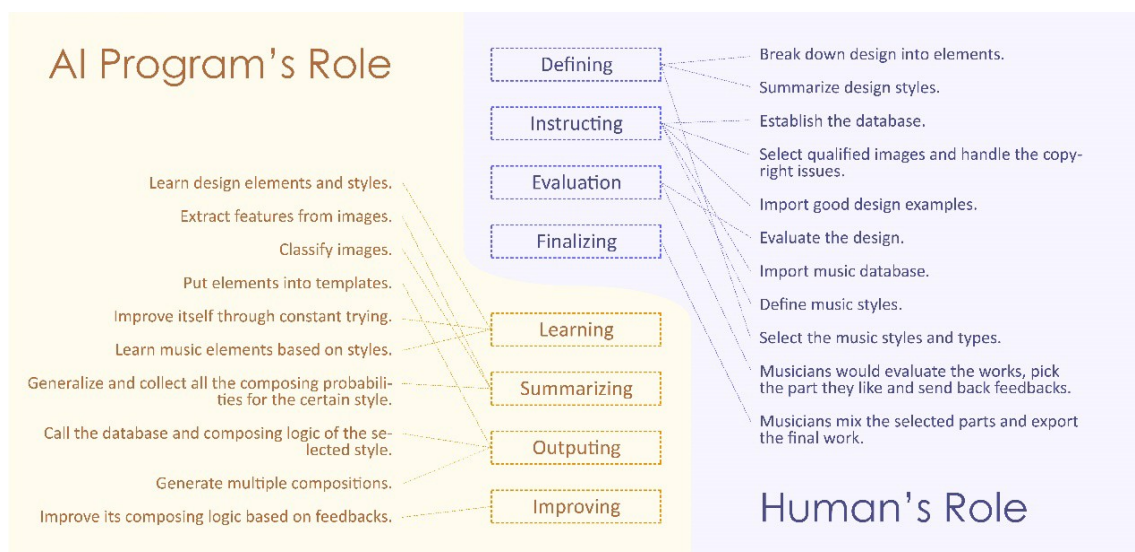


Fig 4. Generalization of human's and AI's role in the creativity process of AI programs.

Created by Xiao Ma on Sep 15, 2018.

### 3.3. Predictable future of the change in the design process

To understand what effect Artificial Intelligence Programs would have on human designers, it is necessary to study which part of the human design process could be replaced by Artificial Intelligence programs. In addition, the process of how human designers generate “creativity” should also be taken into consideration.

<sup>9</sup> Lucy Jordan, “Inside the lad that’s producing the first AI-generated pop album”, Seeker, <https://www.seeker.com/tech/artificial-intelligence/inside-flow-machines-the-lab- thats-composing-the-first-ai-generated-pop-album>, April 13, 2017



Since there is already some design process in different fields, several design models are combined and integrated into the universal design process model. This model is more focused on the general procedures to make it suitable for the overall design area.

- **Requirement & Empathize:** When designers receive a specific requirement from clients, sometimes the client does not know what the core problem is or in which direction should they try to find the solution. The design team needs to analyze the case and figure out what is the critical problem they need to solve.
- **Define:** After the critical problem is narrowed down, the design team would set up the plan and research on related areas to clear the goal for the final solution or result. Multiple or parallel goals could be made at this moment.
- **Design & Prototype:** Based on the research data the design team would start the creating of new concepts or blueprints. Some of the potential concepts will be made into prototypes or frameworks and tested.
- **Evaluation & Production:** The design team would evaluate each concept based on their performance in the testing and select the concept that is great enough for production or adopt the qualified features for further design.

When the universal model is compared with the human's role in the creative process of AI programs, it is clear that it is still necessary for human designers to get the requirements from the client to discover the critical problem. The difference happens after defining the problem. Usually speaking, designers nowadays would come up with several ideas and proposals for senior managers or clients to evaluate and select, and this process is very time consuming since it is usually not that easy for designers and clients to reach an agreement on all the details at the beginning and designers would have to make changes several times—sometimes useless works. However, with the intervention of AI technology, designers could rely on it to generate different concepts and proposals after it is specially trained. This process covers brainstorming, sketching, prototype making, rendering and so on—which would take so much time for human designers but not for AI program due to its ultra-high efficiency—and designers would save much time and focus more on the evaluating and improving the ideas put forward by AI programs. What's more, designers can let the AI program try some non-mainstream or unsure ideas, and sometimes great works are inspired by those 'wired' or 'deviant' ideas.

Based on the comparison above, the new design process model is established based on the current technology and the expected development of Artificial Intelligence. Some steps are designed especially for AI programs or designers while the other steps require the collaboration of both sides.

To start with, designers could work with AI to improve the researching and analyzing efficiency. Actually, the search engine nowadays is one kind of AI technology, and with the development of AI big data analysis—that is how Google Suggest works—it is possible for AI to recommend designers the materials or information related to the project. What's more, AI could assist designers in collecting and generalizing the materials and improve the efficiency of case studies and information analyzing.

After the critical problem is defined by designers, they would set the goal for the desired result and establish the database of related design works for AI to learn the certain design styles and establish its design logic. Since the more AI program has learned before, the more design skills and styles it has mastered, so with more experience the AI program has gained it may not be necessary for it to learn new styles for every project, but just call the proper database.

The next step would be letting the AI program do all the 'repeating' design works after designers preset some additional limits on the project. At this step, AI would try to arrange the design materials based on presets and its design logic in all possible ways. All the ideas would run through a self-assessment where the criteria are set by the AI program based on its generalizing of design work samples input. Ideas survive the assessment would be presented to designers, and designers' task would be evaluating AI

program's works and selecting the qualified ones or providing feedbacks for the AI program to improve the idea. This process would help the AI program to optimize its design algorithm and become more 'qualified' or 'skilled' in design. Meanwhile, designers would pick the qualified ideas and move into the finalizing process.

The evaluation would be the most critical step in the overall design process model for several reasons. Firstly as I mentioned before, the AI program is not truly 'creative' and it is just mimic the design style which it thinks best matches the requirements input. Since it is impossible for AI program to generate the innovated idea, designers need to make the judgment on if the design style AI program uses is the best one for the project and how could it be improved to match clients' criteria. Also, the design aesthetics and trend are always changing according to designers and consumers. Occasionally designers would come up with unprecedented design styles, and the ones that gain popularity among consumers would become the new trend. AI program could learn the trend but cannot lead the trend, and it would still be designers' duty to develop the design styles.

## Design Process of AI & Human

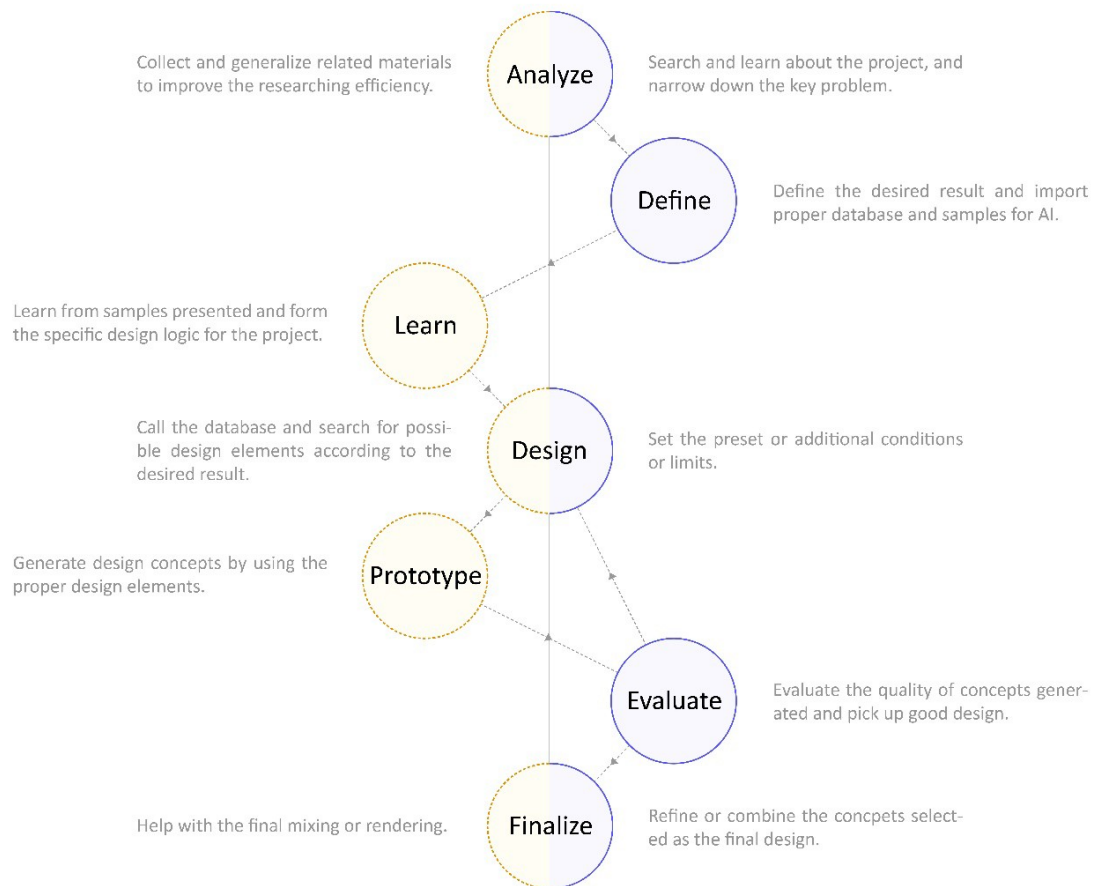


Fig 5. New design process with the collaboration of designers and AI programs. The AI program's roles are listed on the left and designer's roles are listed on the right. Created by Xiao Ma on Sep 16, 2018.

## 4. Conclusion and Discussion

Based on the current technology and predictable future of Artificial Intelligence, the appearance of AI programs should not be considered as the threatening of AI could replace designers' position. On the contrary, AI programs could serve as an effective assistant in the design process. The success of Luban and Flow Machine have proved that AI programs nowadays are not truly creative, and what they do is learning design samples, forming its design logic and mimicking human's artworks, while in the final stage designers are still needed to evaluate design works and specify improving directions. Therefore, designers could apply AI's ultra-high efficiency, 'unlimited energy', and superior learning ability to their design process to improve their design efficiency to a higher level.

If applied properly, AI programs could help with data collecting and generalizing to guarantee a more thorough researching process; their high efficiency in generating design concepts would enable designers to try all the possible design direction and have a more diverse brainstorm; and designers could co-create with AI to produce multiple design solutions by simply putting in the desired goal<sup>10</sup>. All those would lead to a more efficient and elaborate design process, and those are just what Artificial Intelligence technology is capable of nowadays. With the development in the future, it could be expected that the application of some AI knowledge related to the creative fields, like Generative Adversarial Networks, would bring more positive effects to design area. In short, it would be better for designers to embrace the new technology and make good use of it rather than getting scared of it. The appearance of AI programs in creative fields would not change designers' position, but their roles in the overall design process. With the intervention of AI programs, designers could concentrate more on the evaluation and innovation stage and put more energy into leading the new trend and elevating the overall design aesthetics.

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## **Analysis of The Narrative Elements in The Film - Discuss Violent Films of South Korea and China**

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### **Abstract**

South Korea has a long history of film works with a variety of crimes. This kind of film works presents a good market performance and a certain social influence, a film with critical power and a favorite audience. The ambiguity of China's film type positioning on crime subjects has become a kind of "China's Crime-Free Crime Films" [1] in the Western media. As an important part of the type of film, criminal films have shown different trends in the development of the two countries. Due to the differences in the social system and film censorship system between the two countries, there is a strong difference in the narrative characteristics between the films of the two countries. Therefore, this article takes Chinese and Korean criminal films as the text, from the Narrative Point of View, The Use of Dramatic Conflicts, and Movie Ending, the three angles of the narrative features of the two countries in criminal movies are compared and analyzed. Through analysis, hope can contribute to the development of criminal films in China in the future.

***Keywords- Film Genres ; Criminal films ; Narrative elements ; China and South Korea***

### **1. Introduction**

"A criminal film can be called a police film, and a crime film must have a crime and a detective "[2]. According to the general opinion of the academic world, criminal movies usually include: "black gang movies, black movies, detective films, gangster movies, and contemporary crime movies of various shapes"[3]. "Shao Mujun's view in *An Introduction to Western Film History* argues that "criminal films are a big concept. The core type is the robbers. Others can be called subtypes, such as police films, Film noir, detective films, thrillers, etc." Criminal films usually run around criminals or gangs, triad criminals, and fight against the police or detectives who oppose them, thus containing actions, violence, adventure, suspense and many other elements. "Criminal movies belong to commercial films that provide social viewing and entertainment while providing public viewing and entertainment. Thomas Shatz once pointed out in *Hollywood Genres*: "As long as our cities and commercial films exist, urban crimes are nothing. The question is still an important and marketable theme in the production of the feature film". Therefore, in the centuries of film development, criminal films have formed a unique motif, stylized characters, and the narrative paradigm is constantly innovating in stability.

## 2. Similarities and Differences of Narrative Features

### 2.1. Narrative Point of View

American scholar Peter L. Berger believes that we are in an era of "narration"[5]. With the application and promotion of narratology in film and television research, it is now deep enough to study the inner relationship between narrative and film and television. The field of film and television narrative research has gradually integrated related theories such as psychology, anthropology, sociology, and law. Narrative research is no longer a simple language text, it is closely related to the law of communication, social psychology, and popular culture. According to Martin .W, the term "point of view" refers to all aspects of the relationship between the narrator and the story, including distance (details and details of the description of the consciousness, close or alienated ), perspective or focus through which eyes we look at, the visual angle, and the identity and location of what the French call the voice narrator"[6]. Wallace Martin once pointed out brilliantly: "The narrative point of view is not added as a transmission of the plot to the reader's appendage. On the contrary, in most modern narrative works, it is the narrative point of view that creates interest, conflict, suspense, and even the plot itself"[7].

The narrative of criminal movies should also be analyzed from the expression of specific topics and the choice of narrative positions. The core of criminal film narrative is "how crime is produced", although the majority of criminal motives in life are caused by money and sex. However, in the creation of Korean criminal films, many of them are based on the motivation of crime and specific non-utilitarian psychological elements, and stand out in this respect to form the characteristics of Korean crime types. The criminal impulse may be caused by the suffering of a loved one, perhaps the individual is insulted and damaged, perhaps religious fanaticism, abnormal psychology, childhood memories. Many excellent crime films face the focus of the society or simply take the real social events. For example, the film *Silenced* is based on the sexual assault in a deaf-mute school in Gwangju around 2000, showing the teachers and teachers of the school. Human rights activists unveiled the story behind the shady scene. The social problems reflected in the film were highly concerned by the public and the country. Nearly 5 million Korean viewers watched the movie in the theater and commented that the film was a film that changed the Korean country. In addition to being close to reality, the Korean crime film also seeks to dig deeper. For example, the film *The Yellow Sea* shows crimes with a cold brushwork. The protagonist living in Yanbian, China, sneaked into the imaginary happiness of Korea in order to seek a more happy life, became a killer and was chased and killed. The film is full of bursting killings and thrilling chasing scenes. More importantly, the film has deeper thoughts in the framework of commercial films, and the social reality and tragic nature of the Korean nation divided on both sides of the Yellow Sea. The emotions are analyzed and have an epic temperament and height.

On the other hand, China's crime film creation is not enough to reflect reality. Even the well-regarded *Mekong operation* (2017) and *Operation red sea* (2018) are based only on statements about crime at the national level, not interpretations of crime. Hayden white points out: "the most basic meaning of a narrative involves the decomposition and subsequent reconstruction of a series of events that have been constructed, decomposing (or real or imagined) a series of events encoded in the original metaphorical form, and then rearranging them in a different pattern. In this way, the narrative will be a process of decoding and recoding, in which the raw perceptions encoded according to convention, authority, or custom are clarified in equal to a different figurative pattern. Therefore, the original code and the later code form a sharp contrast, which constitutes the narrative explanatory power " [8]. The narrative perspective of crime films shows how to reveal the criticism of human nature and society from different



perspectives. Compared with the attention and interpretation of Chinese and Korean crime films to real life, this is also the basis for the prosperity of South Korean crime films. It is of great reference significance for China which is located in the East Asian culture.

## 2.2. The Use of Dramatic Conflicts

The moving image we see on the screen is a medium, a reproduction in which each image or series of images is made for a specific economic or cultural purpose, and they are also in a specific way. Interpreted by people, these images express ideas, methods of observation and reflection, ways of behavior and feelings. They represent culture, but they are not real objective existence. They are made, distributed, and accepted. They are both an imaginative creation and an economic means. "The drama conflict in a movie is a sentiment node based on a specific economy or culture"[9]. The setting of dramatic conflicts in criminal movies has certain different characteristics compared with other types of movies. Modern Chinese and Korean criminal films have evolved from a single between opposition liberal ethics and people's ethics to a "cross-shaped" form of opposition, and there has been a constant shift in criminal action. Individual heroism and collectivism, technological representation and true restoration are all based on violations of law, humanity, and secular traditions.

The two countries are also different in the same. Korean films are more focused on the selection of conflicting and dramatic events, and the deep development of this conflict. For example, many viewers were shocked by the Korean film *Children*. The film was adapted based on the case of five elementary school students who went to catch frogs. The body of the child was found 11 years later and the murderer has not caught it. The theme of the story is full of conflicts, and children's problems can easily touch people's nerves. Similar movie themes include *The Chaser*, *Memories Of Murder*, *The Crucible*, *Hope*, *His Voice* and so on. Most of these incidents are about social hot issues such as crimes and children. The incident itself is very conflicting.

China's attitude toward dramatic conflicts is different, and China is more inclined to downplay these conflicts. Most of the Chinese directors' choices avoided conflicting themes. The *Blind Mountain* gave up the tragic ending and was forced to change into a successful ending. The film *A Touch Of Sin* was directly classified as an illegal movie. Released, like the film *Dearest* tells about children's trafficking, but the film focuses on the distinction between right and wrong and the story of family, and there is no strong sense of conflict. The film *Lost and Love*, also known as *Combating Child Abduction* The film was built into a type of looking for lost children, without the conflict between the traffickers and the families who lost the children. Even *Crazy Stone* (2006), *Crazy Racer* (2009) Although the film still describes the crime showing the process of crime, but the film is far from reality, its purpose is no longer a deep reveal of human nature and society, It is a fun display of a hypothetical cat-and-mouse game, and the meaning and attributes of crime films are constantly being cut. The two countries are also different in the same. Even *Crazy Stone* (2006), *Crazy Racer* (2009) ,Although the film still describes the crime showing the process of crime, but the film is far from reality, its purpose is no longer a deep reveal of human nature and society. It is a fun display of a hypothetical cat-and-mouse game, and the meaning and attributes of crime films are constantly being cut.

## 2.3. Movie Ending

"The control of the modern movie narrative works to the audience is not to attract the audience to identify and intervene, but finally to draw the final hypothesis of the narrator's code, but to leave the

audience, let the audience continue to narrate the story, reflect the narrative, the storyline of the traditional narrative. It is the "endline plot"[10]. From this we can see the importance of the ending in the narrative. We are from many criminal films in China, *Blind Shaft* (2003), *Blind Mountain* (2007), *The Coffin in the Mountain* (2014), and *The Dead End* (2015), *Saving Mr. Wu* (2015), *Mekong operation* (2016), *The Devotion of Suspect X* (2017), *Wrath Of Silence* (2018) etc. *Blind Mountain* is selected in those films, this film tells the true story about female college students being trafficked to the mountain village. The film has two endings, and the French version ends with the heroine to save the father. The tragedy of being forced to kill his own husband ended. Director Li Yang said that the ending is a true story ending. But the final outcome of the domestic review version is that the female host did not kill her husband, but his father. With the police to save her, the police finally saved the heroine. The director changed the ending of the story into a good ending for the reason that the film can be released in the country. In addition to the bright ending that was created as a last resort, there is another. The story itself is a bright ending, such as the *Mekong River Action*. In Korean movies, we found that there are many very exciting open ending movie works: *Memories Of Murder*, *His Voice*, *The Yellow Sea*, and *The Children*. The Juvenile Missing Event, such a situation that dares to put the ending of the real story in the film, does create a lot of possibilities for the development of the film.

Among the criminal films adapted from China and South Korea, most of the Chinese films use closed endings. Most of the Korean movies are ending in tragedy, and many movies have adopted an open ending. In fact, the choice of ending is either a closed ending or an open ending, but the end of the movie narrative is not a dead knot. The ending of the Chinese criminal film is also constantly trying to bring more recollection and deep thought to the audience like *Wrath Of Silence*.

### 3. Conclusion

The German philosopher Martin Heidegger once said: "The existence of a work contains the establishment of a world"[11]. At the beginning of the 20th century, Proust, the Russian master in narrative theory, introduced the concept of "anthropological function" into narratological research and dispelled by it, which lays the foundation for the exploration of post-structuralist films. As a type of film, criminal film, like other types of films, as well as other types of films, contains a narrative logic higher than its own form, and it also has its own internal and external formal characteristics and functional characteristics. Criminal cinema has become an important carrier of economic, cultural and ideological output.

Through the above analysis and comparison of the above three aspects, it can be seen that in the mature development of criminal films in China and South Korea, narrative creation is based on the reality of the country, and actively seeks space for survival and development, and pursues the desire to excavate humanity while expressing social reality, exposing the essence of crime. With the deepening of China's film industry, the adjustment of the scale of the review, coupled with the emergence of excellent criminal films. For example, the film *The Burning Sun*, reveals that half-life redemption of the protagonist along with the melodrama entertainment. The main plot of the film *Youth* is a contest between the perpetrator and the police, but behind it is the pain of juvenile growth and the root causes of the crime. It can be said that the creation of crime films in mainland China is based on the real life of China, and a number of crime films of true type meaning have emerged and achieved certain results. The Korean crime films will continue to innovate. Above all, the criminal films of China and South Korea will surely become the pride of Asian movies.

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## **How to improve the sensation of distance when interacting with objects in VR game**

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### **Abstract**

To reduce the sensation of error in the distance that occurs when interacting with objects in virtual reality (VR) games, I propose in this paper, a way to improve by two methods, the blur effect and the enlargement and reduction of the image. VR games with HMD provide users with a visually intense immersion experience. However, since there are many differences between the real world seen directly by the human eye and the virtual space seen on the screen, the user feels an error in the distance with the contents of VR, which leads to the reduction of the feeling of immersion that is the advantage of the VR game. As a result of the usability evaluation of my own VR game using the method presented in this paper, it can be confirmed that the sensation of error in the distance perceived by the user is less than that of the conventional one.

***Keywords- VR;Interaction;Usability Evaluation;***

### **1. Introduction**

The VR game provides a strong visual stimulus and makes the participants feel immersed in the VR game. However, in the VR game, there is a difference between what is perceived by the human eye and the reality, which causes an error in the sensation of the distance and interrupts the interaction with the object in the virtual space. This greatly reduces the user's feeling of immersion in the content, which causes the dissatisfaction of the VR game. In this paper, I propose two methods to improve the sensation of error in the distance. First, the blur effect and second, image enlargement and reduction. In this paper, I applied these methods to the VR game I made and verified the usability by a comparative evaluation. I consider that this will be the cornerstone of future research.

### **2. Sense of distance in virtual space**

There are several limitations in the VR environment compared to the perception of the real space by the real eye. "In VR, the image screen is fixed, so it is impossible to recognize it as when moving the real eye of a human being and the display resolution of the HMD is limited to the limits of the hardware and the viewing angle is also inferior to the real eye. [1]" These differences and limitations are applied in a complex way, so that the participants feel as if the object is closer in the virtual space compared to the real distance, and an error occurs in the sensation of the distance.

### **3. How to improve the error of distance sensation**

In accordance with the order of investigation, I will first investigate the factors that affect the recognition of distance through preliminary studies. Then, I will come up with two ways to solve this. These ways will be implemented and applied to VR game based on Unity3D. And, finally, to verify the validity of the study results, I will conduct a comparative evaluation of usability and the results will be reviewed.



Fig. 1 Image using blur effect

Preliminary studies have shown that the two methods of blur effect and enlargement and reduction of images can affect the perception of distance in a person. First, the blur effect, which is shown on the left side of Figure 1, is used by film makers working with a miniature image model to make it look like a real size in a movie scene through a small camera aperture. On the other hand, the right side of Figure 1 shows the tilt-shift effect that allows a real-sized object to appear as a miniature model. As we saw, the "Blur effect plays an important role in the transmission of the desired size and distance. [2]" Secondly, the enlargement and reduction of images can enlarge or reduce the size of the image displayed on the right and left sides of the HMD to affect the binocular disparity and thus control the sense of distance. [3] To implement these two methods in Unity3D, I used the Gaussian filter shown on the left side of Figure 2. The  $g(x, y)$  is the size of the Blur filter calculated by the Gaussian function, and it adjusted by the  $\Sigma$  value.  $(x', y')$  means the size of the image enlarged or reduced by the  $s$  value magnification.

$$g(x, y) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x^2+y^2)}{2\sigma^2}} \quad (x', y') = s * (x, y) = (s * x, s * y)$$

Fig. 2 Gaussian filter to implement the Blur effect (left) Equation for conversion to enlarge and reduce images (right)

These two methods are applied to Treasure Hunter, a VR game created by myself with Unity3D. Treasure Hunter is a VR adventure game that escapes from an Egyptian pyramid by acquiring established items.

## 4. Experimental Methods and Results

The following experiment was conducted to verify the effectiveness of Blur effect and enlargement and reduction of images to improve the distance sense error of VR environment.

### 4.1. Experimental Methods

As the experiment method, the comparative evaluation of usability was used. I compare the VR game adventure, Treasure Hunter, dividing it before the application (Table 1, Before) and after the application (Table 1, After) of the two methods proposed. The experiment consisted of 10 people and the average age is 24 years old. First, 10 participants were asked to experience it before the application, and then, using the 5-point scale, they measured the degree of error in the distance by checking the items, 5 means a very significant error and 0 no error, then I obtained the average of these values. Then let the 10 participants experience again the game after the application to check the feeling of error in the distance for obtaining the average value. Finally, compare the two average values derived.

## 4.2. Results of Experiment

In Table 1, the Before is a scene before the application of the method of improving the sense of distance, and the After is a scene in which the two methods of Blur effect and image enlargement and reduction, are applied. A is the blur effect applied only to a specific object in order to adjust the distance to the object. B shows that the image size value is reduced to Before in Table 1.

Table. 1 Result image and Result of comparative evaluation of usability



According to the result of the experiment, the participants perceived the sensation of error in the distance of a value of 4.1 before the application of the two methods in the VR game. On the other hand, the sensation of error in the distance of the VR game after the application of the two methods was perceived as 2.6. It was confirmed that the value decreased by 1.5 compared to the state prior to the application. To summarize, it can be said that it is the same as the Figure 3 below.



Fig. 3 Result of Usability Evaluation

## 5. Conclusion

I verified that the sensation of error in the distance is alleviated through the usability evaluation of the VR game which is made by applying the two methods presented in this study. This provides the user with greater interactivity with the realistic objects than the existing ones, so that the user can feel a greater degree of immersion for the VR game, thereby achieving a high degree of perfection. As a follow-up study, I will investigate the factors that can enhance the interactivity of VR games as well as improve the sense of distance, and apply them to VR games for more improvements.

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# **Industrial Design as an Essential Component for Assistive Technology Development and Business Success**

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## **Abstract**

New technologies have opened the doors of opportunity to those with disabilities. Exciting new inventions are helping them to live with greater health, productivity, and independence. Moreover, in this new world Industrial Design is finally getting a face with big contributions in the entire product development. These assistive devices are finally drawing the attention to Industrial Design that it deserves from manufacturers who have a financial interest in staying competitive in this lucrative industry. This paper details the benefits of Industrial Design as it is used in the assistive-device industry, as part of a multi-disciplinary process, to create successful and affordable assistive technology products while maintaining consideration of Aesthetics, ergonomics, usefulness, adaptability and production methods.

***Keywords-Product Design, Assistive Technology, Industry, Design Thinking***

## **1. Introduction**

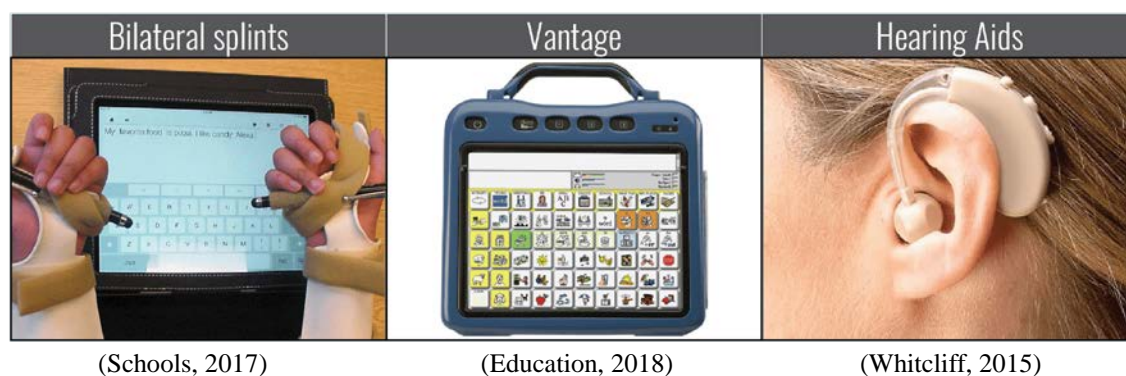
More than a billion people in the world today experience disability. These people generally have poorer health, lower educational achievements, fewer economic opportunities, and higher rates of poverty (World Health Organization, 2018). Assistive Technology (AT) is a tool to help people with disabilities adapt to different environments allowing them to accomplish different tasks and perform better socially, academically and physically.

AT devices are usually created by biomedical engineers with functionality as the primary object for their clients. However, most of these devices lack essential things to help users psychologically and monetarily. Moreover, in this age, designers are not merely looking for useful objects, but for something that attracts their attention and that of the people around them.

People with disabilities face significant challenges that can impact their lives. Being accepted is one of the principal concerns for the users, and the implementation of Industrial Design in the development of these AT devices has been mind-changing in the people using them. AT devices have been evolving and becoming more aesthetically attractive, ergonomic, easy to use and more importantly, they are becoming devices that create self-esteem in the users. Transforming that “Thing” that can be seen as a fearful object for others into art without compromising function, form and aesthetics

Most devices found in the market can be amazing, but all of them have one thing in common: they are expensive. The biggest market for all these devices is in third-world countries, but potential users are not able to afford these kinds of devices. Design and new ways of production and materials are helping to create products that are accessible and functional for everyone.

As Donald Norman said in his book *The Design of Everyday Things*, “Design must be thought of as a total experience.” (Norman, 2011) This paper presents problems in the biomedical engineering process and calls for the creation of AT devices that implement Industrial Design in their process that will lead to successful and affordable devices within everyone’s reach.



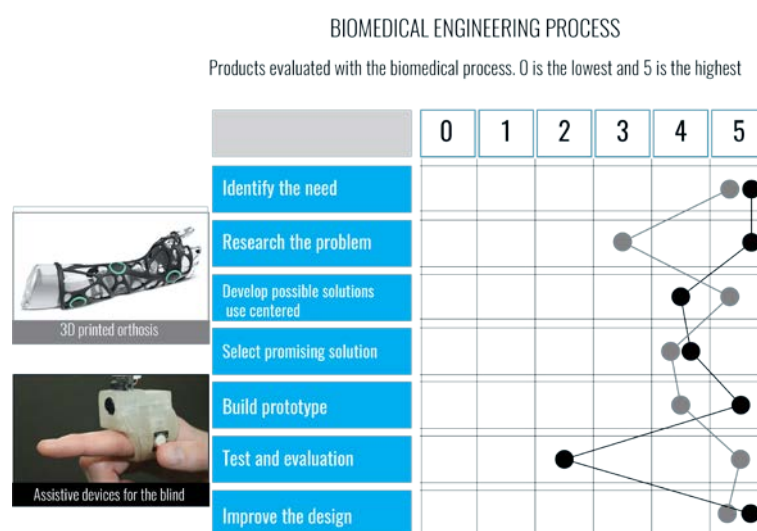
If some steps from the Industrial Design process are implemented in the development of AT devices, future objects for people with disability could be affordable and aesthetically attractive, easy to use, ergonomic and creating emotional satisfaction for the users.

## 2. Methodology

For this paper qualitative research is used that aims to understand the principles of AT development and human behaviors with the interaction of these devices. The biomedical engineering process was used to create AT devices and the Design process from the INTI was used to compare them with different objects. Both processes were tested with one product design device and with an AT device created by biomedical engineers, to have a better understanding and approach to dealing with the strengths and weaknesses of each, which leads to a better process for the further development of these devices.

### 2.1. Analysis of Biomedical Process

When developing a product, biomedical engineers consider several steps to create functional objects. Most of the time the aesthetics of the product is not the primary concern for them. They must deal with different electronic and security problems to improve the interaction with the user. The primary biomedical process was evaluated by picking different products and evaluating specific points showing the weak and strong points in the process.



**Black Points and Lines:** Color black represents the AT device used to test the Biomedical Engineering process

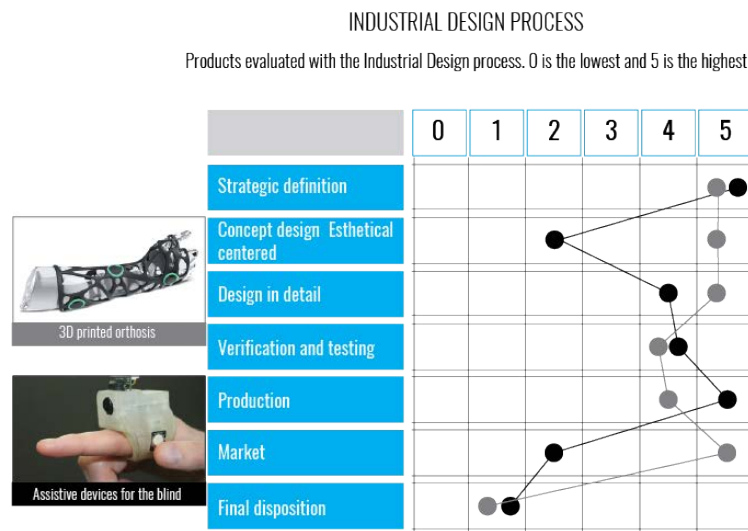
**Grey Points and Lines:** Color grey represents the ID device used to test the Biomedical Engineering process

**Figure 1:** Biomedical Engineering Process to create AT devices

## 2.2. Industrial Design Process

Taking as a reference the design process (phases for product development) of INTI, the methodology was evaluated in the market, and different weak and strong points were identified.

The Industrial Design process considers important elements to create products. When designing for disabilities, designers don't just consider aesthetics, but the human factors receive greater emphasis including ergonomics and usability, before the product can be configured in an attractive way.



**Black Points and Lines:** Color black represents the AT device used to test the Biomedical Engineering process

**Grey Points and Lines:** Color grey represents the ID device used to test the Biomedical Engineering process

**Figure 2:** Industrial Design Process

After evaluating both processes the similar elements of both were taken, combining each of them with their process contribution. These contributions benefit the process by having different research backgrounds and interacting with patients and doctors to identify every possible need.

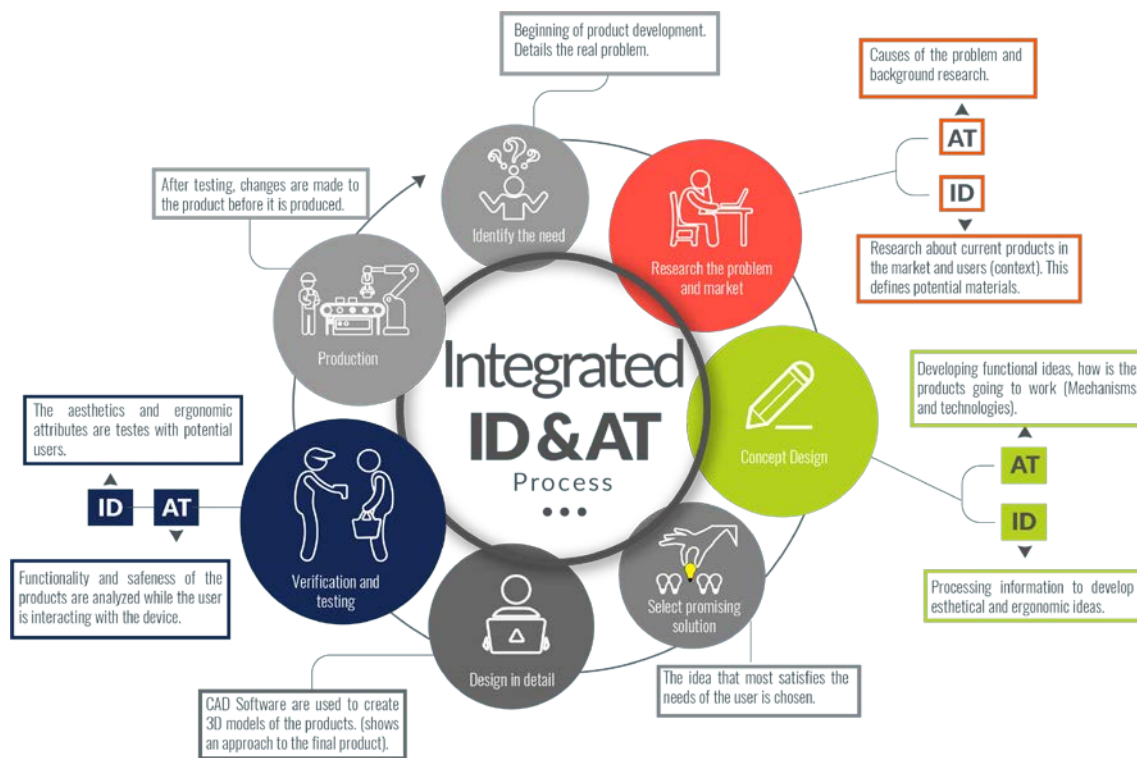
A different approach to concept design was taken including product verification and testing of both processes, considering more elements at the time of making the concept designs and testing the prototypes with the users.

## 3. Results

### Combined Process for Successful AT Development

It was concluded that the best way to create assistive technology devices is to include different parts of the design process. Industrial Design has strength when developing products—the emotional and human factors—and the aesthetical configuration of the product depends on the interaction and research made by Industrial Designers.

The Innovation brought by Designers also helps companies gain a place in the market. The contribution of different tools and points of view to create valuable products works as a strategy for companies in development



**Figure 3:** Integrated Industrial Design Process and AT Process (Used in Biomedical Engineering)

1. **Identify the need:** Before any further research patients and doctors' points of view are heard about the main problem to give a direction to the research.
2. **Research the problem and market:** After getting the feedback from doctors and patients both AT and ID start their research. AT is in charge of finding the different causes of the problem and future development of the disability. ID finds different solutions already in the market, and defines possible users, materials, configurations.
3. **Concept Design:** ID considers Human factors, usability, ergonomics and aesthetics when creating concepts. AT focuses more in the functionality and usability of the device.
4. **Select promising solution:** The concept that is closest to assisting the patient with all or most of the problems is chosen.
5. **Design in detail:** CAD models are made to have a better approach to the look and functionality of the concept chosen.
6. **Verification and testing:** Using potential users (Patients and Doctors) the prototype is tested. ID evaluates the human factors, usability, ergonomics and esthetical components of the device while AT evaluates the functional and safety components. All error is detected and fixed before producing the device. (Repeat this step as much as needed.)
7. **Production:** The first production of the device is small. In this way problems in the device or the manufacturing process are detected before making a large production

#### 4. Discussion

Industrial Design helps a company to be competitive in their market niche. As part of the process of development, they must learn to empathize with the audience for whom they are designing. By using the design thinking process, where the user frequently engages for feedback throughout the design process, industrial designers play an important role in making sure that product launch is successful. (Arts, 2017)

There are various definitions of AT: The International Classification of Functioning, Disability, and Health (ICF) defines assistive products and technology as any product, instrument, equipment or technology adapted or specially designed for improving the functioning of a person with a disability. The

International Organization for Standardization (ISO) defines assistive products more broadly as any product, especially produced or generally available, that is used by or for persons with disability: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions. (Unicef, 2015)

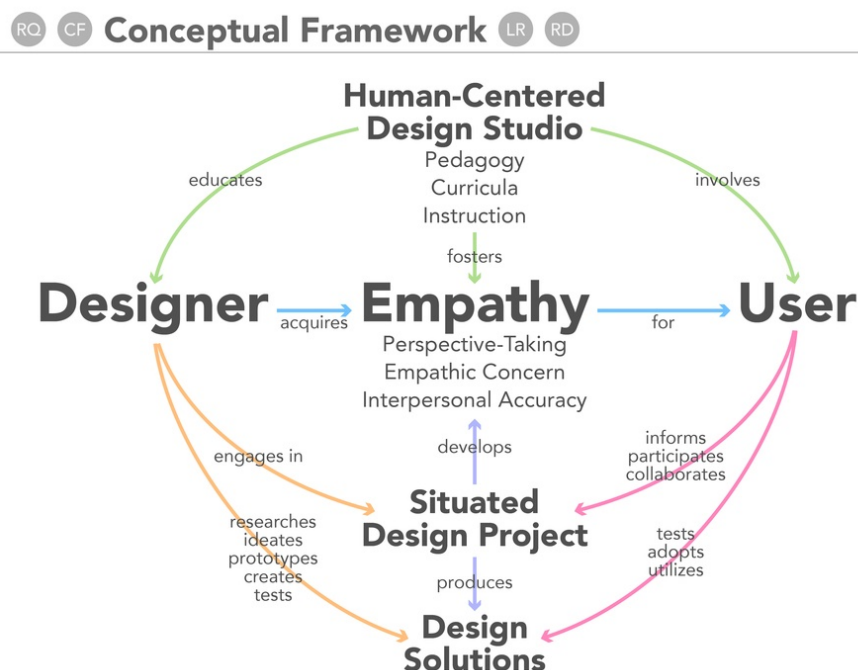
For most people technology makes things more comfortable, but for people with disabilities, technology makes things possible. Industrial Design, as a part of the product process, makes objects functional and esthetically attractive against the competition in the market. Awareness of the value of good design is at an all-time high. Good design is recognized as a significant differentiator in ensuring product success in a crowded global market. Evidence abounds that more people in business or society understand that. (Joyce Thomas, 2006)

Figure 4, from the European Commission Directorate's 2012 General Regional Policy Report, illustrates that innovation is a crucial determinant of competitive advantage. Historically, the competition involved making things cheaper, faster, and better, but in today's markets, "Making better things" means authentically addressing the user's experience through design, innovation, and differentiation. (Arts, 2017)

Period	Aim	Advantage	Practices
1960s – 1970s	Making things cheaper	Cost	Division of labor, motion & time studies, mass production
1980s – 1990s	Making things Better	Quality and Delivery	Total quality management, just-in-time, flexible specialization, automation.
2000s	Making better things	Experience and Authenticity	Design, innovation, differentiation

**Figure 4:** Seeking Competitive Advantage

Assistive Technology plays an essential role for the person that uses it, not just for the functional benefits that it gives them, but also the impact it has on intangibles such as self-image, self-esteem, and the sense of self-worth. Industrial Design in the development of these devices helps to create valuable and attractive objects which are then perceived by people to only "work better."



(Tellez, 2014)



The Interaction Design Foundation states that empathy is crucial to a human-centered design process such as Design Thinking, and empathy helps design thinkers to set aside his or her own assumptions about the world in order to gain insight into the users as well as their own needs. (Dam & Siang, 2018)

In the whole process of AT development, feedback from the doctors and patients are important. As designers, understanding the user and his or her feelings helps to direct the design based on needs, desires and preferences of the user.

Objects for people with disabilities have two kinds of interactions, the Direct and the Indirect, where Direct is the first contact with the user while the Indirect is what other people see. Most assistive devices can be expensive and sometimes unaffordable for people; however, the National Endowment for the Arts has shown that implementation of Industrial Design by companies lowers costs through improved manufacturing and reduction of product-to-market time. (Arts, 2017).

Examples of Assistive Technology Devices.

Category	Product Examples
Mobility	Walking stick, crutch, walking frame, manual and powered wheelchair, tricycle, artificial leg or hand, leg or hand splint, clubfoot brace, corner chair, supportive seat, standing frame, adapted cutlery and cooking utensils, dressing stick, shower seat, toilet seat, toilet frame, feeding robot
Vision	Eyeglasses, magnifier, magnifying software for computer, white cane, GPS-based navigation device, Braille systems for reading and writing, screen reader for computer, talking book player, audio recorder and player, Braille chess, balls that emit sound
Hearing	Headphone, hearing aid, amplified telephone, hearing loop
Communication	Communication cards with texts, communication board with letters, symbols or pictures, electronic communication devices with recorded or synthetic speech
Cognition	Task lists, picture schedule and calendar, picture-based instructions Timer, manual or automatic reminder, smartphone with adapted task lists, schedules, calendars and audio recorder Adapted toys and games

**Figure 5:** Examples of AT

As more as devices come to market, competition for market share drives innovation in one or more of the areas of product, process, or in their manufacturing operations.

A wide variety of devices launched to the market allow companies to have more innovative options either in the product, process or their manufacturing operations. Kaan Turnali notes the importance of Industrial Design in his book *How Design Thinking Can Help Your Business*: “It can be as effective in technology or education as it may be in services or manufacturing. It could result in new products and services for customers or improved processes and productivity gains for internal operations. If applied with equal fervor, it can even transform HR, finance, marketing, or operations teams—turning them into lean and agile profit centers. (Turnali, 2015)

Successful Assistive Technology Designs



(Innovations, 2018)



(Ramey, 2014)



Industrial Designers are educated to apply sensory perception and different theories of human factors in their designs when it is suitable, allowing for the creation of safe and efficient products. In the article “Addressing Human Factors and Ergonomics in Design Process, Product Life Cycle and Innovation: Trends in Consumer Product Design” it states that ergonomics and Industrial Design have an anthropocentric focus, and that the critical point for a successful process integrating Industrial Design is how designers understand human beings and their role in the development process. (García, Lange, Puentes, & Ruiz, 2011)

Finally, Industrial Designers possess a comprehensive set of skills, such as business modeling, research, observation, manufacturing, human factors, ergonomics, marketing, and design principles, and these skills make them an essential component for product development and business success.

## 5. Conclusion

Companies that have incorporated Industrial Design into their AT products will find that it leads to innovations in materials and process that benefit the user. Industrial Design improves goods and services and lowers the cost of products and manufacturing, making AT devices more affordable for more people.

Industrial Design is gaining greater acceptance into the industry of product development and services. The design process combined with other disciplines creates a powerful convergence to create and execute solutions for problems of functionality, physical ergonomics, human factors, form, usability, marketing, sales, etc.

Industrial Design considers human factors, ergonomics, usability and aesthetics which leads to the creation of better products (AT Devices) with less flaws.

Good Design allows for the exploration of new manufacturing processes and product improvements, and for being more competitive in a global market, taking into consideration price, features, quality and product innovation.

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## **New design innovation and technology are creating new problems in our community.**

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### **Abstract**

Nowadays, design technology and innovation is developing in a high speed. More and more new products, systems or design solutions are provided for people to help them get a better user experience in daily life. However, sometimes, users may found that when they enjoy the convenience from the modern design innovation and technology, some unexpected problems or phenomenon happened in using process. For example, when using convenient sharing bicycles transport in China, citizens may realize that many sharing bicycles have been abandoned on the sides of roads. When drinking the clean drink water in front of vending machine, you may found that the trash bins beside are filled with plastic bottles. These kinds of problems of phenomenon always happen in our community and they can contribute to more serious problems or social issues in the end. Too many abandoned sharing bicycles can block the traffic, affect the image of a city. Plastic bottles can be an important impact in environment problems, especially plastic pollution problems. Based on elaboration and analysis of these problems that modern design innovation and technology created, the purpose of this paper is to discuss why these problems happened and how could designers avoid these problems in design process. More design potential approaches will also be talked in order to solve the problems.

***Keywords:*** design approaches and methods, user-centered design, sustainable design, design complexity

## **1. Introduction**

### **1.1. Current situation of sharing bicycles in China**

Last year, bike sharing took off in China, with dozens of bike-share companies quickly flooding city streets with millions of brightly colored rental bicycles. However, the rapid growth vastly outpaced immediate demand and overwhelmed Chinese cities, where infrastructure and regulations were not prepared to handle a sudden flood of millions of shared bicycles. Riders would park bikes anywhere, or just abandon them, resulting in bicycles piling up and blocking already-crowded streets and pathways. As cities impounded derelict bikes by the thousands, they moved quickly to cap growth and regulate the industry. Vast piles of impounded, abandoned, and broken bicycles have become a familiar sight in many big cities.<sup>1</sup>

This kind of situation seems will keep happening in a lot of big cities in China. Sharing bicycle is a typical problem created via new innovation and design technology. In the beginning, the goal of this innovation is to provide people a convenient transportation. However, something unexpected happened during the using process. More similar case will be rise to talk about the reason why this kind of problem

<sup>1</sup> Alan Taylor, "The Bike-Share Oversupply in China: Huge Piles of Abandoned and Broken Bicycles", <https://www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/>, Mar, 22, 2018

happened, how to solve it and what can we predict in future design innovation work in the following content.

## 1.2. New design technology and innovation really created new problems

There are also many different kinds of cases, which share the similar problem with sharing bicycle case. For example, disposable products, straw and water bottle design. Recently, a bill proposed in California would make it illegal for restaurant servers to give guests plastic straws unless requested — with the threat of a \$1,000 fine or jail time attached. “We need to create awareness around the issue of one-time use plastic straws and its detrimental effects on our landfills, waterways, and oceans,” Calderon, majority leader of California's lower house, said in a statement.<sup>2</sup> Plastic water bottle design also contributed to a plastic pollution to our environment. “We were surprised by the amount of large plastic objects we encountered,” said Julia Reisser of the foundation. “We used to think most of the debris consists of small fragments, but this new analysis shines a new light on the scope of the debris.” Since plastic has been around only since the 1950s, there's no way of knowing exactly how long it will last in the ocean. If left alone, the plastic could remain there for decades, centuries or even longer.<sup>3</sup>

In the beginning, the purposes of these disposable or plastic products innovation really provide us a huge convenience in daily life. Straw helps people a lot when drink some special drinks. Water bottle design helps delivery the clean and direct clean water to each place we want conveniently. People don't need to use water tank in transport any more after the appearance of plastic water bottle design. However, these kinds of new innovation and design technology always contribute to more new problems in the end. Sometimes, it even causes a more serious problem comparing with the problem already solved, such as environment problems or climate changes problems. So, an argument can be rise now: do our new design innovation and technology always cause more new unexpected problems in our community? How to cope with that? Is any other suitable solution now? What can be predicted in the future? More discussion and analysis will be demonstrated to talk about these questions.

## 2. Research and study methodology

In this paper, case study is the primary research method. Cases of sharing bicycles current situation in China, air pollution purifier, water bottles design, plastic revolution and smart home current situation in China will be discussed and analyzed.

First, sharing bicycle in china will be describe to demonstrate as the background to demonstrate a current problem that already caused by new design innovation. Based on the current problems, some thoughts and doubts will be rise based on more specific cases to let the readers consider what the new problem is.

Second, after clarify the problems, the reason why we may have these problems will be explained. Design complexity will be talked in this part. A Japanese “less is more” life style will be discussed to help analyze that if we try to avoid new design innovation and technology in our life, will it helps solve the problem?

Third, some suggestion and comments on the existing solutions to these current problems will be displayed to help expound which kinds of the solutions should be better. User-centered design, sustainable design and other design approaches will also be illustrated to analyze a better solution.

At the end, what can be expected or predicted in the future design work to avoid or reduce the effect from the problems our new design innovation and technology created will be talked.

<sup>2</sup> Josh Hafner, “Plastic straws illegal unless requested under California bill — with up to a \$1,000 fine attached”, <https://www.usatoday.com/story/money/nation-now/2018/01/29/plastic-straws-illegal-unless-requested-under-california-bill/1074610001/>, Jan. 29, 2018

<sup>3</sup> Doyle Rice, “World's largest collection of ocean garbage is twice the size of Texa”, <https://www.usatoday.com/story/tech/science/2018/03/22/great-pacific-garbage-patch-grows/446405002/>, March 28, 2018

### 3. Main body

#### 3.1. A new design innovation and technology can cause both physical and mental problems

##### 3.1.1. Different details of physical problems

Now, it's clear that sometimes, new design technology and innovation will cause more new unexpected problems in using process. However, how it happened? What will show up following these problems?

To explain these questions better, these unexpected problems can be categorized into two main types: physical problems and mental problems. Physical problems are those problems which can cause a chaotic and incomprehensible surroundings such as the sharing bike issue. Or it can create a series sequential social problems, such as environment pollution and climate changes. More cases and analysis will be demonstrated and to explain the detailed problems that our new design innovation and technology created.

Sharing bicycles mentioned before really create a bunch of problems and they can be summarized into three different parts. First over launching waste the recourses. Second, too many bicycles stuck in the urban area and disturb the regular order of society. Third, lack of management, maintenance, and control aggravate the problems. The initial purpose of launching sharing bikes is to solve the short distance transport problem and provide traffic convenience to the public. However, the problems happened now even much more serious comparing with the original problems.

Disposable products sharing the same situation with sharing bicycles. In China, actually, the innovation of disposable plastic bags was considered as a "white revolution". However, it becomes "white pollution now". White pollution, increasing rapidly, stands for some plastic waste due to its major color, caused by single-use plastic tableware and thine plastic bags, which are parts of municipal solid waste. They meet Chinese people's favor and have become a part of their daily lives, when people ask for take-out food, it normally comes with single-use plastic containers.<sup>4</sup> This white disposable products were designed according to people's favor and provided a huge convenient in daily using. However, it caused serious environment pollution which people didn't expected.

Other similar cases are water bottles design and air purifier designed for air pollution. These design are all plan to meet users' demands and make life convenient. However, they all both cause more pollution and create more greenhouse gases in using process.

##### 3.1.2. Mental problems contribute to bad user experience and emotion

Mental problems will affect people's user experience. It may create a lot of redundant messages, information or some chaotic data which is unnecessary for people to learn about it. It will divert users' attention from their usual work or waste their energy and attention on worthless things. Even worse, it may even affect people's emotion during their life and work. Smart home products in China is a good example to expound it. Innovative smart home solutions aim to create a smooth and connected environment for users. Life becomes smarter while people do not need concern to much in their home or heavy housework. However, users need to install an application every time they add a new smart device. In the end, their cell-phone will be filled with many different kinds of applications.

The fig.1 below shows the relationship of mental and physical problems that these design innovation and technology caused. All these different designs all have a similar and prefect anticipation and purpose in the beginning. However, things always develop through an unexpected way and may cause a bunch of different kinds of problems.

<sup>4</sup> "White Pollution in China Paper", <https://paperap.com/paper-on-white-pollution-in-china/>

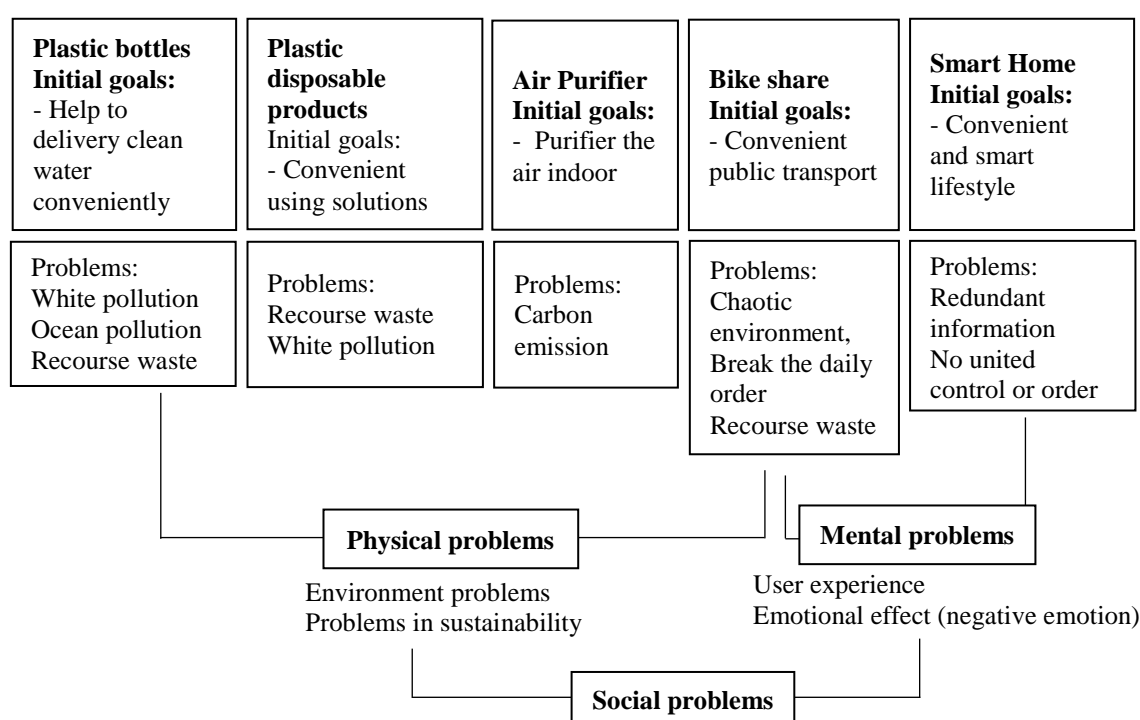


Figure.1 Relationships between different kinds of problems

### 3.2. Why these problems appeared?

Different types of problems that new technology and innovation created has already been talked in the section above. Since what these problems are is clear now, the reason for the appearance of these problems or how these problems happened will be elaborated.

#### 3.2.1. The property of this world is complexity

The reasons of why these physical and mental problems appeared during using process can be talked from three aspects. First, the world is a complex system, and design is a complex human activity.<sup>6</sup> There must be some problems happened during the design process, it's hard for the usual public to understand avoid it.

Nowadays, various kinds of consumer products, new design technology or innovation achievements are full of our life. The world is becoming more and more complex. Conversely, there is a new way to live in Japan which is entirely different from the normal one. "Extremely austere" lifestyle now is becoming popular in Japan. This kind of lifestyle follows "less is more" tenet, which claims that too many goods at home are not suitable for people's work and life. People usually live in an empty house without any redundant goods. They wear the clothes which they bought when they were young. They continue using a same old washing machine for more than thirty years. Unnecessary things are thrown away from their house. They reject too much consumer goods and technology, trying their best to keep their life clean, natural and straightforward. If something is broken, they will try to fix it first instead of buying a new one. They believe this is a sustainable lifestyle way. More focus and attention can be put into their work since no energy can be wasted on redundant goods. They work more efficiently every day. They are trying best to release their world from a complex and full of problems surrounding.<sup>5</sup>

These "Japanese" lifestyle is trying its best to avoid the complexity property of the world and keep everything simplest. Is it a good way to solve the complexity of the world and avoid the problems created by modern design innovation and technology? The answer may be no, though it avoids the attendance of new technology and innovation in daily life, which seems like solve the problem. A report of Japanese

<sup>5</sup> [https://www.youtube.com/watch?v=JLmlA\\_dErD8](https://www.youtube.com/watch?v=JLmlA_dErD8)



economy situation can be an evidence to prove it.

Table 1. Japanese Economy Data from 2013 to 2016

Year	2013	2014	2015	2016
Population (million)	127	127	127	127
GDP per capita (USD)	40,110	38,361	34,557	39,195
Economic Growth (GDP, annual variation in %)	2.0	0.4	1.4	1.0
Domestic Demand (annual variation in %)	2.4	0.3	1.0	0.4
Consumption (annual variation in %)	2.4	-0.9	0.0	0.1
Investment (annual variation in %)	5.0	2.9	1.8	1.2
Exports (G&S, annual variation in %)	0.7	9.3	3.0	1.7
Imports (G&S, annual variation in %)	3.2	8.2	0.7	-1.6
Industrial Production (annual variation in %)	-0.8	2.1	-1.2	-0.2
Retail Sales (annual variation in %)	1.0	1.7	-0.4	-0.6
Fiscal Balance (% of GDP)	-7.7	-5.7	-4.3	-5.0
Public Debt (% of GDP)	232	236	231	236
Policy Interest Rate (%)	0.10	0.10	0.10	-0.10
Stock Market (annual variation in %)	56.7	7.1	9.1	0.4

The table.1 above illustrates the economic situation in Japan in recent years from 2013 to 2016. What can be learnt from this table is that GDP almost keep decreasing in these four years. Industrial production, retail sales and import situation is not positive enough during these four years, which was contributed by the “extremely austere” lifestyle mentioned above. Industrial Japan society is becoming a low desire society now. If people in Japan continue keeping this simple and natural life style, the society will stop developing soon.

### 3.2.2. Modern design technology is complex

So, complexity is the basic property of this world. It cannot be changed by human activities or subjective thoughts. Modern design technology is complicated too, since it's a part of this world. It can be complex are to be found in two aspects of understanding. First is the design of the thing itself that determines its understandability. Second is our own set of abilities and skills.<sup>6</sup>

Design is a human activity which is too complicated to be understood by the public. Our designers work is to translate this complexity to the users. However, the initial property of the world decide that it's not an easy work.

Designers and users abilities and skills also determine the degree how people understand the design and the behavior in using process. So, to some extent, if an innovation create more new problems in the end, it's also attributed to designer's own responsibility. The lack of design experience, knowledge and can lead to the some potential problems in using.

For example, there is a water tank design for people in Africa to collect the rain since designers find the

<sup>6</sup> Donald A. Norman, “*Living with Complexity*” The MIT Press, Cambridge, Massachusetts, London, England, 2011

problems that it is not convenient for them to transport water from river to home via pots in a traditional way. However, in the implement of this design, what surprised designers is that peoples still prefer the traditional way to transport the water via pots since this behavior has become one of important habit and custom in their life. Since the lack of understanding of users' custom, the result is unexpected and unsatisfied. And there is another solution to this phenomenon, the Aqueduct, designed by IDEO.<sup>7</sup> It's bicycle design with a water tank onside, which can help people in Africa to delivery their water from the lake to their home. Comparing with the water tank deisgn before, it's really a smart idea and innovation. The cost of this design is not too high to be afforded and it's really a fast and efficient way to delievery the water. Most important of all is that people can accpet that. The design can fit their original cogintion. This case explain that designers need to own an ability which can predict the trend of design development with a far insight. They need to have enough understanding of their users' behavior and habit.

Users can accept the results which they can predict the trend or learn what it is going to be, which means that design should meet users' cognitive level or guide users' cognition. So users' abilities, knowledge especially understanding of their users are also important in the whole process. One reason that we cannot accept these social problems which new design caused is that it does not follow the trends it must be.

### 3.2.3. Design innovation and technology are working for users and business instead of the problem

Most design work on the market today are most based on User-Centered Design (UCD), which means that these design works focus more on users, user requirements and business demands instead of the problem itself. To tell the truth, UCD is really an efficient way to do the design work, optimize the user experience and maximize the business value of the design but it may not suitable in solving the real original problems.

User-centered design (UCD) is a kind of design which aims to analyze the usability goals, user characteristics, environment, tasks and workflow of a product, service, or process are given extensive attention at each stage of the design process.<sup>8</sup> It will optimize the product according to what they want and what they will do instead of letting users adapt to the products. UCD can help find a balance between user demands and business requirements, which can add a larger business and market value on a design work.

The hierarchy of users' needs are like that way fig.1. Functionality needs have to do with meeting the most basic design requirements. Reliability needs have to do with establishing stable and consistent performance. Usability needs have to do with how easy and forgiving a design is to use. Proficiency needs have to do with empowering people to do things better than they could previously. Creativity is the level in the hierarchy where all needs have been satisfied, and people begin interacting with the design in innovation ways.<sup>9</sup>

However, if designers move their focus from users' demands to problems' demands, the hierarchy level map should look like fig.2. Design creativity and usability are not very important in solutions' needs, since it is not focused on users. Sustainability should be the crucial part because it will be related to the potential developing problems in the future. The reason that the plastic pollution broke out in the water bottle case is that designers didn't take sustainability into consideration in their design work. All design activities will all create waste to our environment since it is one step of production. Based on consideration of sustainability, functionality can be the next important factor, which is the basics of the solutions. And then, it can be the environmental-friendly and mental-friendly design, in order to avoid a bunch of social problems in the future. Usability should be the final factor in this hierarchy structure because in the real solution, convenience to users is less important as solving the problems. So some design with this hierarchy level may not be as thoughtful as other consumer products on the market but it will consider more about future and our environment.

<sup>7</sup> <https://www.dezeen.com/2008/03/11/aqueduct-by-ideo/>

<sup>8</sup> [https://en.wikipedia.org/wiki/User-centered\\_design](https://en.wikipedia.org/wiki/User-centered_design)

<sup>9</sup> William Lidwell Kritina -Holden Jill Butler "*Universal Principles of Design*"

<https://arc345ergofactors.files.wordpress.com/2016/03/william-lidwell-kritina-holden-jill-butler-universal-principles-of-design-rockport-publishers-2003.pdf>

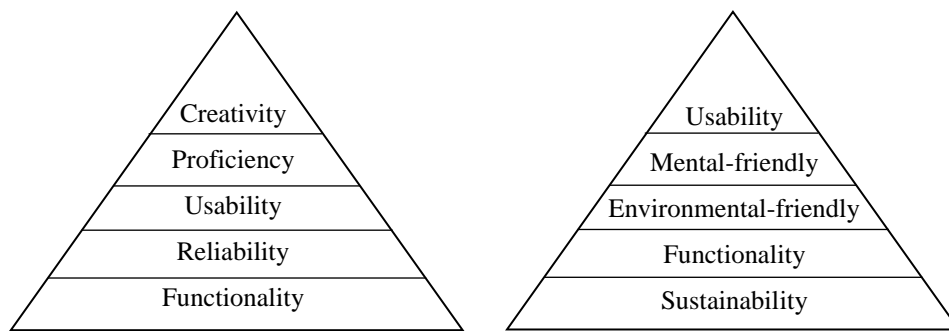


Figure.2 hierarchy level of users' needs and solutions' needs

### 3.3. Solution or suggestions to some certain problems

Because of the huge effects of these problems that our new design innovation and technology already created, some solutions have been came up with to help release or solve the problems. Here are some real solutions or to the cases or some ideas or options which have be rise to help solve the problems I mentioned before. Some analysis will be summarized to elaborate do these solutions or ideas can solve the problems or not.

#### 3.3.1. Current solution or suggestions to disposable plastic bottles

Actually, there is no special solution to the ocean pollution problems caused by plastic bottle design. "It's a ticking time bomb of larger material," Dubois said. "We've got to get it before it breaks down into a size that's too small to collect and also dangerous for marine life." However, no governments have stepped up to clean the trash, which is in international waters, so it's up to privately funded groups such as the Ocean Cleanup Foundation to take the lead in getting rid of the garbage.<sup>3</sup>

Sometimes, the problems that our new innovation and technology created are very hard to be coped with via the current science and technology. It will continue contributing to the damage to our environment or society. At this time, trying to avoid this kind of problems before it happened is very essential. More solution and ideas will be explained below.

#### 3.3.2. Current solution or suggestions to sharing bicycles

Now, since the bike share problems are more and more dangerous, society and government all focus on it and think of the solution. Here are some efforts or suggestion in this problem now:<sup>10</sup>

1. Regulate management and establish control and punishment mechanism
2. Improve and upgrade infrastructure
3. Establish competition mechanism to keep the original intention of this service
4. Strengthen market control and establish an operation management mechanism

Table.1 shows that it is evident that the leading roles in each solution are all not designers or users. It tries to control the behavior instead of guide the behavior. Indeed, capital and market are hard to be guided by the things beside profits, and this kind of solution can work, but we still can do more work on the users' part or focus more on the problems themselves.

Table.1 main roles in different solutions.

Objects	Solutions	Main roles
Users	Control their behavior via law mechanism	Social policy
Capitalists	Control their behavior via profits and market mechanism	Capital and Social policy
Market	Government control	Government

<sup>10</sup> <https://www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/>

### 3.3.3. Current solution or suggestions to smart home products in China

Here are some comments and suggestions for the smart home products online<sup>11</sup>

1. One united control for a series of products.
2. Interoperability. Products from different company or producer cannot be operated together.
3. Many products need to be changed manually, which is not smart
4. The biggest problem: too much redundant information, push and data, try to optimize it.

It begins to thinking the more efficient interaction way between users and products. But these solution still pay more attention to users. If it can switch to the view of products, some other different solutions may show up.

### 3.3.4. Problems in current solution

So far current solution or suggestions cannot really solve the problems efficiently since these solutions are based on the demands of users and the market or start from a macro-control view instead of focusing on the problem itself. Or the problems even cannot be solved by the current science and technology.

### 3.3.5. Sustainability and sustainable design

We mentioned that in order to design for the real solution, sustainability should be the most important part in design process in the hierarchy level structure. So what is the specific content of sustainability and sustainable design? Sustainable design is the philosophy of designing physical objects, the built environment, and services to comply with the principles of social, economic, and ecological sustainability.<sup>12</sup> Since sustainable design service for our social, economic, and ecological sustainability, the physical problems can actually be avoid or released via sustainable design.

## 3.4. Current challenges

So, sustainable design will protect our environment surroundings, which can avoid most physical problems that new innovation and technology may create. The problems that new technology and innovation can create can be divided into physical problems and mental problems. Sustainable design actually can be a good way to solve the physical problems. However, mental problems are still not easy to be solved. At this time, UCD is still the efficient way to deal with this problems since it can provide a better user experience and satisfy users' emotional needs in design process.

In conclusion, the challenges we are facing now are below:

1. Find a balance between solving the problems themselves and meet the users' demand, creating business value.
2. Find a balance between sustainable design and UCD since their hierarchy level content and requirements are totally reversed

## 3.5. What can be expected in the future

### 3.5.1. Switch to sustainable design and pay more attention to our environment

Sustainable design may replace user-centered design in the future because of the sustainability requirement worldwide.

### 3.5.2. New design thinking approaches<sup>13</sup>

We also can change our thinking mode to avoid creating the unexpected problem during the design process. New thinking can solve new problems caused by new design innovation. Innovation is the result

<sup>11</sup> <https://medium.com/iotforall/the-connectivity-problem-in-smart-homes-and-how-to-solve-it-fe80e632e4cc>

<sup>12</sup> [https://en.wikipedia.org/wiki/Sustainable\\_design](https://en.wikipedia.org/wiki/Sustainable_design)

<sup>13</sup> <https://www.interaction-design.org/literature/article/design-thinking-new-innovative-thinking-for-new-problems>

of thinking. If we can improve our thinking, we must get a better innovation.

Design sometimes will create more problems in our daily life because our design thinking cannot catch up with the high speed developing of technology. Briefly, design innovation should keep pace with design technology. If we break this balance, the problems will come out. sometimes, if we can add more layers of technology into the design, some complicated problems may be solved directly. For example, one crucial reason for smart home products problems is the limitation of the development of technology nowadays cannot match the designers' innovation of intelligent life.

**a. Think for human instead of only users**

Traditional design approaches all require to focus more on users and their behavior. It is right but not exactly right. According to what mentioned before, it's not a right way in providing a perfect solution. A user is a complicated group which may develop and changes. To learn more about human's desire and sensitive needs, the designer may understand their user group better since the complexity of human-beings contain the complexity of individual users.

**b. A new design approach which is dynamic and flexible and has a strategic plan.**

The world is changing every day, but our design approaches do not. Nowadays, designers still follow the specific design methods or approaches to figure out the problems in design. It can work now but may not be suitable in the future. Some new and flexible thinking must be created to adapt to the change in the world.

**c. Cross innovation should be utilized**

The world is complicated. Different kinds of problems must be rise via many different elements from different fields or aspects. Comparing with the traditional design solution, cross innovation must solve the problems better since the current primary design approaches still start their point for the view of design inside of other different fields. We need this kind of difference in our future design approaches.

**d. More sustainable design and innovation are necessary**

However, nowadays, we still don't have enough power of technology and innovation to support this kind of design thinking way since it requires a condition and the technology and innovation all arrived at their peak situation. At that time, some substantial qualitative changes must happen. Moreover, new design thinking is a meaningful way to contribute to this qualitative change.

## 4. Conclusion

In summary, this paper is talking about that our new technology and innovation can create more new problems in our community based on these cases: sharing bicycles problems in China, ocean and environment problems cause by design of plastic water bottle, white pollution cause by plastic disposable products, smart home problems and carbon emission caused air purifiers. The first three of these case have been elaborated to explain and discuss based on the content of this topic. More detailed framework is showing in fig.3 below to explain the content of this paper.

Then, three reason have been discovered to demonstrate why these problems happened. The reasons are the complexity of our world, the complexity of design work and technology and the problems in our current UCD approach.

However, the current solutions to the problems happened didn't show the understanding of these three main reasons. People still focus on the public control or a better UCD approach. So the challenges now is to break this current situation and add new blood (now design approaches) into our design work.

So, in the future, from short term view, more sustainable design approaches should be utilized in new innovation and design work. From the long term view, new design thinking and philosophy should be taken into consideration.

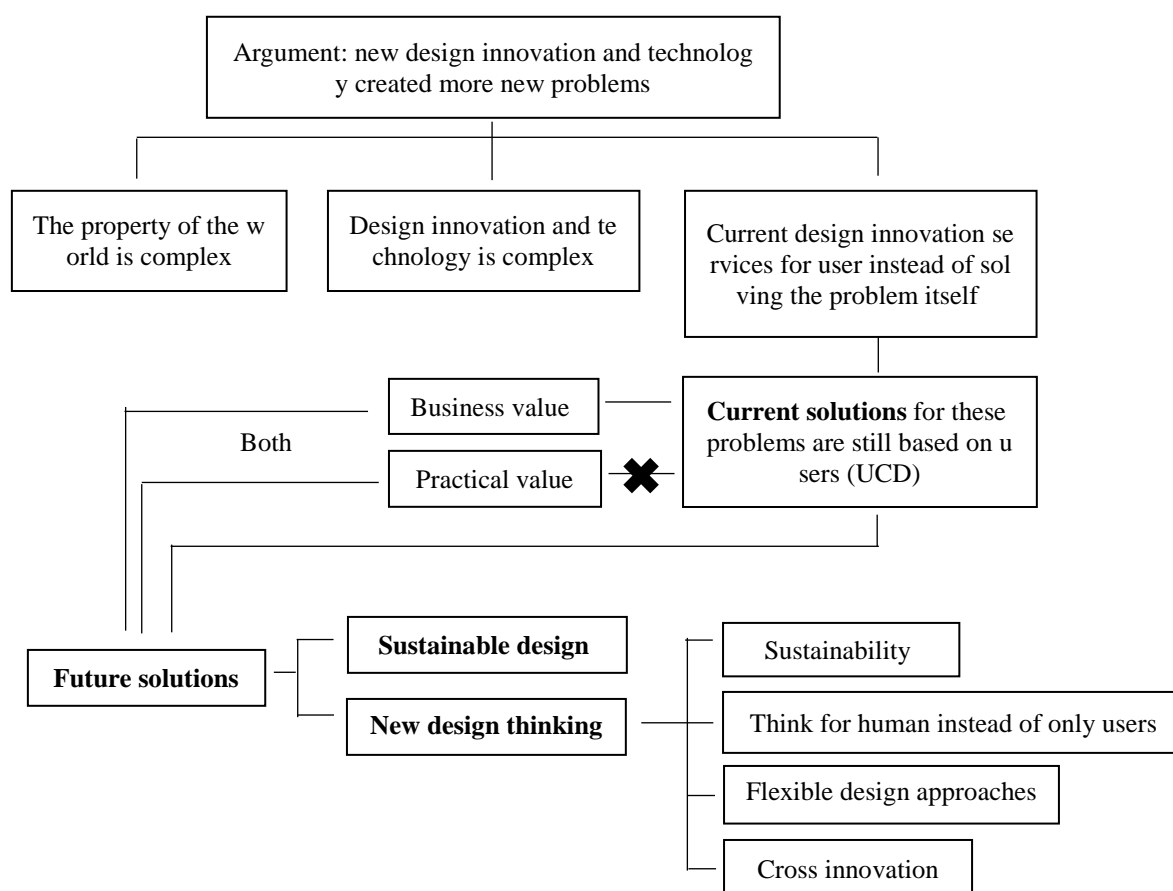


Figure.3 Structure of this paper

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## **Gathering creativity from different specializations in an educational institution: A proposal to design school**

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### **Abstract**

Universities offer students a multidisciplinary, creative centered environment. Making creativity one of the most crucial part of its culture, it maximizes the effectiveness of learning and functions as the fuel for ideas. With the diverse disciplines, it comes with different types of creativities. Specifically, the creativity that's frequently used in the design school is different from creativity for the engineering school and is also disparate from business school's creative thinking process. This article breaks up the four main types of creativities and purposes the ideal "creativities combo recipe" for designers. It analyzes in detail the type of creativity each discipline offers, from a design educators' perspective, proposes an alternative solution for design students to hunt and harvest various creativities not only from design school, but also from other disciplines in a university. By using real industry case studies, the article also highlights the importance of the surrounding environment does to creativities, suggests students emerge themselves into other disciplines' environment to absorb their creativity.

### **1. Introduction**

Human, the most evolved species, dominates the planet by having exceptional skills such as the use of language, the ability of complex reasoning and the ability to solve difficult problems. Being able to create a unique solution for problem makes human survive. Human thrives on creativity, and creativity thrives on novelty. We are gifted with such a powerful asset which contributes to the creation of some of the most spectacular art and sciences achievements in the world. Among all the factors that influence one's creativity, atmosphere and environment play a significant role in the league. In Article "How the environment impacts creative thinking", the author Major Tian mentioned an experiment she did which examines the relationship between personal environment and creativity. They selected two groups of people and place them in two different environments to measure their creativity differences, they have collected a consistent numerical result presenting that various environments scenarios affect peoples' cognition and behaviors. Some of the environment cues include sound, color, temperature, lighting, and space; the results show that the environment brings a significant influence on how human's brain work and function.<sup>1</sup> Not only has the right atmosphere enhance one's creativity, Getting into a new environment and adapting to it can also do the trick, one study done by Professor William Maddux showed the creativity could be greatly boosted when individuals spend time living and immersing himself in a foreign and unfamiliar environment. He conducted a study in which they placed the candidates in a one-to-one buyer and seller negotiation situation, with the knowledge of if the candidate had the experience of traveling or living aboard, they were able to conclude with a result that for the candidate who had traveled aboard, indeed, have the high likelihood of creative deals being reached<sup>2</sup>. The result shows the change in ones living environment can stimulate one's creativity. Other than the surrounding atmosphere, creativity can also be influenced by creative people one surrounds

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<sup>1</sup> Major Tian, "How the environment impacts creative thinking", <http://knowledge.ckgssb.edu.cn/2014/01/13/management/how-the-environment-impacts-creative-thinking/> Jan 13,2014

<sup>2</sup> Arieti, S. (1976). *Creativity: The magic synthesis*. Oxford, England: Basic.

himself with. Many tech giants are utilizing the freedom created by the open office to foster a creative centered environment for employees. Companies like Facebook opened the world's largest open-office workspace in Menlo Park, <sup>3</sup>when employees from different field of studies are brought together to solve problems in a group, people from different background influence each other as well as bring different information, creativity, and perspectives. "Collaboration plays a critical role in scientific creativity" says Jian Wang from the Georgia Institute of Technology, in paper "Collaboration and creativity" from research, she explained the how creativity could be boosted by following the collaborative creative process. "Scientific creativity requires divergent thinking to generate a set of novel ideas, convergent thinking to select the best alternative and coordinated action to implement the selected ideas."<sup>4</sup> Both the surrounding atmosphere and creative people do influence one's creativity significantly.

## 2. Methodology

The paper firstly illustrates how creativity are being taught in design schools in modern days, while other schools are exploring different creativity from other disciplines. It explains the fact that one's creativity can be majorly affected by the environment and people's behavior. And then, by displaying human's four types of creativity, the paper categorized the creativity types into different educational disciplines, engineering discipline, business discipline, art discipline, and design discipline. Taking data from the case studies about the gifted children's drawing, it is clear that different discipline have their own unique way of doing creative work. In detail, the paper talked about the creative technique that are being used by students from different discipline, and the benefits for design students if other disciplines' creativity are adapted into the design process. In conclusion, the paper makes the proposal for design school to encourage students to explore other discipline's environment and learn their creativity.

## 3. Background

The engineering schools are implementing design thinking into their process; business schools are thinking more entrepreneurially; while other schools in the university are undergoing the reinvention, reformation to promote cross-disciplinary creative learning, design schools still focus on pounding the fundamental design skills into students rather than guiding students' creative thinking. Some might argue that it is important for students to focus on the basic principles to build their sense of design. First, they need to broaden their library by acknowledging the lines, shapes, points, hues, and textures in design. However, it is possible for students to acquire knowledge of design fundamentals while maintaining the creativity. In the article "Can Creativity Be Taught?" the author picked John Maeda's (former president of Rhode Island School of Design) mind on creativity education, he stated, "I would not say it can be taught in the normal sense of adding knowledge and wisdom to someone. I would say instead it can be re-kindled in people — all children are creative. They lose their capability to be creative by growing up." He believes creativity in a child, "is the ability to diverge. In a productive adult, it is the ability to diverge and converge, with emphasis on the converging." Professor Maeda explains how most kids are born with a strong sense of creativity and as they grow and gain more experiences they tend to lose them. <sup>5</sup> Design students complains about having their creativity constrained, since environment can majorly impact peoples' creativity, instead of limiting students at one space, design schools should promote the creative thinking by letting student loose to explore another part of the campus to harvest their creativity. Utilizing other discipline's space to do creative exploration.

## 4. Types of creativity

Creativity is not one dimensional; different disciplines tend to practice a different type of creativity. Modern psychologists were able to categorize it into four quadrants. In the document "The 4 Types of

<sup>3</sup> Todd C. Frankel, "What these photos of Facebook's new headquarters say about the future of work" <https://www.washingtonpost.com/>, Nov 30, 2015

<sup>4</sup> Major Tian, "How the environment impacts creative thinking", <http://knowledge.ckgsb.edu.cn/2014/01/13/management/how-the-environment-impacts-creative-thinking/> Jan 13, 2014

<sup>5</sup> John Maeda, "Can Creativity Be Taught?", <http://knowledge.wharton.upenn.edu/article/can-creativity-be-taught/> Aug 27, 2014

Creativity” by Dr. Rishaquiem, he stated that “Creativity can either be emotionally (based from the heart) or cognitively (thoughts, logical an intelligence) based, and can also be spontaneous (something unexpected) of deliberate (conscious effort to sustain).” In the same document, he laid out the four types of creativity are: The Thomas Edison quadrant which are cognitive and deliberate, The therapeutic “A-ha!” quadrant which are deliberate and emotional, The Eureka quadrant which uses cognitive and spontaneous ability of human. The our hard-to-find Epiphanies quadrant (aka. Artists and musicians quadrant) which are emotional and spontaneous<sup>6</sup>. Different characteristic of people and their disciplines stimulate different creativity, and it goes without saying that it would be benifitlial for one to learn about all types of creative thinking process and use them during a creating session.

#### 4.1 Creativity regarding creative discipline in the university

The four quadrants of creativity can also be categorized and matched up with the educational specializations currently offered inside of a university environment. Hypothetically speaking, engineering school represents the combination of deliberate and cognitive creativity, design school uses a deliberate and emotional type of creativity. While students from business school use cognitive and spontaneous creativity in their process, art students tend to use their spontaneous and emotional creativity when creating artworks.

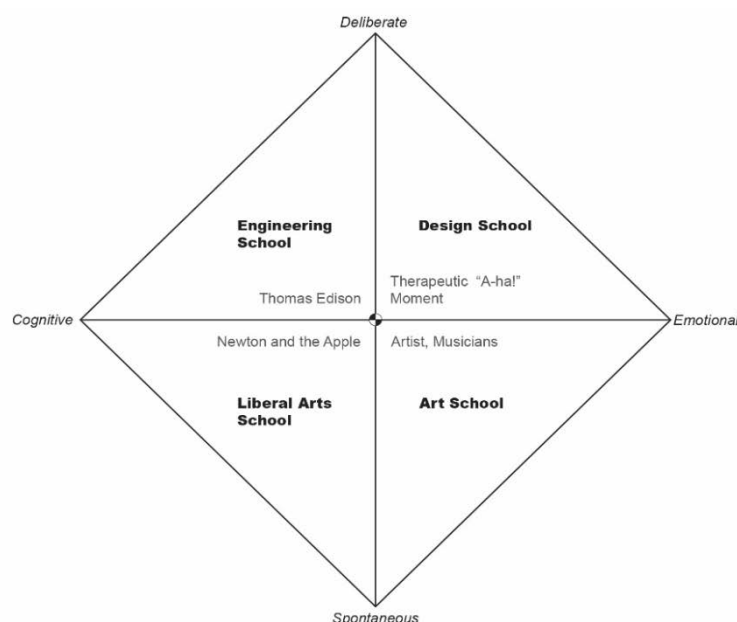


Fig. 1 School disciplines' creativity distribution map<sup>7</sup>

##### 4.1.1 Cognitive and Deliberate – Engineering

It is easy to see the similarity between certain creativity characters with educational specialization in school, for example, the traditional engineering mindset requires engineering student to have the cognitive and deliberate side of creativity. Besides the excellent analytical skills, engineers are known for their hierarchical and formal culture. Engineering schools push students' ability to think logically, using intricate sciences, they make sense of composite systems in the world<sup>8</sup>. Olesya Blazhenkova from Sabanci University and Maria Kozhennikov from the National University of Singapore did a study, they suggested one's spatial visualization ability can be related to his scientific creativity on the

<sup>6</sup> Beth Hendricks, “Types of creativity: Descriptions & Examples”, <https://study.com/academy/lesson/types-of-creativity-descriptions-examples.html>

<sup>7</sup> Beth Hendricks, “Types of creativity: Descriptions & Examples”, <https://study.com/academy/lesson/types-of-creativity-descriptions-examples.html>

<sup>8</sup> John Maeda, “Can Creativity Be Taught?”, <http://knowledge.wharton.upenn.edu/article/can-creativity-be-taught/> Aug 27, 2014

team-level. The scientific creativity mentioned here refers to the cognitive creativity. In the study, 82 gifted adolescents from Russia were divided into four teams: visual art team, science team, the humanities team, and a mixed team. All students were given a large piece of poster board and various drawing materials, and they were told to imagine and illustrate an unknown planet within a certain amount of time. The result represented by the four teams are significantly different. All the planet drawings from the scientist's team seem to follow the natural round shape of the planet, the shape and materials are presented similar to how the planets are portrayed in their textbooks. Although they were provided with various drawing utensils and mediums, all the scientist team insisted on using pencils and minimum color to present the clear and unambiguous representation of their imagination through drawings. Interestingly, the study conductors found that within the scientist teams, the team who has biology focused students created a drawing that represents planet with clear sign alien living things based off of human figure; while the other two teams created drawings with no clear sign of life. The spatial compositions and object properties (materials) of the planets are all presented in a creative and unconventional science fiction way, while they all somewhat relate back to realistic cosmic objects or their past knowledge<sup>9</sup>. The cognitive and deliberative character of scientist students' creativity gives them the ability to imagine things using their spatial visualization. Their spatial visualization ability gives engineering students a unique perspective of viewing objects in life, their cognitive creativity is hugely influenced by that.

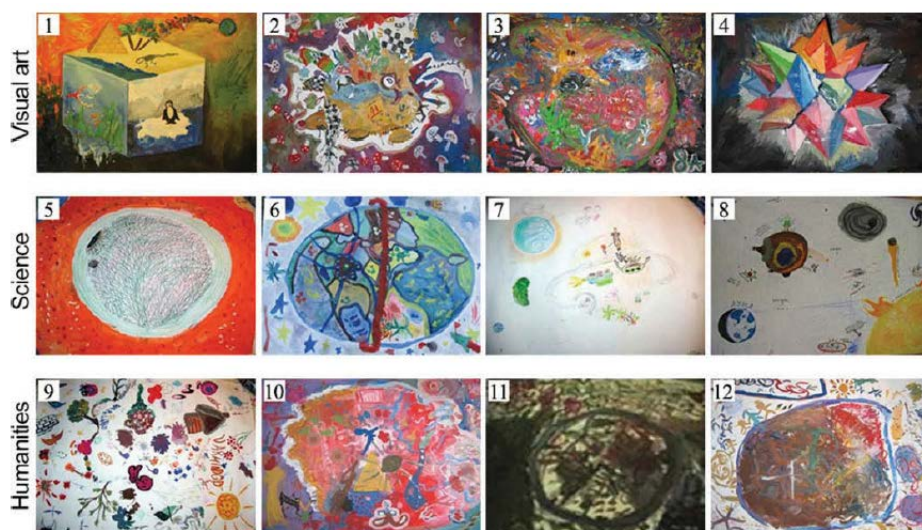


Image 1 Types of Creativity and Visualization in Teams of Different Educational Specialization<sup>10</sup>

The advancement laboratory equipment also gifts engineering students an opportunity to acquire a vast amount of technical knowledge. They are often identified as the most mindful and meticulous member of the group. Studies like mechanical engineering require students to apply creativity with science to produce and analyze the mechanical system, they think deliberately and cognitively. The way that engineers think make them a unique group in college, in the article “Design thinking and engineering: complementary disciplines, but very different cultures,” the author wrote, “Where engineering aims for perfection, design values imperfection.” He went on and explained how “continuous improvement” culture of engineers are different from designers who value the problem-solving process from imperfection. He highlighted the benefit can be huge when engineers adapt design thinking through collaboration. Vice versa, designers can benefit from “engineering thinking.”

Don Norman believes designers should head to engineering schools and pick up some technical skills; he said because design school hires a specialist to train students, students often times narrow in on their specialty. Don encourage the school to reform and let the student gain an understanding of

<sup>9</sup> Olesya Blazhenkova&Maria Kovhenikov “Types of Creativity and Visualization in Teams of Different Educational Specialization”, <https://www.tandfonline.com/doi/abs/10.1080/10400419.2016.1162638> May 9, 2016

<sup>10</sup> Olesya Blazhenkova&Maria Kovhenikov “Types of Creativity and Visualization in Teams of Different Educational Specialization”, <https://www.tandfonline.com/doi/abs/10.1080/10400419.2016.1162638> May 9, 2016



technologies from other departments. Environmental impact on ones' creativity is huge; it forward thinks for students to explore and emerge themselves within an engineering environment. Additionally, he thinks it is perfectly fine for students to have shallow but more board general knowledge. Tying this back to one's creativity, Don expresses that he believes students should know something about everything, knowing the way to consult the world's specialists, to communicate cross creativity, to convey thoughts through products and services<sup>11</sup>. While Don encourage students to get a grasp on the knowledge from different field of study, design student can also learn different creative learning methods by engaging in other disciplines.

#### 4.1.2 Cognitive and Spontaneous - Business

Compare to engineering school, the business school might not have the most sophisticated equipment or tech-oriented lab environment, but business school surely teach the student to be creative. "Creativity is essential in business because it is a differentiator," says professor Tucker Marion from Northeastern University's D'Amore-Mckim School of business<sup>12</sup>. The business school trains their student to think and react fast with the latest change in the business world, they are known for giving the fast elevator pitch using their past knowledge and spontaneous creativity. To maximize return in any market fluctuation requires careful decision and innovative solution. For example, in the study of marketing, the promotion had shifted its focus from solely advertising to providing users a pleasant and interactive experience while getting the message crossed. Thanks to the technological progression, marketing students can benefit from many forms of information delivery methods, from the use of social media to mobile marketing to augmented reality, the digital marketing is becoming more pervasive and requires more user-centered interaction<sup>13</sup>. In the article "The importance of creativity in business," the author suggested that "Creativity in business is a crucial first step that needs to be prioritized by senior leadership." He revealed a survey done by IBM showing among the interview of 1500 chief executive officers, creativity was ranked the first factor for future business success, and this is ranked higher than management, integrity, and vision. A little bit of unconventional thinking can go a long way in any given field of business, Mike Mansbach, president of BlueJeans Network, believes, "Creativity is often the key differentiator in the success of company's departments and internal strategies."<sup>14</sup> A creative business process developed by social psychologist and co-founder of the London School of Economics, Graham Wallas, which aims to harness the unconscious creativity. This creative process has been adopted in many disciplines, but it has been massively used in the world of business. This creative process can be beneficial to design school when it is adopted into the design process. There are four steps to this creative process template:

Step 1 – Preparation: Recognize the problem and find out as much about it as you can. Consciously try to come up with an answer.

Step 2 – Incubation: Do something unrelated to the problem, think of something else and allow your mind to work on the problem unconsciously.

Step 3 – Illumination: It is during the incubation period that an unrelated event could answer, a sort of realization, an illumination.

Step 4 – Verification: At this point, you check the solution you have come up with to see if it will work.<sup>15</sup>

It is admitted that the adopting a various creative process would be extremely beneficial. And design schools could very well take advantage of this when doing ideations, by following through the steps, students are able to explore a distinct way of creating things.

Other than having the creativity to keep up with the latest trend in the market, communication is also one of the business students' specialty. It is the act of conveying meaningful information from one party to another through verbal or visual language. Being able to think critically and communicate through effective dialogue is what design students need to pick up from business school. Because

<sup>11</sup> Owen Daly-Jones "Design thinking and engineering: complementary disciplines, but very different cultures"

<https://www.sutherlandlabs.com/blog/design-thinking-engineering-complementary-disciplines-different-cultures/> Sep 13, 2017

<sup>12</sup> Donald A. Norman, "The problem with design education", <https://www.technologyreview.com/s/423552/the-problem-with-design-education/?set=500031>, April 6, 2011

<sup>13</sup> Lauren Landry, "THE IMPORTANCE OF CREATIVITY IN BUSINESS", <https://www.northeastern.edu/graduate/blog/creativity-importance-in-business/>, Nov 9, 2017

<sup>14</sup> "User centered design" <https://www.interaction-design.org/literature/topics/user-centered-design>

<sup>15</sup> Lynda Shaw, "How to use creative thinking in business", <https://www.forbes.com/sites/lyndashaw/2017/03/26/how-to-use-creative-thinking-in-business/#34029e1176c0> Mar 26, 2017



collaboration is becoming the inevitable driver for future businesses, being able to exchange one's idea is crucially effective. Collaboration is business students' second natural, picking peoples mind and talk through the problem is how they operate, in any team creative session, they push towards the goal together instead of separating the thoughts. Overseeing the big picture, business students become good at thinking critically and working with teams. They combine their statistical concept with liberal art background in many subjects; business students have a strong foundation that allows them to fit into a wide variety of careers.

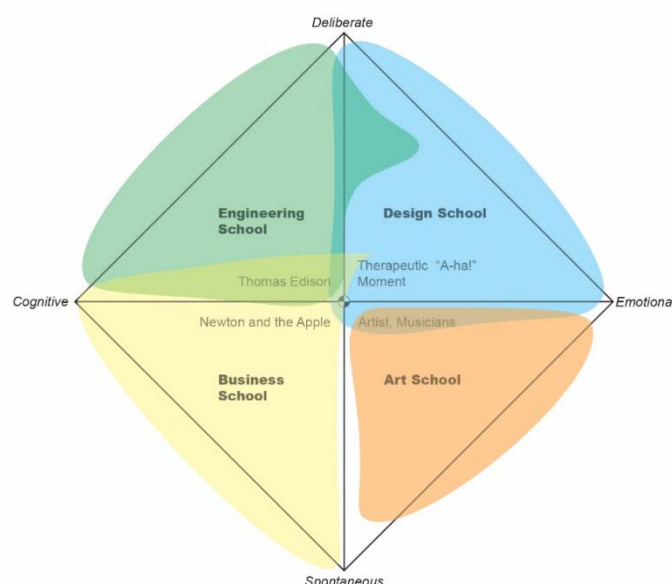


Fig. 2 creativity distribution map of students from different disciplines

#### 4.1.3 Spontaneous and Emotional – Art

In the article “Mark Rothko on How to Be an Artist” the author mentioned, “Famed Abstract Expressionist Mark Rothko believed that art was a powerful form of communication.” He believes that artists should be able to express the inexpressible, he goes, “Indeed, Rothko emphasized that “the most interesting painting is one that expresses more of what one thinks than of what one sees.” Likewise, he placed great weight on abstraction’s ability to convey what is most important to humans—not the world around them, but their emotional life.”<sup>16</sup>. The visual artist uses their work to express their creativity, and it is undeniable that the artists always have their way to keep their creativity fresh. The creative process for artists are spontaneous and can be full of personal emotion, from the same “Unknown planet” study done by Professor Olesya Blazhenkova and Professor Maria Kozhenvnikov, it is discovered that the groups with specialization in visual presented the most non-spherical shape for their planets, they tend to explore the possibilities with various shapes and perspectives. Regarding the use of color and materials, the artistic team explores all the possibilities with drawing utensils as well as the color pallets and compositions. The techniques they used were unexpected, and the color they chose was extraordinary. Unlike the drawings done by the sciences groups, when it comes to the meanings that the drawings were representing, there seem to be any ambiguity and misunderstanding and misleading shape between the thoughts and the drawings. According to the document, “the teams of visual artists tended to create drawings rich in object properties (using the complex color palette, color blending, and shades, pictorial detail, complex texture) and did not represent realistic spatial relationships.” The act of visual art can be spontaneous, and artists often use to express their emotions through their works<sup>17</sup>. In this case, designers can also borrow the freedom to express one’s self-creative thinking process. Although they rarely take lessons on creativity from other disciplines, artists have many ways to stimulate their creativity.

<sup>16</sup> Lynda Shaw, “How to use creative thinking in business”, <https://www.forbes.com/sites/lyndashaw/2017/03/26/how-to-use-creative-thinking-in-business/#34029e1176c0> Mar 26, 2017

<sup>17</sup> Olesya Blazhenkova&Maria Kovhenikov “Types of Creativity and Visualization in Teams of Different Educational Specialization”, <https://www.tandfonline.com/doi/abs/10.1080/10400419.2016.1162638> May 9, 2016

#### 4.1.4 Deliberate and Emotional – Design

Design school today requires students to take a limited number of engineering, art and business courses, but by only taking the classes is just scratching the surface of those disciplines. Without collaborating on a project with people from different disciplines, it is hard to observe their way of conducting the operations, therefore, hard to absorb their creative thinking processes. From an educator's perspective, the goal of creative teaching is to create a responsible environment through teachers' enthusiasm and appreciation of individual differences. Davis in handbook "Teaching creativity thinking" wrote that establishing a creative atmosphere was essential to stimulate creative thinking in a classroom environment. The environment with high competition but low conflict can significantly boost students' creativity. Also, it helps to encourage creative and reflexive thoughts through activities. Creativity scores were significantly higher when students were provided with more opportunities to manipulate materials, participate in open discussions and self-evaluation, and engage in self-initiated learning<sup>18</sup>.

Creativities that designers need differs from stage to stage in the design process, but for the most part, the designer is equipped with deliberate and emotional creativity. When designers are in the problem-solving stage of the process, the deliberate creativity kicks in and helps the design innovate using the logic and past experiences. The emotional aspect of creativity also plays a significant role; the designer often relies on the innovative thinking comes from emotion. During the research phase, to come up with different data collecting methods, designer can borrow the cognitive and spontaneous creative technique from business school. To effectively convey the ideas, spontaneous creativity helps one to construct the sentence effectively, and cognitive experience hinders designers to explore possibilities from different perspective, it makes students to think outside of the box. The emotional and spontaneous creativity can provide an alternative platform for designers to create during the ideation process, while the deliberate and cognitive creative process from engineering creativity would come in handy when designers are figuring out the mechanical aspect of the product or frameworks for the ecosystems. Using the spatial visualization ability that engineering students mastered, design students can better picture of the objects when experimenting with rapid prototyping; later in the stage, the deliberate side of creativity from engineers would help designers to embrace the story and logic of the product.

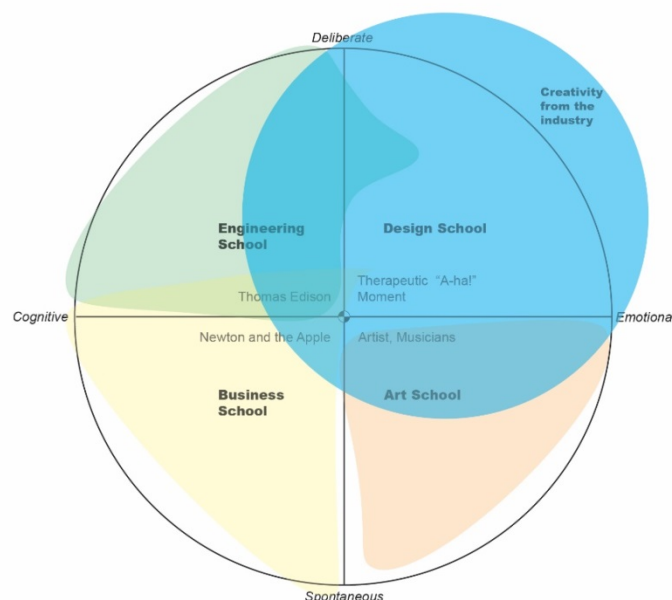


Fig. 3 Ideal creativity distribution map for design students

<sup>18</sup> Cody C Dellisraty, "How environment can boost creativity", <https://www.theatlantic.com/health/archive/2014/09/how-environment-can-boost-creativity/379486/>, sep 19, 2014

## 5. Conclusion

Due to the students' age, demographic, and diversity of personality, it is admitted that cultivating students' creativity while maintaining the same educational standard regarding the fundamental skills in a tough task. A common misunderstanding is the design or art school is the only place on campus that uses creative thinking; the truth is other schools has their unique way of being creative. After realizing that adapting design thinking into their process can be greatly beneficial, many other schools in the university are taking the initiative to learn the process. Design school should also take action, one of the alternative solutions is using the entire campus as a creative resource, encourage students to seek creativity from different disciplines in their space. Environment and influential individuals can majorly affect one's creativity, by emerging themselves into their environment, freely collaborating with people from different disciplines, design students are being empowered with creativity assets from multiple fields. The full circle creativity distribution map gathers creativity from the whole campus as well as encouraging students to explore the possibilities in the real world, taking advantages of the creative working process from the industry. Creativity is the common language that connects numerous disciplines, it uncovers insights, bridges gaps and solve problems. Having larger overlapping areas on the creativity distribution map would make the collaboration process not only seamless, but also significantly expand students' creative ability in design.

## Acknowledgment

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# **The possibility of the content expression of the film with minimalism: Taking “WORK” as an example**

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## **Abstract**

I believe that many people can and even have talent, accept simplified information and understand it through the brain. Let's take the text we use every day as an example, after thousands of years of simplification, from body language to original murals to hieroglyphics, it has finally become the language we use today. Today, some people advocate a minimalist lifestyle, arguing that giving up messy and superfluous things can simplify life and then focus on life itself, improving the quality of life and comfort. We simplify non-essential information or content to truly focus on important and necessary content.

***Keywords-component; Minimalism; Cinemagraph; loop***

## **1. Introduction**

What is the result of this concept in film production? In a minimalist film, how does the information that it contains be passed on to the audience? Inspired by cinemagraphs, I use the loop method to make two movies under the same theme.

## **2. History and Origins**

### **2.1. History of Minimalism**

Minimalism was an art faction that emerged in the 1960s after the Second World War. It was presented to the audience in the form of the original object itself, and the author eliminated the oppression of the audience through the work. It minimizes the sense of violence when the work appears in the form of words or symbols, opens the image space of the work itself, let the audience participate in the construction of the work, and eventually become the author of the work without specific restrictions.

### **2.2. Origin of the Cinemagraphs**

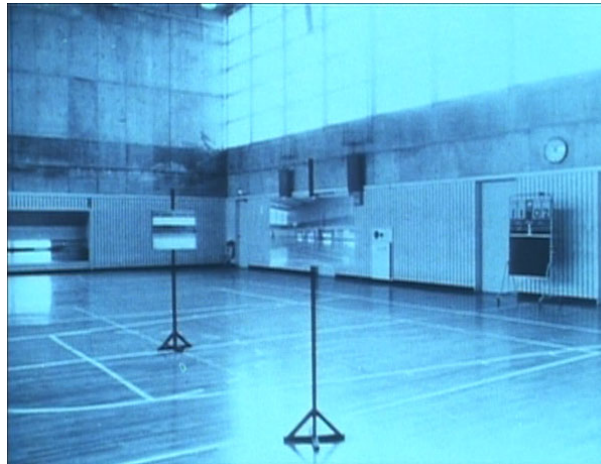
The magical subtle motion technique in still photos refers to the combination of dynamic photography and still images. The art of two artists, Jamie, and Kevin from NYC, first came out of the website cinemagraph. It combines still pictures and video to make a moment in the picture moving at a moment;

Jamie & Kevin: We want to convey more stories in the picture than a still picture, but we don't want to use lengthy videos. In the process of preparing for Fashion Week, we tried to find a way to convey more content;

Cameraman Fernando J Baez said, the charm of cinemagraph is: more than a photo, but not quite a video.

### 2.3. “Spacy”

The experimental video work "Spacy" by Japanese artist Itoh Takashi, which combines more than 700 photos to design an empty stadium scene, and uses three wooden tripods with artboards as props. This experimental film is, in my opinion, a work of Minimalist style, which creates visual space movements and cycles through the alternation of the picture. I believe that viewers who have enjoyed this film can clearly feel the image space that the film conveys through the combination of sound images, but they will have different feelings.



Pic.1 Screenshot of “Spacy”.

### 2.4. “Circuit”

The film "Circuit" produced by Kreis Film in Germany is a self-directed and self-directed work by Robert Gwisdek. The story is that an electrician who entered a room repair circuit entered the room but found him trapped. He will return to this room anyway by "escape" from the room. This film also uses a room with a pure white scene. In addition to the tools that the actor carries with him, the props only have circuit boxes on the wall. Although it is different from "work", the story and rhythm of each cycle are not exactly the same, and it can't be seamlessly played, but in such a plot, many factors are generated to image the audience's emotions. The movie is played in the form of a single screen, making it more dramatic. But I think "Circuit" is still a film with a very minimalist style. From its props (single, small amount), scene (solid color, simple space), lines (no), personnel (less) and other elements which can be seen, the rhythm of the different plots makes the plot very attractive to the audience, and the visual focus is definitely the plot and the actors themselves, but there is no slack in the attention to detail.



Pic.2 Screenshot of “Circuit”.



### 3. Experimental: a case of minimalist video “WORK”

#### 3.1. Equipment and software

Hardware:

Camera: Canon EOS5DIII (FE 24-70mm F2.8、 FE 50mm F1.4); Sony nex-5R (FE 18-55mm).

Software:

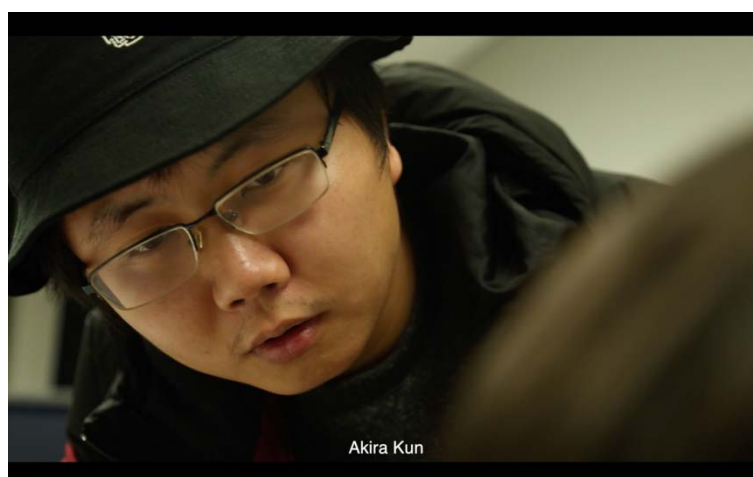
Final Cut Pro X.

#### 3.2. Ordinary version

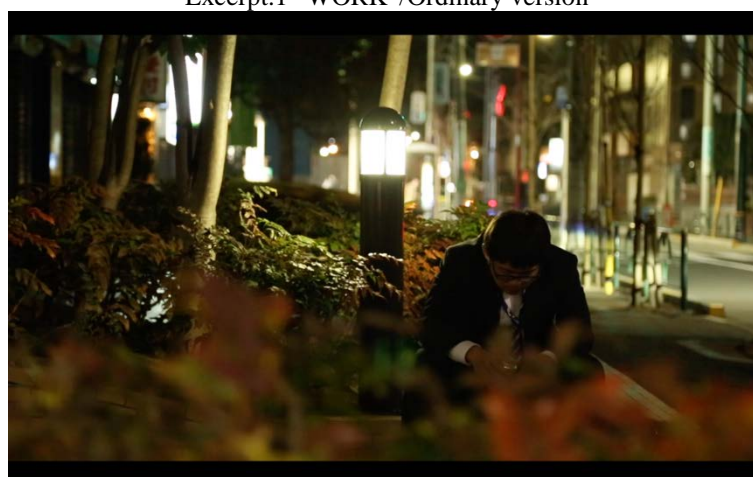
The film takes the work of office workers has been too heavy in recent years, excessive overtime and other topics as the theme, through the traditional film production process, to complete the production of the micro-movie "WORK".

Story: The protagonist was under pressure from his superiors at work and worked overtime until late at night(Excerpt.1-2). When he woke up in a night, he found himself returning to the office(Excerpt.3). After working overtime this day, the protagonist rushed home, and when he opened the door, he saw a light(Excerpt.4-5). When he walked into the light, he found himself returning to his office again(Excerpt.6).

He opened the door despite everything and fled the space, but he came back again(Excerpt.7-8) ...

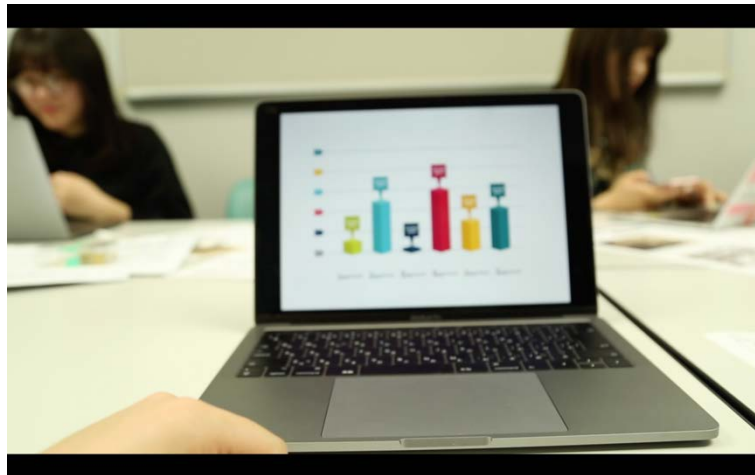


Excerpt.1 “WORK”/Ordinary version



Excerpt.2 “WORK”/Ordinary version

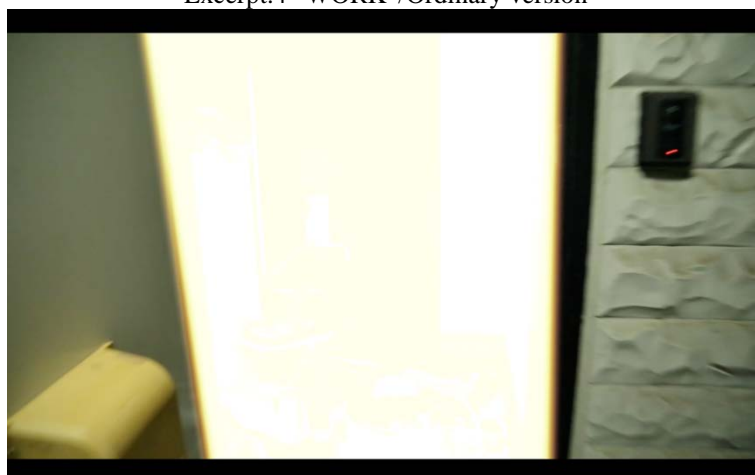




Excerpt.3 “WORK”/Ordinary version



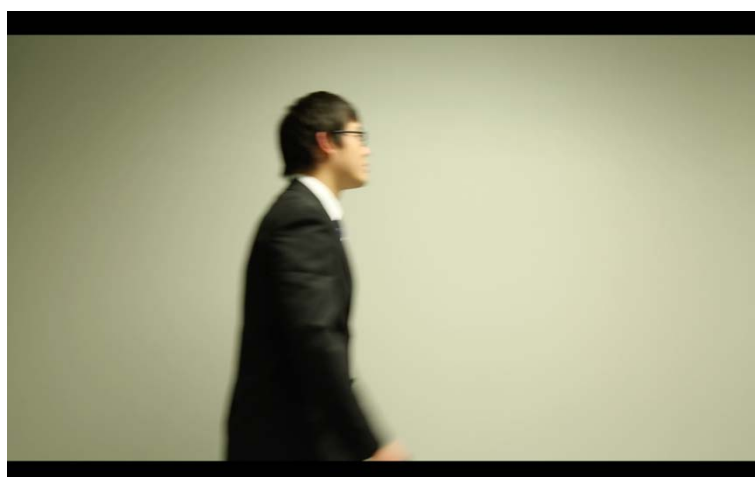
Excerpt.4 “WORK”/Ordinary version



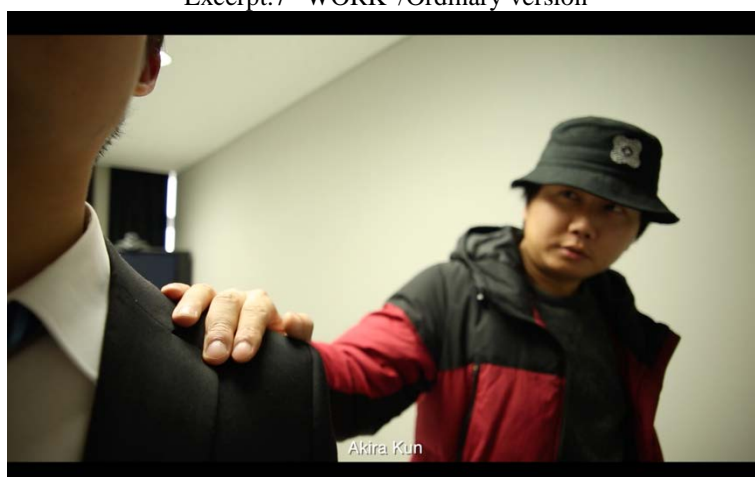
Excerpt.5 “WORK”/Ordinary version



Excerpt.6 “WORK”/Ordinary version



Excerpt.7 “WORK”/Ordinary version



Excerpt.8 “WORK”/Ordinary version

### 3.3. Minimalist version

First removing the part of the first film that does not directly express the central idea, including but not limiting to: scene, field, lens, picture, sound, dynamic, props, lighting, background, even the plot, characters, lines... only the part that directly corresponds to the central idea, the film re-selects the pure white scene: reorganizing with only one actor, one desk, one computer, footsteps and keyboard percussion, we make a minimalist content movie. Then we use the loop method to edit this movie. At this point, I completed the streamlining and re-creation of the film, using a single pure picture and language to convey the core content of the original film to the audience. Like cinemagraphs, a single dynamic picture seamlessly loops back and forth, which can be played indefinitely. Its particularity does not affect the understanding of the content from any point in time, and the information that it conveys is not affected by other factors.

Story: The picture is fixed in front of a table. The protagonist enters from the left screen, then he walks to the bottom left of the desk to start office... He stands up and leaves from the right side of the screen, and then he enters from the left again.

This work needs to be displayed through more than three connected images, which can express the central idea that the work is too heavy for the protagonist to escape.



Excerpt.9 “WORK”/Minimalist version



Pic.3 How to display “WORK”/Minimalist version. (In 21st JAALA International Art Exhibition-2018, at TOKYO METROPOLITAN ART MUSEUM).

## 4. Conclusion

This thesis is produced by the use of minimalism and editing in video films. I made an association with the possibility of the result of this combination, and tried to confirm the works “Spacy” and “Circuit” from Itoh Takashi and Robert Gwisdek, and made a film production with this kind of thinking. Exploration and experimentation. My goal is to understand the emotional infection and information transmission capabilities that can be achieved through video images with different expressions and media images.

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- [3] “Spacy” ITOH TAKASHI, 1981.
- [4] “Circuit” Robert Gwisdek, 2013.

# Emotion Extraction from paintings based on Luscher Color test and Culture Technology (CT)

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## Abstract

Paintings are part of a nation's culture, as different cultures have specific styles of painting. When human beings look at paintings they feel certain emotions. In this paper, we have presented a novel approach for emotion recognition in paintings based on Luscher Color Test and Culture Technology (CT) concept. To the best of our knowledge this psychological theory have never been used in this domain. This paper is a first attempt to use this untouched color-mood theory in psychology.

**Keywords-** *Luscher Color Test, Painting, Color, Emotion, Culture Technology*

## 1. Introduction

When people look at paintings, they feel certain emotions. In fact, in some painting styles, like Expressionism, the artist tries to depict a special emotion. Why is it important to study about paintings? Different cultures have specific styles of painting. Paintings are part of a country or nation's artistic and cultural heritage, depicting the identity and history of those people. By the advent of new technologies, it is possible to better preserve and understand cultural content. As a matter of fact, this idea was first developed by Professor Kwangyun Wohn as Culture Technology (CT) in 1994. Its goal is to take advantage of technology to better study, analyze, and disseminate culture.

In this paper we are going to study on the extraction of emotions evoked by paintings in the field of CT [8] [9]. Due to psychological studies [1] [2] [3] [4] there is a great relationship between colors and evoked emotion in human and it has a universal trend [5]. Therefore we are going to use colors that shape the paintings to extract emotions.

We are going to use Luscher Color Test [6] as psychological basis for extraction emotions evoked by paintings. Luscher Color Test is a simple yet powerful test to understand personality of human. In this test, eight colors is used that consists of four basic color (*blue, green, red, and yellow*) and four auxiliary colors (*purple, brown, gray, and black*) (fig1.) and subject's color preference in choosing the colors is important in revealing their characteristics. Our idea is to capture these eight colors in paintings and arrange them based on the area they cover in the paintings. After obtaining color preference of the painting then we can extract the emotion of a painting.



Figure 1. 8 colors in Luscher Color Test

The remainder of this paper is as follows. In section 2 we are going to discuss Luscher Color Test in more detail. We explain our approach of extracting paintings' color palette as the input for the Luscher Color Test. Then we present results of our proposed method and its evaluation in section 3. At last but not least we provide our ideas, summary of the work and our future goal as conclusion in section 4.

## 2. The Luscher Color Test

The Luscher Color Test is devised by Dr. Max Luscher in Basel, Switzerland. Although this is designed in a simple way, it is a powerful tool for personality assessment. In the ordinary form of the test, a subject puts the eight color cards in order of their preference. The basic colors represent good personality features, while the auxiliary colors demonstrate less good personality features. In this test each color has special meanings but we have extracted eight main emotion for eight colors that are presented in table 1.

Table 1. Emotions related to each color in Luscher Color Test

Gray	Inattention
Blue	Calmness
Green	Persistence
Red	Passion
Yellow	Wish
Purple	Interactive Relation
Brown	Physical Pain
Black	Despair

Also Dr. Luscher created four layers and each layer is for two colors. First two colors are related to first layer and they are the colors that the subject likes the most. Third and fourth colors are related to the second layer in Luscher test which reflects the current state of the subject. Fifth and sixth colors are related to the third layer. This layer shows the characteristics that subject has put aside temporarily and may be used at the right time. The fourth layer is related to the last two colors which are hated the most by the user. These layers are like 2D matrices, containing 56 elements (all possible two color combinations), so the order of the two colors in each layer is also important. Each element contains statements about the subject selecting those two colors, in order to use these layers we have created four 3-dimensional matrices, the row and column dimensions consists of eight colors and the third dimension has eight emotions stated above. Elements of these matrices were rated by experienced psychologists to form our knowledge base.

## 3. Emotion extraction and experiment results

Now we have created a knowledge base with four layers and an input color palette of the eight colors in the Luscher test is needed for a painting to extract the vectors of emotions from each layer.

For dealing with colors, a color space should be chosen, RGB color space is frequently used in image processing, but this color space is not similar to how human perceives colors, hence we use HSV color model that is suitable for this work and also it has the capability of thresholding. We extract the eight colors in paintings and sort them from the mostly used to the least used color, which is a naïve idea that the most used color affects human perception the most. Then each two color of the color palette created from the painting, goes to the related layer and the corresponding emotion vector is extracted. So we have four of these emotion vectors extracted from each layer, in this study we naively calculated the mean of these four vectors in order to obtain a single vector containing the eight emotions.

For experiment purpose and evaluation of our method we need a ground truth dataset of paintings. Except IAPS, which is a dataset of images, there is no special painting dataset. Furthermore results of any other work are different with the results of our method because the Luscher Color Test is not used in this domain. We chose the 16 paintings in Kobayashi's work. Kobayashi devised a color image scale [8] and showed the paintings on that scale. This color image scale contains many emotional words and each have a specific coordinate. Therefore we have to map our emotion vector to the Kobayashi's *cool-warm* and *soft-hard* emotion coordinates. For this purpose we created a set of rules that are conditions for the emotional words. There are two examples below.



If (calmness is high & wish is high  
& despair is low)

Then *Refreshing*

If (calmness is low & passion is low  
& physical pain is low)

Then *mild*

If the conditions are met, then we put a point on the color image scale for each word, at the end of this procedure we have a map of points related to the paintings.

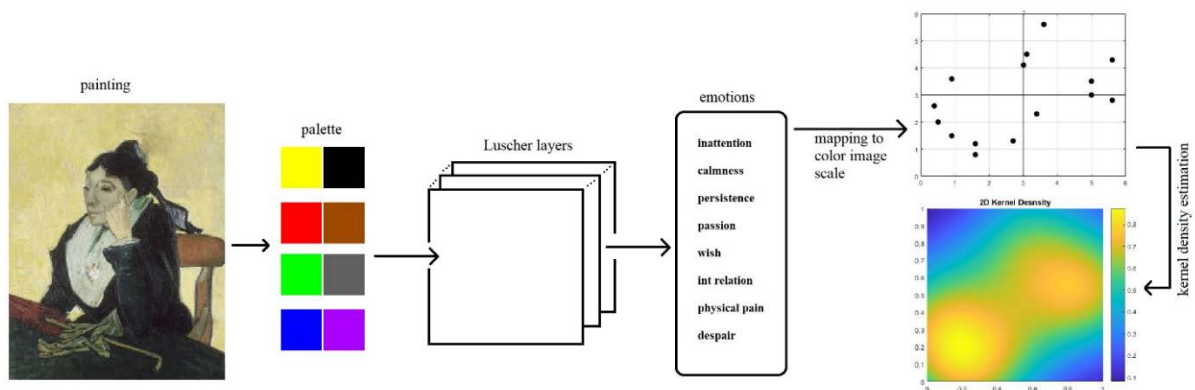


Figure 2. Overall procedure of the proposed method

At the final stage of our work we use a 2d kernel density estimation [7] in order to specify the position of the paintings. In fig. the whole procedure of our method is demonstrated.

We put each 16 paintings in this procedure and calculated their position on the color image scale by our method. Kang et al. used machine learning and based on the three color combinations in Kobayashi's work have specified the position of the 16 painting [8]. Comparison of the three works is depicted in fig.3, fig.4, and fig.5.

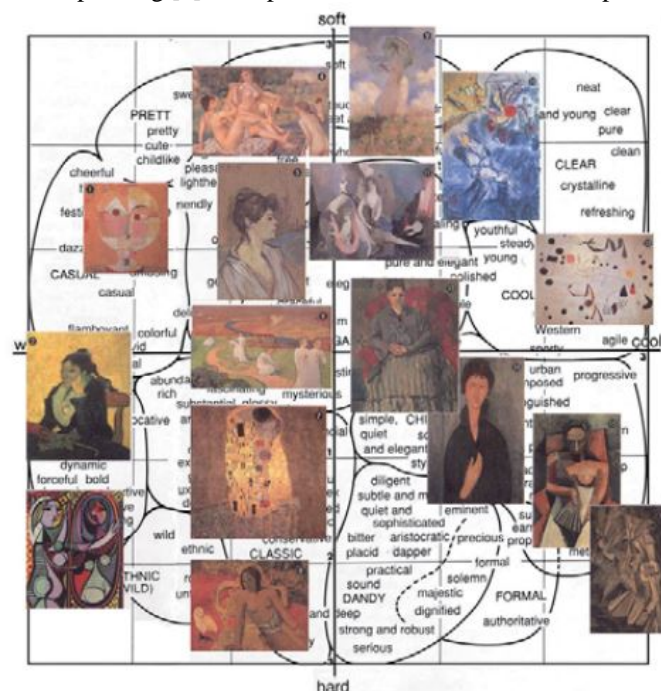


Figure 3. Kobayashi’s ground truth

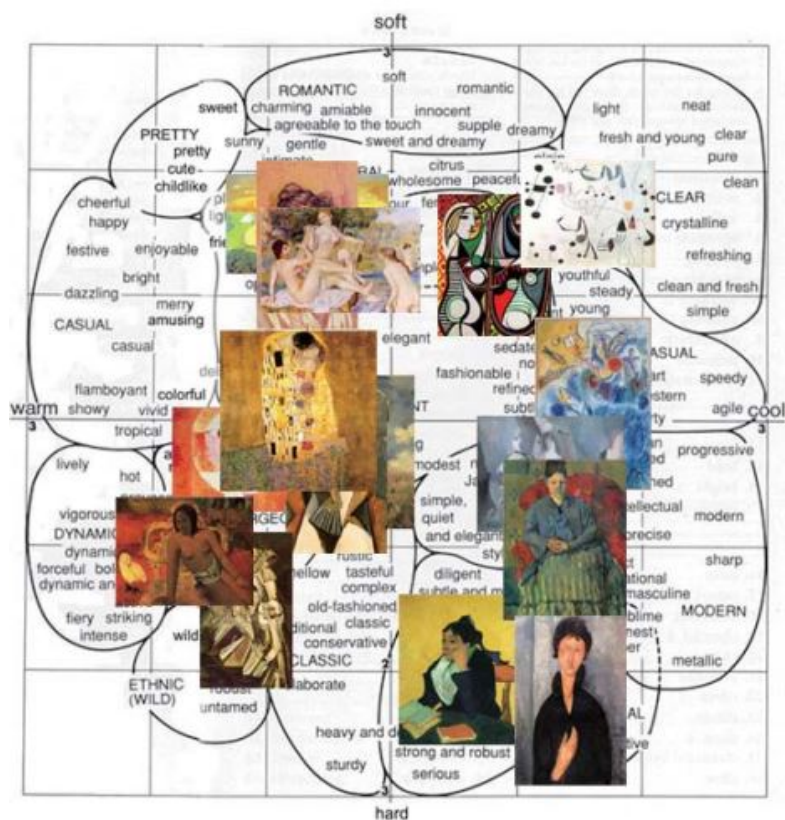


Figure 4. Kang et al. [8]

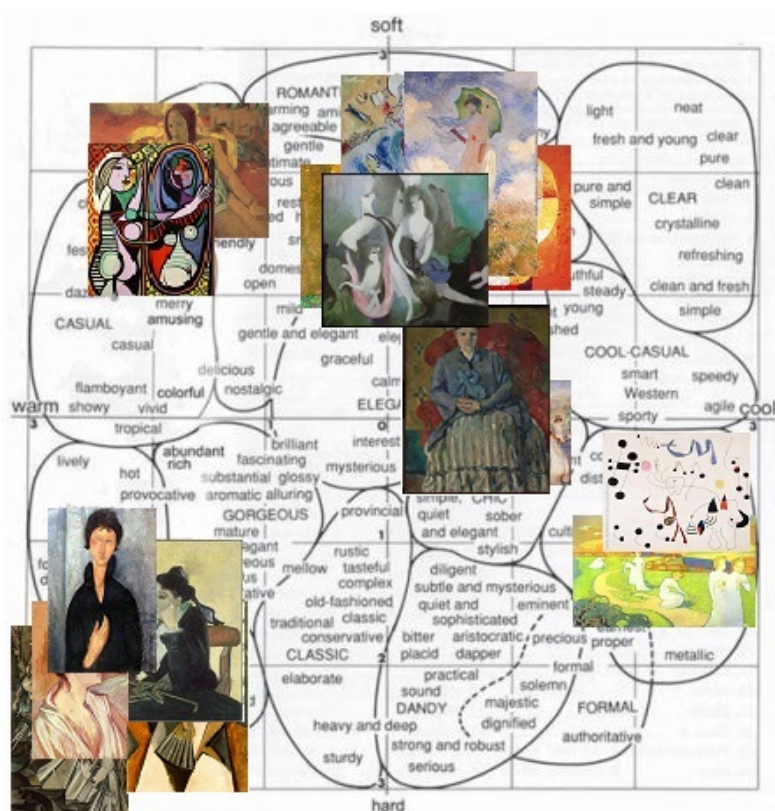


Figure 5. Our method

## 4. Conclusion

In this paper, we used Luscher Color Test to extract emotions from paintings. This test has eight colors, four basic and four auxiliary colors. Color preference is the key parameter in Luscher test and also two color combinations. Each two color in the test is related to a layer. We asked experienced psychologists to read the statements in the four layers and rate the eight emotions in Luscher test. We created four 3D matrices as our knowledge base and it requires an ordered color palette as an input. Each two color from the ordered palette goes to the related layer respectively and four emotion vectors are extracted as a result. In this work we naively calculated the mean of these four vectors to have a single emotion vector. For experiment purpose we chose the 16 paintings in Kobayashi's work. As the color image scale and emotions in Luscher color Test are not directly comparable, so we created a set of rules to map the emotional vector to the color image scale.

Our method based on Luscher Color Test showed promising results, yet it is less good than original work by Kobayashi. This might be due to the errors that are inevitable when we map the emotional vector to the color image scale. Also as stated in [8] the colors of the digital image acquired now are different to those used by Kobayashi. This work was the first step towards studying our countries' rich historic heritage of paintings. For future work we are going to use more ground truth paintings and try to find better ways of comparison so no additional errors can affect the results.

## Acknowledgment

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# Maximizing Designer Effectiveness in a Convergent World

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## Abstract

Designers practice at the convergence of multiple disciplines: technology/engineering, art/aesthetics, manufacturing, business/strategy, and sociology/consumer behavior. How does a designer navigate within so many disparate areas? What attributes separates a design that is held in the highest esteem with one that never achieves significant success or recognition? This paper looks at three key areas: Designer-Creator, Designer-Strategist, and Designer-Visionary. Attributes of each area are discussed and interplay between them yields a method of defining a design and applicable method of operation to maximize the designer's effectiveness.

***Keywords-industrial design, return-on-investment, strategy, cross-discipline, market awareness, customer value, business strategy, innovation, brand awareness, visionary, maker, leadership***

## Methodology

A literature review serves to show the economic benefit, and thus motivation, to invest in industrial design activities within both emerging and mature markets. A breakdown of management and designer needs and expectations are discussed and a rationale for why a symbiotic relationship between the two disciplines needs to exist. The information gathered and analyzed from the literature review justifies the proposed designer framework/model that concludes the paper.

## 1. Introduction

It has been studied and shown that the involvement of designers by companies can reap significant returns on investment financially as well as from market awareness and customer satisfaction standpoints. The economic benefits serve as the backdrop for corporate motivation to heavily support industrial design efforts within the firm. In short, the financial returns on design serves as a justification for management to champion design efforts.

Despite these benefits, companies have too often either limited designer's field of influence within the organization to a very narrowly defined skill-set or have broadened their job descriptions to the point that an extreme amount of cross-discipline burden ultimately dilutes the potential impact these individuals can have. This paper attempts to analyze and define a core group of skills that maximize the ability for the designer to create, lead, align with the company's strategies, and have an overall positive impact for the company.

## 2. Corporate Management and Designers

### 2.1 Impact of designer and designers on corporate image and financials

Anecdotally, many companies have had their success stories tied to visionary designers and an active innovation culture. Names such as Apple, Ikea, Starbucks, and Dyson are a small sampling of such well-known brands and companies.



However, managers often struggle with requesting or championing the financial and strategic support necessary for employing highly talented design resources. By their very nature management seeks to minimize the risk of any such outlays and expenditures. They often do this by studying current/past trends and attempt to extrapolate the future based on these data points.<sup>1</sup> In addition, financial models and spreadsheets attempt to ward off any potential downsides by rationalizing through numbers. A recent *The Economist Intelligence Unit* article places the success rate of management-driven strategies 63%, while others argue that number is as low as 10%.<sup>2</sup>

Designers often operate outside of the comfort zone of management's premeasured, analytic forecasts. They often employ methods that appear subjective, emotional, experimental, and oscillate between abstract ideas and particular details.<sup>1,3</sup> With such a disparity between design and management, why would management ever concede to such a risk and cost?

Studies have shown that companies that rely upon industrial designers have increased brand recognition<sup>3,4</sup>, higher customer satisfaction<sup>1,4</sup>, and even improved financial performance<sup>5,6</sup> over those companies that do not invest in design. Of particular interest Gesmer and Leendner's research has been demonstrated that it is best to lead in design innovation than to follow.<sup>5,6</sup>

It is important to note that the Utterback and Abernathy model of technological evolution<sup>5,7</sup> parallels the results of Gesmer and Leendner—the type and financial impact for the company depends upon the maturation of the industry/products and the novelty of design for a given industry.<sup>5,7</sup> The Abernathy model states that over time innovation will shift from radical innovations to incremental, cost-cutting advances. However, investment in industrial design was also shown to be important to maintaining financial performance and standing in the marketplace, whether in a mature or emerging market.<sup>5</sup>

Hertenstein, et al. went deeper with their research seeking to compare return on assets, return on sales, level of sales growth, net income, operating cash flow, and stock market returns between firms with high- and low-levels of industrial design support/activity.<sup>5,7</sup> The seven-year aggregate of financial data analyzed showed a consistent correlation of design activity to higher financial performance. In almost all cases the confidence level of the correlation was beyond .01, with two-tail test.<sup>7</sup> In other words, there was a greater than 99% confidence that the higher financial returns were impacted by increased industrial design efforts.

## 2.2 The world of designers

Designers live between doing (designing: verb) and delivering a final product (design: noun).<sup>1</sup> Liedtka states that “Real-life behavior, rather than theory, is what matters for design.”<sup>1</sup> This underscores the difference, once again, between the pragmatic and number-driven universe of management and the design world, as noted in the last section.

In between the doing and the release of the designed product is a process that is often difficult to objectively measure, as it is a typically non-linear path from project start to end. Designers expect to experiment throughout the process and iterate toward an optimal solution. A key to this process is an extreme bias toward action and doing. Experiential methods allow for the emotional drivers of the project to be lifted up while the pursuit of novelty and the minimization of the status quo underscore the values of the designer.<sup>1,2,8</sup>

The designer's world is built around dealing with uncertainty, as opposed to the analytics of traditional business strategy that excels in mature markets and a more predictable world.<sup>1,5</sup> In the end, the products and services that are developed by designers are purchased and consumed by people<sup>1,4,8</sup>, and the softer, emotional side of meeting human needs carries far more weight than any cold and impersonal business strategy. Designers work within a mastery of observation and iteration to uncover a deep understanding of the motivations and needs that consumers may not be consciously aware of—this is the underpinning of innovation within the realm of product design.<sup>1</sup>

## 2.3 Why designers need management

Designers bring a significant value to the product development side of the business and can elevate the company's performance and perception. However, designers and management must co-exist in a symbiotic environment; each playing to their own strengths and relying on the other to supplement their weaknesses.

Business strategy is the machine that delivers the design to the marketplace. It is also the backbone that captures profits from the consumer to ensure that the company is on solid financial footing and operations can continue unabated. Liedtka defines four major areas that a business strategy or business/product idea must meet in order to be a truly attractive venture: Value Creation, Execution, Scalability, and Defensibility.<sup>1</sup> Designers are trained and are well versed in the Value Creation area. However, the other three are within the core-competency of business leaders and management.

Execution, or financial positioning, is a core competency of management and aligning of the design so that the firm may deliver the new product at a price that works for the consumer, but also delivering a profit back to the company is critical for a healthy company.<sup>1</sup> Scalability is the business pragmatism regarding the size of the market opportunity for the company and how to seize that opportunity. Beyond simply a size measurement, this attribute takes into consideration time-to-market and the potential impact of the company on the market.<sup>1</sup> Defensibility is the understanding of and the ability to maintain a competitive advantage for the company in the marketplace. Having an on-going way to keep other companies from imitating the investment the company has made into the design is one of the key drivers to making sure that the project has a positive return on investment for the company.<sup>1,8</sup>

### 3. Designer for the convergent world

#### 3.1 Introduction to designer model

What follows takes the above-mentioned interplay between management and designers and combines those insights with traditional roles that designers play to create a model of designer attributes to be most effective within a convergent world.

The model presented provides three aspects that define the core competencies for the modern designer. These pillars align with the above-described interactions of designers within the companies whose goals are to drive innovation through design. These characteristics breakdown into the following categories: *Designer as Creator*, *Designer as Visionary*, and *Designer as Strategist* (Figure 1).

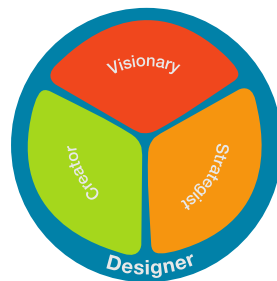


Figure 1.

It should be noted that in this model, each of these areas creates a check-and-balance between one another. This allows each area to stretch the others in significant ways, but also to keep one another in alignment with the goals of the company and within a pragmatic worldview of what is possible. The result is affecting a design direction that is appropriate for both the firm as well as the end-user.

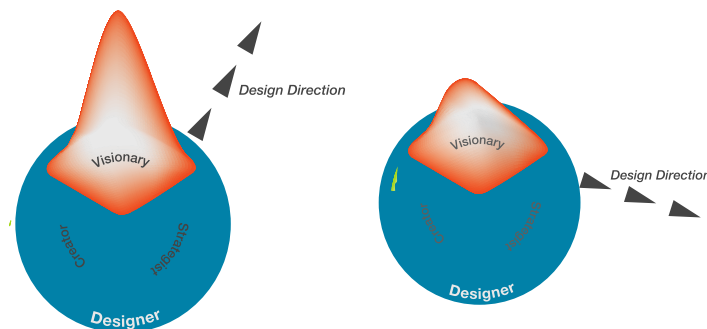


Figure 2.



Figure 2 highlights this interplay between the designer personas graphically. The Visionary and Strategist are the main direction drivers, where the Creator can be thought of as providing feedback and data that shades to the Visionary or Strategist side, as appropriate. The macro direction of the design can range from radical to pragmatic as dictated by the Visionary and Strategist struggle for dominance. The left image of Figure 2 shows the Visionary mindset having a much larger influence and pulling the design in a much more innovative direction. The right side of Figure 2 demonstrates the more pragmatic side of the Strategist impacting the design direction.

This model works well with the Utterback and Abernathy product evolution methodology as well as the observations by Gesmer and Leendner showing that the maturation of a product/market has a direct correlation to the financial impact to the company as well as the novelty of the design—incremental designs for mature markets/innovative designs for emerging markets.<sup>5,7</sup> In short, a newer product/industry will likely have a much higher innovation level with the Visionary persona having a much larger influence on the design. However, as a product/market matures, incremental improvements in the design and functionality of the product are the rule. As such, the pragmatic Strategist has a much higher impact on the direction of the design.

Attributes		
Designer as Visionary	Designer as Creator	Designer as Strategist
<ul style="list-style-type: none"> <li>• Attracts/excites others for the potential of the future and design</li> <li>• Self-confident</li> <li>• Defines the what and why—the grand scale of the future</li> <li>• Understands motivations</li> <li>• Deep understanding of needs</li> <li>• Outward-facing persona—the face of the design</li> <li>• Visual communicator</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme bias toward action</li> <li>• Seeks near instant gratification/goal achievement</li> <li>• Practiced aesthetics</li> <li>• Multi-disciplinary multi-medium</li> <li>• Seeker of proper fidelity</li> <li>• Attacks problems</li> <li>• Playfulness</li> </ul>	<ul style="list-style-type: none"> <li>• Realist</li> <li>• Behind-the-scenes</li> <li>• Understands and operates within real world constraints</li> <li>• Alignment to users               <ul style="list-style-type: none"> <li>◦ Wants</li> <li>◦ Needs</li> <li>◦ Value/benefit provided</li> </ul> </li> <li>• Drive positioning of design to market</li> <li>• Aligns back to company strategy</li> </ul>

Table 1.

### 3.2 Designer as Visionary

A visionary is often held up as the pinnacle of what a great designer should be. The visionary is the designer that has the uncanny ability to see deeply into a scenario, understand the motivations of that consumer, and deliver a simple, yet complete, aesthetically beautiful product that ultimately transcends the ‘thing’ it was designed to be and becomes a timeless icon of an age.

This is an incredible amount of pressure for the visionary to live up to. Indeed, the visionary is often focused not on today, but well into the future that by definition does not yet exist. It is up to the visionary to inspire and communicate the perspective of this future ideal. The visionary also sets the stage for the quality and refinement of the embodiment of the design. Further, it rests on the visionary to align the design with the values and mission of the company and to ensure that the overall team internalizes such values.

The visionary is constantly struggling between the potentials of a perfect tomorrow with a deep understanding of needs and motivations that are the limitations of today. These observations allow the visionary to take on the role of trend forecaster. The visionary operates methodically and with intention. Otherwise, design without vision often leads to mediocrity.

The visionary has a bias to always push toward the perfection that tomorrow promises, only to be held in check by the other two personas of the designer's triad. The visionary 'directs' the maker and informs the strategist and is adept at being a future trend spotter.

### 3.3 Designer as Creator

The three first characteristics usually attributed to a designer are master of aesthetic application, agile developer/experimenter, and evaluator of results to allow for feedback into the iterative development process. The extreme bias toward action and outcomes manifests itself in physical prototypes or mock-ups that can be quickly tested and evaluated.

To further clarify the definition of the designer in this role, the following spectrum has been developed that ranges from pure function to pure expression/form (Figure 3).

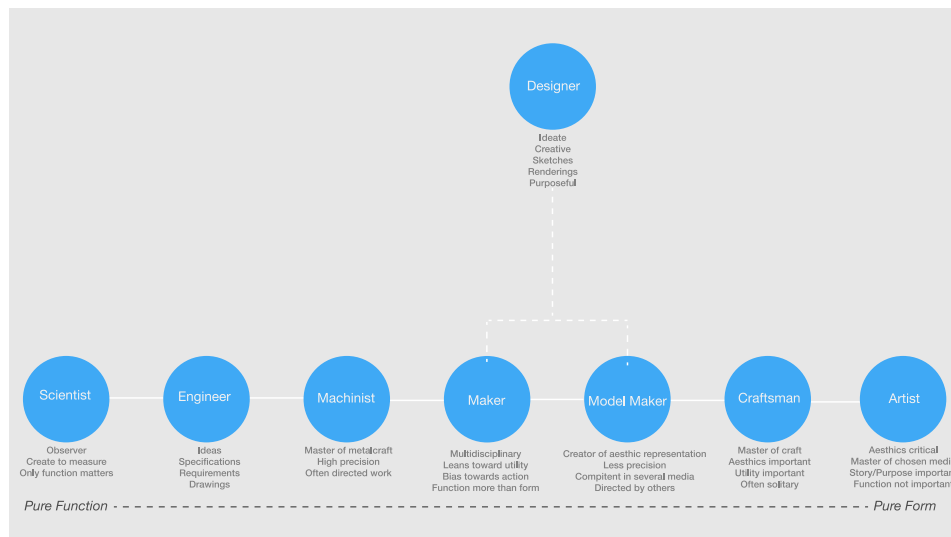


Figure 3.

In order to maintain the velocity required to develop and deploy innovation into the marketplace, it is critical that the experiment/iteration phase move as quickly as possible. One critical way for this to occur is to have the designer be capable of generating a physical embodiment of the current state of the design. Much has been made of the impact of the maker movement has had on the economy, ultimately being dubbed the third industrial revolution.<sup>9</sup>

The ability to give physical form to the design is integral to gathering feedback and ascertain the kind of understanding that generates innovative outcomes desired by the company, markets, and users. The creator is both pushed by the visionary to perform and create at an extreme level as well as kept within the limits of what is needed and practical by the strategist.

### 3.4 Designer as Strategist

The strategist is the realist and holds a very pragmatic view of design execution and its alignment with company goals. However, a distinction needs to be made: the Designer as Strategist does not play the corporate management role of strategy. It should be considered that the Designer as Strategist works solidly within the design realm to align the design to the market within real-world constraints and to align the design as closely as possible to corporate strategy.

The strategist keeps the creator and visionary within bounds of the constraints of the project/company goals. In particular, the strategist works to make sure that the visionary brings insight back into focus for the real world and pulls the information gathered from the creator to align the design in such a way to deliver value to the user and the company.

The strategist also strives to properly scope the design to the maturation of the market as well as the expectations of the user and company. This creates the most tension with the visionary, as often the 'right' design is not the most ambitious or grandiose. The strategist further refines the direction by looking toward the users with both a design-focused and company-focused lens. This allows the design to properly position the design and as closely align the design sensibilities to the firm's goals and structure to maximize the potential for success.

#### 4. Conclusion

This paper started by describing the differences between management and design and then made a case for a positive financial impact on the company by an active investment in industrial design. Next, a short deconstruction of who designers and managers are and what motivations they each then led toward a stance of why both camps need to work well together in a symbiotic relationship to maximize their impact for the firm. Finally, the foundation that was laid earlier in the paper is leveraged into a triad of designer personas: Designer as Visionary, Designer as Creator, and Designer as Strategist. These three definitions align with the needs of the firm while maximizing the effect that designers can have both on the firm as well as the users.

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# Gamification engages children in UX research

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## Abstract

Everyone knows that children are a particular group among us who behave unpredictably and uncontrollably. Thus, when we aim UX design to children, it is hard to do user research. This paper includes the analysis of children's characteristics and wants to help readers comprehend why children are hard to be researched and how to avoid making mistakes when they research kids. Gamification is a hot technique and has been used in various areas. Thus, we try to figure out if gamification is helpful in UX research. Based on the two research cases and analysis of gamification, gamification could be proved as an effective method to overcome children's characteristics and help children focus on the assignments and express what is really in their mind. Finally, the paper includes possible limitations and problems of using gamification in UX research.

**Keywords-** *Children, research, psychology, UX design.*

## 1. Introduction

Nowadays, more companies and designers have found a vast market for children and have begun to focus on children's various needs. There are thousands of apps and furniture designed for children in recent years which come to the public's knowledge and catch parents' attention. As the research, the market of children app has reached \$2.2 billion [1]. However, designing for kids is a tough task. One of the most challenging parts of the design process is how to research children.

Currently, there is not any matured method focusing on how to conduct research involving children, even for those professional designers. The main reason is that children are trying to study and control. Children's behaviors are unable to comprehend correctly. During author's working period in the company, we always use research methods designed for adults on children. Sometimes we made adjustments, sometimes not. Thus, maybe the data collected from this research is inaccurate and misleading, and which leads to a failure for the apps or products.

Some other designers make some conclusions about their personal experience which is more like principles than methods. There is an idea claiming that UX research need to be organized in a familiar environment to children where they feel comfortable, which generally means visiting children in their homes or at school and making the necessary preparations to ensure that space is necessary for one's research needs.

Admittedly, those principles could be understood by us easily and could help us avoid apparent mistakes. However, it is enough to design a whole research process after reading the article. Before we talk about how to conduct UX research with children, we have to comprehend why it is so tight.

## 2. Methodology

In order to test the gamification is useful in UX research for children. This paper explains what is the gamification and how to use elements of gamification in other field. This section is important and tell you

what you could use. Then the paper talks about UX (User experience) research. Because if we want to add gamification to UX research, we have to know about what is UX research at first and what is the problem of UX research for children currently. To figure out the problems, the paper analyzes the personality of children and try to find out what leads to the problems. Finally, this paper analyzes two research cases which use gamification on children in other fields. By analyzing those two researches, we make an analogy to the UX field and find how to add gamification to children in the process of UX research.

### **3. UX research**

User experience (UX) is a strange phenomenon: readily adopted by the human-computer interaction (HCI) community – practitioners and researchers alike – and at the same time repeatedly critiqued for being vague, elusive, ephemeral. The term ‘user experience’ is associated with a wide variety of meanings [2], ranging from traditional usability to beauty, hedonic, active or experiential aspects of technology use [3].

The process of user experience design is divided into researching and designing. During the process of research, the designer researches the user and collects the relative data, especially when the designer believes the concept of User-Centered design. There are a few famous and approved research methods which help the designers collect data, such as interview, surveys, and group discussion. In this section, the highest priority requirement is accuracy. The fake data not only will lead the whole research to a wrong conclusion, but also take the design in a wrong direction, and of course, the product will fail eventually.

### **4. Children Characteristics Analysis**

Everyone knows children are uncontrollable, unpredictable and irregular, but most of them do not know why children behave in this way. I will analyze some universal psychologies of children and explain how it happens and how it relates to our UX research.

#### **4.1 Fear**

Fearing unknown is the instincts for both children and adult, but children are influenced easily, and they always express their fear through behaviors. This fear is more apparent when children stay in an unfamiliar environment with strangers, which is called “Stranger anxiety.” Stranger anxiety is said to occur when infants or children feel uncomfortable or frightened when approached by someone they do not know [4]. This anxiety could not be relieved, even their parents or someone they are familiar with are close to them. When children are in Stranger anxiety, some children will cry, shout, fight with others or cannot say anything.

Beside strangers, the content of research is all unfamiliar with children. Most children do not have this kind of experience, so they do not know what will happen a few minutes later. In this situation, stranger anxiety shows up frequently.

#### **4.2 Imitation and Conformity**

Children begin to imitate after when they are born. During UX research we should pay attention to whether the kid is just following what other kid’s behavior. For example, when a child said he likes a cartoon, it is because he actually likes this cartoon or just because the prior kid said he likes this cartoon. It is a real case, author designs two kinds of UI with entirely different styles. When researchers ask a group of kids to pick their favorite style, most of them raise their hands in the first style, and only two kids choose the second one. Researchers believe they had gotten the result. However, when author asks a kid for the reasons why she chooses the first one in private, she told that she does not want to be the minority.

### 4.3 Distracted

Children are distracted easily under exciting and strange environment. This is why children are trying to be controlled. The environment during the UX research is strange to children. There are various distractions for children including strange researchers, new technical devices and staying in a new classroom. The distraction becomes more dramatic when they operate a smart device. Children would be attracted by the animation, the icons and buttons which are not related to the object. A large number of researches testify the attraction of electronic device. I have seen a 7-year-old kid watch the welcome animation repeatedly for more than four times, during a 5-minutes practical test. This scene happens even I just stood behind him. I cannot imagine what will happen if I give them enough freedom to operate the APP by himself. In this situation, finding appropriate interviewees is a crucial process. Our research target should be familiar with electronic devices and value the context in the device rather than the device itself.

## 5. Gamification

Gamification can be described as the integration of game mechanics into a non-game environment in order to give it a game-like feel [5]. These mechanics are used in the different area to motivate people's engagement. There are two definitions which could help us comprehend the concept.

### Definition 1

Gamification is defined as the use of game design elements in non-game contexts [6].

### Definition 2

Gamification refers to a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation [7].

In the field of UX research, designers intend to add gamification elements to the process of research, which motivates interviewees to engage in the research. Those gamified elements are combined with each other and form an integral system. However, when people design a gamified system, they need to think about those elements separately and find which are suitable for the object.

If we consider the process of conduct UX research as service design, gamification likes a tool which could be used to improve the experience with children and encourage them to create or express their ideas. Gamification has been used in the industry to improve the degree of participation for many years and tested its' effectivity. Gamification is not a method designed for children. It could be used for all kinds of people. However, after analyzing a large number of cases, children are more likely to be affected. For example, the apps designed with gamification will have more opportunity to catch children's curiosity and make them addicted to the apps.

Gamification possesses numbers of elements such as narrative, rewards, competition, progress, feedback, challenge, collaboration, etc. Those elements interact with each other and motivate people from different directions. All in all, the whole stimulation could be distinguished from positive to the contrary and from emotional to cognition (Figure 1). For example, the "level" system is a cognitive element, because it gives players a specific target during the playing and encourages players to achieve the target. Moreover, it is positive because it could quantify player's endeavors and gives the player a powerful stimulation after a period of tasks. However, the "unanticipated" is a positive and emotional element. It makes a kid feel curious and would like to find new things.

In the paper, I mention a few elements which are easily added to the process of research. By adding those elements, children's behavior will become engaging and would like to express their real thoughts.



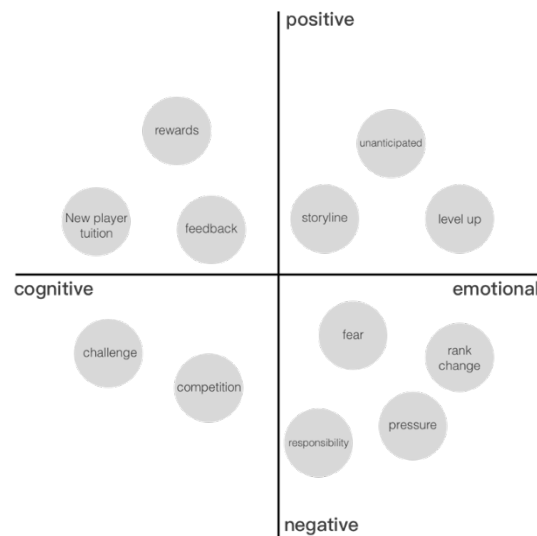


Figure. 1 gamification elements

## 5.1 Narrative

What is the mean of “narrative”? It is similar to the storyline which includes the background, conflict and the end of the story. Everyone likes the story and will be attracted by the storyline, because the storyline makes people immersed in the world created by the storyteller. Liking the story is people’s instincts. When we were a little child, we began to love stories and always asked parents to use stories lull us to sleep. With us growing up, we began to be fascinated with the novel, theater, and movies. Our recreational life always is relative to the storyline, which is also strong evidence for the feasibility of using storyline to attract people.

During the UX research, narrative means the background of the whole research to the children, which means designing a complete story which includes every process in the research, including the introduction of the what UX research is, how to conduct the research and why they should do this. Kids do not know what the UX design is and what researches are, so children must be confused when they are asked to take the research. In most cases, the school tells children that is a survey needing them to take part in and help the company improve their products; sometimes worse, teachers ask kids to follow what researchers’ requirements and do not explain anything. As we mentioned above, children should not be forced to do anything, which may cause their rebellion. As the most significant part of the research, kids’ feeling should care. Thus, as the organizer of the research, we have the responsibility to inform children what they are going to participate. Researchers need to find reasons and motivation for kids engaging in the research. Storyline much is helpful. Engaging in an attractive story, children can understand the assignments thoroughly and keep interesting in the activities.

Looking for a fascinating game, the protagonist always is chosen by the fortune with strong talent and strength, which means everyone wants to become the special one among others. During the research, why don’t tell children the school chooses them, and they are excellent in various aspects which are the only group of people could complete the assignment. In addition, children could be told the engagement with them is essential and could help the company become stronger. Trying to give some responsibility during the story to them could make them feel being trusted and take the research seriously.

The narrative is not an independent element. It combines with other gamification elements to make the whole story attractive. Such the challenge, rewards, and competition, all elements connect with each other and form the storyline.

## 5.2challenge

The challenge in this section likes giving children a specific assignment which could not achieve easily. It helps children focus on the target of the research rather than being attractive by other exciting stuff in the surrounding. Everyone likes to play video games, just because the player cannot achieve the task smoothly. If everyone could pass the game without any failure, no one will engage in the game and have a good experience. In the process of research, especial when there is a group activity, overcoming a challenge in front of all your friends could give you more sense of achievement. On the other side, it is not easy to design the challenge. The challenge cannot be too easy or too harsh. Kids will not attain any achievement if it is too easy. However, if it is too tricky, children will feel frustrated and do not want to try again. So keeping balance is the critical point.

## 5.3competition and cooperation

Competition and cooperation also play a significant role in a game. A single player game will be less attractive than an online game which could play with friends or some strangers. When players compete, defeating you rival definitely could give players many achievements; however, when players carry team members and finally achieve the assignment, the achievement will not be less than defeating the rivals. Human is a social animal who get satisfaction through communication with each other. Competition and cooperation are a kind of communication which make people feel pleasure during the game.

## 5.4Feedback

Typically, the feedback includes two parts, the reaction of behaviors and the rewards after finishing a task. As for the first part, it does not mean we should give a reaction to each behavior. However, when kids feel confused or finish a behavior, we should give a reaction to encourage kids to continue the task or be confident to finish the tasks. This kind of feedback could be a simple action such as an expression on eyes or nod. Children in a strange environment always feel ferried, confuse and do not know what to do. Such actions help children feel comfortable and be brave to express their ideas. Moreover, as for rewards is much more comfortable, providing a favorite item as a reward to the winner who completes the assignment could encourage children to try their best. This motivation will become more potent if kids much love the rewards.

## Study1

Using Gamification to Motivate Children to Complete Empirical Studies in Lab Environments

There is strong evidence proving the feasibility of gamification, element as feedback, engaging children to participate a lab study. Let look the conclusion firstly, the use of gamification increased our study task completion rates from 73% to 97% [8]. This data is enough to prove the effect. In order to collect the clear data, the study includes two comparing study. One used gamification and another one does not use.

During this experiment, researchers just use two gamified elements, rewards and scores. As for scores, researchers add a scoring system to the study task applications. For each gesture that was drawn or target that was touched, children received points. And for prize, At the end of the session, children could “turn in” their points for physical prizes [9].

The point and prize could be classified as feedback which are attractive for children. To win the prize, children try their best the complete the tasks comparing the first study without prize and scores. The score motivates children at every time they finish an action.

However, there is a point which needs our attention. Besides the rewards, competition dons not make sense in this study. Children only need to focus on their task, because they do not need to compete with other children to get the prize. The only criticism to win the prize is to complete the tasks. I do not know whether the rate will increase if we add the competition is the study.

## Study2

The second case proves the feasibility of gamification with a study in which researchers compare the student's participation and proactive behaviors in gamified class and non-gamified class. The outcome is also very positive. Students considered the gamified instance to be more motivating, exciting and more

accessible to learn as compared to other courses [10]. This study also includes a distinct comparing group, the courses without gamification.

In the course with gamification, several elements of gamification are included. For example, students have their own profiles which are different from others. This setting makes students feeling special and would like to devote to it. And researchers also divide the whole exercise into several little section, students could get point and level up if they complete a chapter of exercise. After finishing different tasks, students could get different bonuses.

In order to compare the outcome of two groups, researchers consider participation, the number of the slide download and the grade as the criticism, and then researchers find that the gamified course shows notable gains regarding attendance, participation and material downloads, which suggests improved engagement and diligence, which means the elements of gamification play an essential role in the first course and help student be willing to attend the class.

## 6. Conclusion

Gamification is an effective method to motivate children to engage in the UX research and improve the accuracy of data collected. When you need to design a process of UX research to children, you could divide the whole process into numbers of steps (figure 2). Each step could be described as a circle, and every circle represents a task during the UX research. In the circle, researchers need to tell the story, give assignments, observe interviewees' behavior and give feedback. Telling story means researchers inform interviewees of the background of the research and help interviewees immerse in the research. Giving assignment means interviewees should have a specific target which motivates them to finish the behaviors. Behavior is the real process of UX research, and interviewers will collect information in this section. Then interviewees will be given feedback which relates to their behavior. During each step, research could choose what elements of gamification they need and add it to this step.

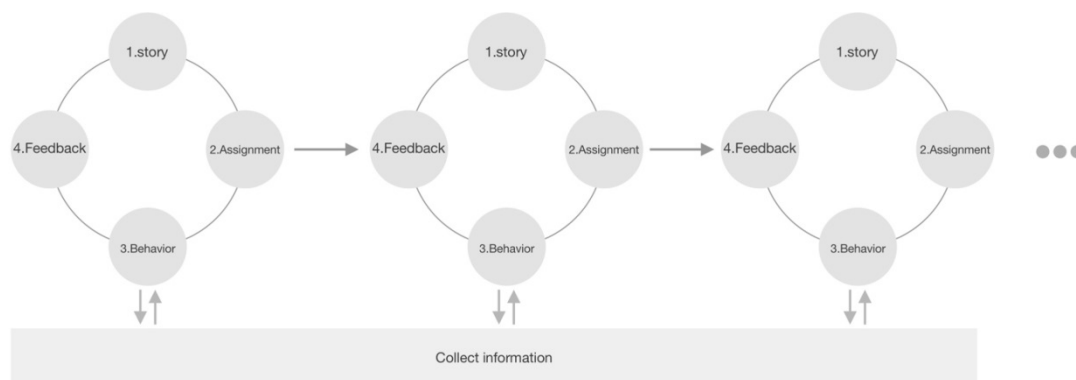


Figure.2 Process design

Although the effectiveness of gamification has been proved, several elements could influence the accuracy of the data from the UX research. What gamified elements are chosen and how to combine those elements into a complete system are the main problems. The gamified elements should be relative to the object of the research, which is the significant section deciding the outcome of the research. Admittedly, the reward is a favorite element which has been testing its availability. However, I do not think rewards could be attractive in every situation. A large number of researchers know the gamification, but there are hardly designers try to add gamification to the UX research. It is because the process of adding the gamified methods to research is time-consuming. We cannot find a universal method which could be applied to all kinds of research. Thus, every time we intend to do UX research, we need to take a significant amount of time to design the gamified mechanism. In a company, the resources of time and manpower are precious, whether the result of research is worthy compared with the expense is what the leader of the company need to consider. Also, whether the gamification could affect success also is determined by some other aspect, such as how to conduct the methods. Although gamification has many limitations, I have reasons to believe that usage of gamification in a UX research will become widespread in the future.

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# Oral Presentation (Session ST1 ~ ST7)

17th November, 2018

## Session ST1 - Digital Contents 3

17th 16:00~17:40, Room#: 1-116 @ Yuexiu Univ. (Teaching Building 1)

Session Chair: Prof. Chul Young, Choi (Dongseo University, Korea)

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| #496 | "Color characteristics of Mexican afterlife expressed in animated film <Coco>," Xiaoshuang Zhang and Donghyuk Choi (Dongseo University, Korea)                      | 139 |
| #572 | "Utilization Plan of 3D Digital Actor as Digital Interface," Dongwoo Lee, Hyungjin Jeon and Hongsik Pak (Dongseo University, Korea)                                 | 143 |
| #551 | "Analyzing the Motion Graphics Animation in the MOOC (Massive Open Online Course)," Lin Xiao and Hyunseok Lee (Dongseo University, Korea)                           | 147 |
| #548 | "Analysis of Anthropology Based on Ethnic Culture - Case Study of <Huayao Bride In Shangri-La, 2005>," Chunliang Zhang and Hyunseok Lee (Dongseo University, Korea) | 151 |

## Session ST2 - Foundation / Source / Culture Service

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Session Chair: Prof. Ted Shin (Metropolitan University of Denver, USA)

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| #518  | "Temporal Expressions Extraction and Normalization for Cultural Heritage Archive Using Word Vector Representation," Watchira Buranasing, Thepchai Supnithi, Pattaraporn meeklai, Phattarapol Jantarasena and Petchwadee Pattarathananan (National Electronics and Computer Technology Center, Thailand) | 155 |
| #601  | "Considerations on Digital Autobiography of the Elderly in the Digital Age," Seoni Joo, Hanil Kim and Seri Pansang (Jeju National University, Korea)  | 161 |
| #602  | "Creative expression of moving images using the interaction between emotion and hue - A case of <peacock > the moving image work.," Dong Siyuan and Yonguk Lee (Tokyo Polytechnic University, Japan)  | 167 |
| #1018 | "Locating Algorithm for the Indoor Robot based on Li-Fi Using the Multi-Beam," Pham Minh Trung, Minwoo Lee, Jinyeong Choi and Jaesang Cha (Seoul National University of Science and Technology, Korea)  | 173 |

## Session ST3 - Advanced Technology 2

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Session Chair: Prof. Rattasit Sukhahuta (Chiang Mai University, Thailand)

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| #618 | "Information Technology Governance Audit Using COBIT 5 Framework in the Disaster Management Office," Komang Devi Tripika Dewi, I Putu Agung Bayupati and I Ketut Adi Purnawan (Udayana University, Indonesia) | 182 |
| #779 | "The Effect of CEO Entrenchment on the Relationship between Corporate Governance and Firm Performance," Duangnapa Sukhahuta (Maejo University, Thailand)  | 187 |
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**Session ST4 - Humanity / Social Science****17th 16:00~17:40, Room#: 1-128 @ Yuexiu Univ. (Teaching Building 1)****Session Chair: Prof. Jaeho Pyeon (San Jose State University, USA)**

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| #559 | "The Transmedia storytelling strategy and structures of heroes in Marvel Avengers films," Jaekyu Kim (Zhongnan University of Economics and Law, China)  | 103 |
| #603 | "Critical Success Factors for E-learning: An Indian Perspective," Namitha K Cheriyan (Christ University, India)   | 208 |
| #885 | "Disseminating Text through Cultural Technology: An Analysis With Reference To Indian Epics," Deepanjali Mishra and Mangal Sain (KIT University, India)   | 215 |
| #597 | "Case Study of Adapting AutoCAD, BIM and VR Software Used in AEC Industry," Jaeho Pyeon, Fatemeh Saffari (San Jose State University, USA) and Joonhee Maeng (Korea Advanced Institute of Science and Technology, Korea) | 220 |

**Session ST5 - Art / Design 3****17th 16:00~17:40, Room#: 1-119 @ Yuexiu Univ. (Teaching Building 1)****Session Chair: SungPil Lee (Dongseo University, Korea)**

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| #482 | "Evaluation of Framework System for Making Safety Training VR Simulation," Qiao Xie, Youngjick Jang and Taesoo Yun (Dongseo University, Korea)                         | 225 |
| #511 | "Aesthetic Effect Expressed by the Theory of Truth and Fiction in CUC Technique: Focusing on Animation Movie," Heqi Geng and Donghyuk Choi (Dongseo University, Korea) | 229 |
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| #775 | "Application of Virtual Simulation Technology on the Practical Teaching Platform for Furniture Design," Wang Zheng Zheng (Shaoxing University Yuanpei College, China)  | 237 |
| #468 | "IMPROVING CUSTOMIZED DESIGN WITH 3D PRINTING," Pengyu Ren (Purdue University, USA)  | 241 |

**Session ST6 - Convergence Technology****17th 16:00~17:40, Room#: 1-119 @ Yuexiu Univ. (Teaching Building 1)****Session Chair : Prof. Fei Hao (Shaanxi Normal University, China)**

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**Session ST7 - Special Session : Higher Education**

**17th 16:00~17:40, Room#: 1-119 @ Yuexiu Univ. (Teaching Building 1)**

**Session Chair : Prof. Intiraporn Mulasatra (Kasetsart University, Thailand)**

<b>#586 "What do students expect from us?,"</b> Hekyung Kim (Dongseo University, Korea)	<b>274</b>
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<b>#620 "ACHIEVING GRADUATE ATTRIBUTES THROUGH AN INTEGRATED ONLINE PLATFORM FOR INTERNATIONAL COLLABORATION: A NEED BASED STUDY,"</b> Guydeuk Yeon and Rinju George (Christ University, India)	<b>286</b>
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## **Color characteristics of Mexican afterlife expressed in animated film <Coco>**

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### **Abstract**

<Coco> is an animation film made by Pixar Animation Studio in 2017. It is based on the 'Day of the Dead (El Día de Muertos)', which is a traditional festival of Mexico related to the afterlife. It was evaluated as the best global animation movies and it showed a new possibility for the animation movie. Therefore, this study analyzed the characteristics of how the color culture of a region was utilized in a video content by analyzing the color of <Coco>, which expresses the afterlife of Mexico with animation. Therefore, this study analyzes the characteristic of how color culture of the region is utilized in image contents through color analysis of <Coco> which expresses Mexican posthumous world with animation.

***Keywords- Afterlife; animation; color; and Coco***

### **1. Introduction**

As the video contents industry has received more attention, people begin to pay more attention to the traditional culture that becomes the subject of cultural contents. The audiences experience identity and cultural belonging from an animation film based on a local culture and they understand diverse local cultures from the movie. Mexico's 'Day of the Dead (El Día de Muertos)' is a festival commemorating the dead and the importance of this local culture has been recognized worldwide. Therefore, it was recognized as a UNESCO intangible cultural heritage of humanity in 2008, for the first time in North America. Analyzing image of the afterlife can help you more easily identify the symbols and the roles of colors in the animation based on regional characteristics. Therefore, according to the color analysis of the afterlife can helps the film animator to convey the intention of the color characteristics of various cultures. The afterlife of the East is divided into the nether world (冥界) and the next world (黄泉) and the afterlife of the West is generally divided into heaven and hell distinctively. From a literary point of view, the image of the afterlife is a culture expressed in the form of an afterlife or myth showing unique worldviews through the literary works and video contents. <Coco>, the analysis topic of this study, was released in Oct 2017 and it earned \$29.76 million until Sep 2018 and it was evaluated at the best global animation movie [1]. It will be meaningful to understand how to utilize the local color culture in the video contents by analyzing and characterize the Mexican people's perceptions and colors about the afterlife that is described in <Coco>, which is based on the 'Day of the Dead (El Día de Muertos)', a custom of Azteca, which is an old kingdom in the Mexican region.

### **2. Historical Background and Meaning of "Day of the Dead"**

The "Day of the Dead [2]" is originated from the ritual of Azteca and it is a traditional cultural festival and a religious ceremony. It was modified due to the Spanish conquest of Mexico in the 16th century and

other historic factors to have the current form. People visit the tombs of their dead family members on November 1 and 2 to decorate the altars of the tombs with flowers, candles, skull shapes, and foods [3]. Moreover, the objects decorating the altars have certain forms and philosophical meanings. Yellow chrysanthemums, orange marigolds, and skeletons made of sugar are known as symbols of autumn, when nature's vitality begins to decline. In Mexico, chrysanthemums and marigolds are used to commemorate someone. The marigold means grief, disappointment, sadness, and happiness that must come. Moreover, one of the important elements of the festival is the skull. Skulls are made of sugar and chocolate and bone-shape candies are prepared. The names of the dead are written on them and they are placed on the altar. When objects containing the remembrance and respect are placed on the altar on the 'Day of the Dead (El Dia de Muertos)', the souls of the dead are led to the altar so they can meet their families. Table 1 shows the symbols of words on the 'Day of the Dead (El Dia de Muertos)' [4].

Table 1. Symbols of words on the 'Day of the Dead (El Dia de Muertos)'

Word	Color	Symbol
Candlestick	White	- Lead the dead to the alter.
Marigold	Orange	- Express the shape of the marigold bridge.
Catrina doll	White	- Stands for the home of a soul or the arrival location of a soul. - A representative image of Mexico and it stands for the dead soul and the origin of life.
Skull doll	Violet	- It means graceful death.
Paper decoration	Red	- It means the dead and it is needed to decorate. - Items decorate the altar.

There are various category classifications for making a cultural approach to color. The color is not only a perceptual phenomenon perceived through the sight but also a psychological phenomenon accompanied by a feeling through the senses. In the animation, the color can describe the characteristics of an object or an event and it also can express an emotion that delivers character's feeling or emotion. Many studies on the images and symbols of colors have made various approaches to the recognition and preference of the public to the color. The color describes the characteristics and image of a country, a region, or a city, and it greatly affects the socio-cultural domain. It is because the personal preference of color and the color preference of a cultural zone, in addition to the universal color cognitive abilities of people, vary. The color has a close relationship with the emotional experience of people and the emotion built in is expressed through colors. Table 2 shows the analysis results of the sensibility reaction survey regarding the correlation between color and emotion-related words in the US, Europe, and Mexico [5].

Table 2. Analysis results of the sensibility reaction survey regarding the correlation between color and emotion-related words in the US, Europe, and Mexico

	Survey Results in the US	Survey Results in Europe	Survey Results in the Mexico City
	Results of Multiple Choice Method/ Preference Oriented	Results of Multiple Choice Method/ Preference Oriented	Results of Simple Choice Method/ Preference and Percentage Applied
Anger (Hate)	Black, Red (89.6%)	Black (58%) Red (36%) Green (18%)	Red (43%)
Peace (Tranquility)	Blue, Green (93.6%)	Blue (56%) Green (42%)	White (77%)

Happiness	Yellow, Orange (63%)	Yellow (61%) Orange (45%) Green (24%)	Yellow (32%) and Green (29%)
Sadness	Black, Gray (86%)	Black (76%) Gray (30%) Brown (18%)	Gray (37%) and Black (21%)
Love	Red, Purple (81%)	Red (36%) Purple (81%) Pink (81%)	-

### 3. Case Analysis


#### 3.1. Introduction of Analysis Target

The analysis target of this study was an animation movie, <Coco>, released in 2017. <Coco> is based on Mexican culture and it is full of rich cultural elements. <Coco> is a story of a boy, Miguel, who dreams to be a musician and fell into the world of the dead by accident on the background of the 'Day of the Dead (El Dia de Muertos)', which is a traditional Mexican festival. Particularly, the characteristics of unique colors expressed in the work allow people to experience the afterlife full of North American culture.

#### 3.2. Color Analysis of Afterlife shown in <Coco>


In animation, a color can express the characteristics of an object or an event. It also has the function of expressing an emotion that draws the character's feeling or emotion. Colors were selected around marigold and Marigold Bridge, which connects the afterlife and the real life on the 'Day of the Dead (El Dia de Muertos)'. They were repeatedly used in the scenes of <Coco>. They are summarized in Table 3 and Table 4.

Table 3. Marigold's color symbolism

Image			
Name	Marigold		
Digital Color Value (RGB)	Orange R234/G100/B23		
What it stands for?	<ul style="list-style-type: none"> <li>- It means the bridge connecting to the afterlife.</li> <li>- Grief, disappointment, sadness, and happiness that must come</li> </ul>		

The marigold shown in the background of <Coco> has a special meaning in Mexico. The main color of marigold, which guides the path of the dead, is orange (Table 3). The color of marigold, the representative flower of Mexico, is orange and it honors the death and blesses the soul in the afterlife. The survey results of Mexico City (Table 2) indicates that orange is the between red and yellow it crosses the anger (hate) and happiness. Especially it turns into yellow when there is a contact with a character, expressing happiness.

Table 4. Skeleton's color symbolism

Image			
Name	Skeleton (Image of the dead)		
Digital Color Value (RGB)	White R255/G254/B250		
What it stands for?	<ul style="list-style-type: none"> <li>- Stands for the dead soul of the dead and the origin of life.</li> <li>- It means grace death.</li> </ul>		

The main color of the skeleton in <Coco> is white (Table 4). The skeleton symbolizing the dead soul of the dead does not give cold, scary, and sad feelings. The white of the skeleton expressed in <Coco> stands for the dead soul of the dead and the graceful death at the same time. The analysis results of the survey conducted in the Mexican City (Table 2) showed that people felt peace and serenity from the white of the skeleton (the image of the dead) expressed in <Coco> and they derived happiness from the yellow, the color of marigold (background), reflecting on the white of the dead.

#### 4. Conclusion

This study analyzed the colors of <Coco>, which is an animation movie based on the 'Day of the Dead (El Dia de Muertos)', a traditional festival of Mexico. The results showed that colors could be used important tools to express the characteristics of a region in an animation based on a local culture. People living in Mexico have considered that the afterlife and the dead are in calm and happy objects and the animation reflected the meaning of the colors in Mexico in the movie as they are. Moreover, it was found that images filled with high chroma expressed the unique images of the afterlife with reflecting the regional characteristics of Mexico, where sunlight is intense. This study also could confirm the symbolism and role of colors in the animation based on the regional and cultural characteristics. We hope that the results of this study will be utilized as a data for video content study and application in the future. I also hope that there will be more studies on the color expression of animations and video contents based on local cultures.

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# Utilization of 3D Digital Actors as Digital Interface

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## Abstract

As digital media including digital devices has rapidly developed, need of more organic interface has also been expressed. In spite of technical development and a variety of studies, however, interfaces have their weaknesses as well. This paper is to complement those weaknesses using 3D digital actor-based user-centric interaction. It expands the notion of 3D digital actor into that working as interface as well beyond its conventional use in entertainment. Through this procedure, the study presents role of digital actor utilized as an offshoot of interface.

**Keywords-** *3D Digital Actor, AI, Organic interaction*

## 1. Introduction

H. M. McLuhan, the author of 'Understanding Media,' states in his writing that 'media is the extension of man.' He argues that media is not to be restricted as 'means of communication' which is generally used today but it implies every man-made artifact. He also clarifies that media is a productive or creative process that continuously changes human capacity and scope and the notion of human itself.[1,2] Development of media, as shown above, can also be referred to as that of interaction between human and media.

Human constantly communicates with artifacts that they make. We call the point of contact upon this communication an interface. We need a keyboard and a mouse to communicate with computer and when touch panel is broken with smartphone's display screen, we have difficulties to communicate with the smartphone, which suggests that the role of interface is instrumental as a channel for man to communicate with computer.

With technical development, interfaces are expanded into various fields including PC, smartphone, tablet PC, laptop computer, etc. Interaction between human and computer is also developing along with AI emerging as a core technology of the fourth industrial revolution, voice recognition technology, and the like. As speaker, refrigerator and air conditioner equipped with voice recognition function has recently emerged, the technology now penetrates deep in our lives. Even with such development, however, it still has error on touch and input and output on voice recognition.

In view of this background, it signifies that the need of notion and method expansion in the process of media interaction is highlighted. This paper suggests a new offshoot of 3D digital actor utilized as interface between digital device user and digital media.

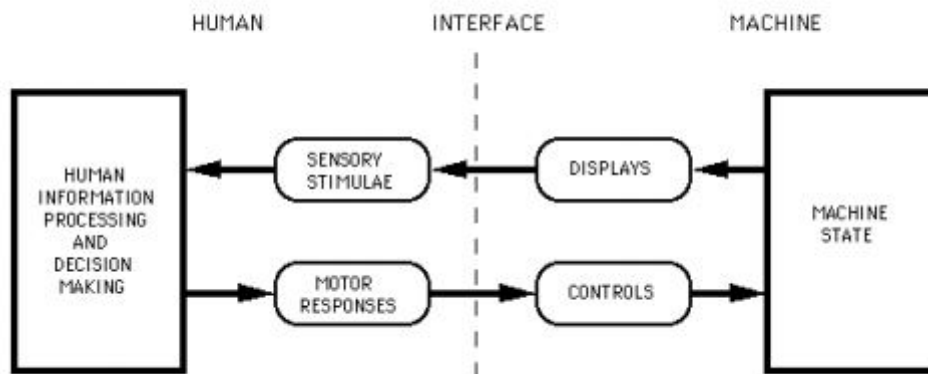
## 2. Related Researchers

Digital actor is currently defined as a computer graphic (CG) image character that can realize appearance and motion of an actual actor at the same level.[3] This tends to be identified with motion capture technique which captures and reproduces real actor's appearance and motion. Such environment has confined digital actor in fields of films or games. As digital environment rapidly advanced, however, utilization of motion capture did not stay merely in screen or monitor. With technical advance to capture motions, it developed into emotion capture that detects fine movements on face and then afterward, it was located in the field of emotional computing as an offshoot of means to qualitatively measure emotions. Thus, it suggests digital actor is also on a phase to go forward with new roles and notion for our time. Realization of intelligent UI by utilizing digital actor covered by a precedent research (Pak, Jeon and Chae, 2017) suggested a new research direction with this



background. Focusing on the precedent research, this paper is to expand and interpret 3D digital actor in the category of interface beyond its use in entertainment.

Interface refers to an object's boundary line and a medium that enables communication and access on that boundary. The term interface literally is a compound with 'inter' (mutual) and 'face' (surface, exterior) and it means between two systems or objects, at point of contact on boundary or faced part in between. It also refers input/output device that works as a means for interaction between human and digital media and what is expressed on that device.[4] When human makes a decision and enters commands to machine, the machine outputs that with sensory information. As shown in Figure 1, it is the domain of interface that lies between human's input and machine's output.



[Figure1. Diagram of Human-Machine-Interface] (Mackenzie, 1995)

As environment surrounding human recently becomes intelligent with development of information and communications technology, ways of interface have also evolved constantly and it serves as a medium of multi-sensory (multi-modal digital actor) interaction accompanied with sense of touch and hearing and beyond that of vision and provides new experiences that could not be realized before.[5] Going through qwerty keyboard and stylus pen to multi-touch screen and AI-based voice recognition interface, environment of interface has continuously developed. The core value in this development process is realization of interface more convenient and organic between human and computer. AI-based voice recognition interface particularly has advantages that it reduces depth levels on menu and its standby status is maintained at all times. However, voice recognition has not been perfected yet so it also has a limit of difficulty in smooth interaction. It is expected to take much time and cost a lot to overcome this limit.[6]

Considering that 3D digital actor is of communion with multiple senses of sight, hearing and touch beyond single sensory component, it would provide users with more intense immersion to realize 3D digital actor into interface as a technology to complement elements that hinder immersion.

### 3. Utilization Plan

Selecting 3D digital actor from real figure in the past and present or a fictitious character, the precedent study restricted the meaning and the scope of 3D digital actor with which shape information, form image and motion picture can be created and utilized as digital information. It is because the study aimed to reinforce connection of interaction between user and 3D digital actor through 3D digital actor-based intelligent interaction UI realized as above. This paper is to suggest utilization plans of digital actor as output produced through such procedures and scope of interface utilization.

#### 3.1 Utilize digital actor in virtual space within VR device

As a channel of imaginary communication utilizing VR devices, technology termed as social VR is recently commercialized. The core of this technology is to communicate with other people using avatar that represents a user in virtual space. The user can interact with another user or artificial intelligence that has appearance data in this space. It is digital actor that is utilized as the most important interface in the virtual space realized as above. Digital actor substitutes role as visible interface that delivers user's action and voice information as it is. Virtual space realized through digital device exists as a channel for interaction. Digital actor that represents a user in social VR plays a role as a medium to actualize user's desire and an interface to communicate with other people or artificial intelligence.



(A)Facebook Spaces

(B)Oksusu social VR

[Figure2. Utilization of digital actor in social VR]

### 3.2 Representing and Utilize historical figures

Animations institute, a German educational institution, worked on digitalization project of Albert Einstein in December 2017. Led by Professor Volker Helzle, this project aimed to make Albert Einstein's new digital ego. More precisely, it was to digitalization of human face and to develop technology that could be applied to animation, VFX and interactive media. The project proceeded with acting by a real actor Andreas Hykade and then adding Einstein's appearance on it. Animation institute uploaded three videos on Youtube as output of the project. These videos are named "World Formula," "Human," and "Smart Phone." From the video, we can see the historical figure Einstein tell stories on human including theory of relativity that he has discovered and use a smartphone with the latest technology.[7] Another precedent research (Pak, Chae, Jeon, Ko)[8] on reproduction of such historical figure is on utilization by making a tool that can save, create and edit data of figure in the past or present, instead of realization of digital actor based on a real actor. This study can be actively used in fields of Education, media and historical Science through digital actor realized as output as well as standardizes a figure's appearance data with deviation on different records. This process shows us that digital actor itself is not confined only to domain of entertainment but works as one interface.



[Figure3. Einstein restored as digital actor]

## 4. Conclusion

We have examined utilization plan of digital actor that works as interface. Utilization of 3D digital actor has been limited to description of more realistic appearance and motion in films and games so far. With development of devices along with media, however, interface environment for more intense immersion is

demanded. This study has significance that 3D digital actor is demonstrated to come closer to everyday life beyond the frame of entertainment and have aspects as interface for organic interaction with user.

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# Analyzing the Motion Graphics Animation in the MOOC (Massive Open Online Course)

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## Abstract

With the rapid development of network technology and information technology, the appearance of MOOC (Massive Open Online Course) makes courses popular and network-based. However, seen from the videos of mainstream MOOC at present, there are many deficiencies in the design of MOOC, such as blind stacks of texts and graphics and boring pictures, which affect users' study experience to some extent. At the present stage, researches on MOOC mainly focus on the design, teaching mode of MOOC, and the analysis of learners' learning behaviors, while there are few analyses on the application of Motion Graphics (MG) animation in MOOC. In this thesis, by analyzing the advantages of MG animation, features of MG motion in MOOC teaching videos are extracted, with a view to providing reference to designers of MOOC in the future.

**Keywords-** *Massive Open Online Course; Motion Graphics; analysis*

## 1. Introduction

As the fragmented new media, MOOC is widely used in the internet teaching, but such a teaching resource has the higher requirements for the production form and specialty. How to improve the presentation effect of MOOC becomes one of important factors for MOOC development. Whether MOOC can attract users to watch continuously and actively and this requires for content design and technical support. That is to say, good MOOC not only needs the excellent teaching content design, but also requires for the proper technical support. Otherwise, it is hard to stand out the short and refined feature of MOOC. MG animation-oriented MOOC is a new form to satisfy the presentation of MOOC and it is greatly used in the internet. In this thesis, learners are selected as the research object. Then MG animation in MOOC is analyzed, so as to improve production efficiency of MOOC videos. In this context, learners will take the initiative to study and their interest in learning will be motivated, which makes it more accurate and smooth for learners to grasp the key points of knowledge [1].

## 2. Theoretical Research

### 2.1. Massive Open Online Course

Massive Open Online Course (MOOC for short) refers to massive open courses online. Some researchers consider that MOOC is an emerging online course format developed by network and mobile intelligence technology based on curriculum and teaching theory. Since MOOC was proposed in 2008, it has had the rapid development until now. Due to different demands of various disciplines for video forms and innovation of today's digital media technology, the production methods of MOOC videos are constantly changing. Under the exploration of different scholars, they have created all kinds of video production modes. The mainstream MOOC video production methods get involved in studio, studio

recording, course video, Khan Academy, and screen record. How to select the best video presentation in the process of making MOOC becomes the primary consideration in production of MOOC videos.

## 2.2. Motion Graphics

Motion Graphics, MG for short, is generally interpreted as motion graphics or dynamic graphics. MG is a language that combines animated movies and graphic design and a visual representation form based on timeline motion design [2]. The originally static flat image is set up in a dynamic way, so as to reveal dynamics. The theoretical foundation of these visual languages and artistic forms is the visual language of television animation. The reason why MG animations are so popular is that it is determined by its characteristics. Generally speaking, graphs in MG animations apply the flat design. The flat design with the short time, fast rhythm and more information enables information expression to be concise and direct. Moreover, it is suitable for the online spread of the internet. Besides, 3-5min MG animations are coordinated with relaxed and humorous language to make the flat graphic color conform to the information receiving habit of the masses. In 2014, Dr. Philip Guo and Post-doctoral Juho Kim in Massachusetts Institute of Technology, as well as vice president of edX engineering Rob Rubi analyzed 862 video watching records and sampling 80 videos watching behaviors on edX together. The findings showed that videos within 6 min were most attractive, providing the practical suggestion on producing MG animation-oriented MOOC. Short contents are mainly reflected in explaining a knowledge point. This exactly corresponds to the fragmentation learning situation of knowledge in the information era and promotes ubiquitous learning and mobile learning.

## 3. Relevant case studies

In this case, we sampled the top 20 videos of the hottest courses in each discipline from three major MOOC platforms, Coursera, edX and Udacity, to carry out a large-scale analysis of recording ways and learning effectiveness. Based on the analysis, we find that different ways of recording will have different influences on learners' learning outcome, and among all the recording ways, animated lecture videos are the most popular videos for learners.

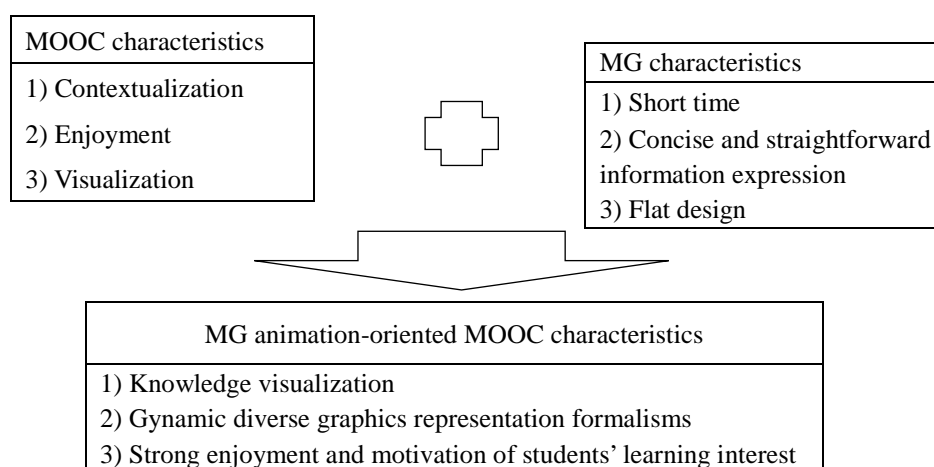
Table 1. Survey on Learners' Preference for Different Types of MOOC

	Outdoor Shooting	Studio Shooting	Classroom Recording	PPT Recording	Animation Type	Hand Painting Type	Other Forms
Coursera	20.69%	10.34%	8.62%	5.17%	<b>27.59%</b>	20.69%	6.9%
edX	19.18%	12.34%	6.79%	8.54%	<b>24.94%</b>	22.89%	5.32%
Udacity	22.56%	9.43%	5.32%	4.39%	<b>29.29%</b>	24.65%	4.36%

The dynamic graphic characteristic formation of MG animations is the necessary choice under the visual cognitive rules. Visual attention is the important constituent part of visual perception. The second level of visual attention means that whether people pay continuous attention after noticing something. As a result, if an animation wants to be attracted by audiences, it must reinforce audiences' visual stimulation and use the sustainable, changeable and stimulative visual effect to maintain audiences' attention. In the new media era, various graphs and image information are flooding. Static frames and traditional images have no feeling of freshness. Information spreading of these modes is hard to attract audiences' attention and maintain their sustainable attention. MG animations endow audiences with the stronger and more abundant visual stimulation by virtue of the abundant and changeable dynamic graphic frames and interesting dynamic expression. Therefore, MG animations are necessary choices for audiences' aesthetic level and visual cognitive rules in the new media era. The biggest advantages of the application of MG in MOOC lies in that animation can be used to simulate image experiments that cannot be obtained, and to present designers' creativity without restrictions. The use of animation can visually present abstract concepts, making the expression of contents clearer and more eye-catching. Besides, the application of animation can also make teaching a dynamic and interactive learning space that can help students to master knowledge more easily.



Table 2. MG animation-oriented MOOC characteristics



#### 4. Case Analysis-NASA's Voyager Mission

In the animation of *NASA's Voyager Mission*, the complex problem of NASA's Voyager Mission is simplified. The graphics in the picture are interesting and appealing, which is more likely to attract learners' interest. In this animation, the colorful pictures, diversified transition animation effects, and smooth graphic animation have both the dynamic beauty of animation art and the formal beauty of visual language, which fully demonstrates that the visual language of MG animation is more colorful. (e.g., "Fig. 1") It is mainly reflected in the following aspects:

1) Knowledge visualization: the short film *NASA's Voyager Mission only* has 2:56 of duration. The duration of short films ranges from 5min to 30min. This short film reveals the boring and complicated voyager mission in a vivid animation. The abstract knowledge is visualized and it is convenient for comprehension. This film has no complicated figure relationship, but shows up the flat symbols, including the earth, rocket, and ejector. It is popular and easy to understand. Ranging from projectile demonstration operation to moving trajectory in the outer space demonstrates the experimental process of the Voyager. The complicated theory is more intuitively and accurately elaborated, making a profound impression on learners.

2) The diversified dynamic presentation: this film has the free and simple sport performance. Some of them refer to the graphic movement. The other part means the lens movement. The earth moves forward in a flickering way. Meanwhile, it is emphasized by the Voyager. This greatly expands the animation space and pays more attention to the logical reflection on the experimental works. Instead, it has no excessive limitations of other factors. The exaggerated deformation of the earth or characters is the lightspot in animations. Those changes won't regard the time or space as the shackles. It fully develops the imagination of the animation creator in physical truth, thus audiences are satisfied in a large range.

3) Strong enjoyment: characters, graphs and images relating to the Voyager are revealed in the dynamic effect. It has the diversified presentations and strong visual convey effect. The dense and unintelligible information is reminded through the voiceover and sound effect. With the funny and humorous language, students gain information in pleasure, so their learning interest will be motivated and learning efficiency will be enhanced.

MG animation-oriented MOOC is based on the plane design. The dynamic deformation effect reveals the characters, graphs and images of teaching contents in the form of concise and vivid language. As a whole, MG animation-oriented MOOC is embellished by complicated and boring theory thus the teaching process and results will be more intuitive, accurate, and understandable, making people impressive.



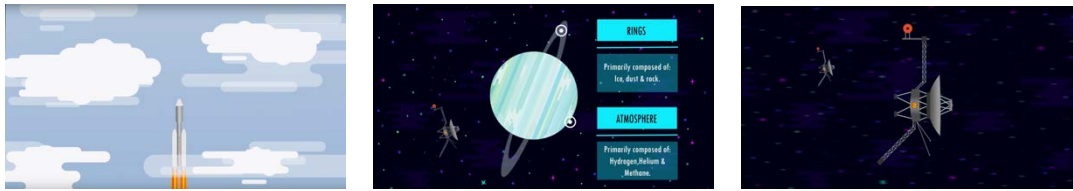


Fig. 1 NASA's Voyager Mission

## 5. Conclusion

MG animation combines graphic design with animation technology, which is interesting and clear in information transmission. The combination of technology and art has become a new form of MOOC production. The production cycle of MG animation is shorter, and the rendering effect is better, which reduces learning cost and speeds up production progress. With the advantages of MG animation, MOOC can be more dynamic and visualized, thus enhancing the application and teaching of MOOC. The application of MG animation into the teaching of MOOC can change the current problems of low learning efficiency and high dropout rate in MOOC teaching, at the same time, improve the design of teaching video. It makes MOOC teaching video more intuitive, improves the effectiveness of experiential learning and information transmission, and optimizes course quality and teaching effect.

Based on teaching video of MOOC, this study analyzes video of high-quality case courses, and finally concludes some points and inspirations of MG animation in video of MOOC teaching. Firstly, the MOOC of MG animation class presents the complex text knowledge in the form of abstract animation, sound and graphics, which makes the information more intuitive and accurate, conveys information in a clear way, and enhances the visualization effect of knowledge. Secondly, in the MOOC of MG animation, MBE, illustration, flat design and other forms of dynamic deduction have appeared in the MOOC with text, graphics and other elements as the main elements. These dynamic expressions are simple and generous in design, reasonable in color and uniform in style, which enhance the effect of the picture on information guidance. In this way, the information is concise and straightforward, and different dynamic expressions express different emotions, which is in line with learners' visual aesthetics. Thirdly, the teaching content is presented dynamically, with various dynamic forms, and the effect of visual communication is strong. The information is prompted through narration, sound effect and music, which is consistent with learners' cognition of audio-visual information, arouses learners' interest in learning and improves their learning efficiency. These features aim to provide references for improving the attractiveness of MOOC teaching video, perfecting learners' learning experience, and promoting the quality and completion rate of courses. It should be noted that the inspiration of MG animation in the MOOC teaching video analyzed and summarized in this study is only based on the analysis of selected quality cases, and the subsequent studies may also involve some cases with poor teaching effects to verify each other. At the same time, the research conclusion still needs further tests of research and practice. The author believes that the quality of MOOC will be improved continuously with constant practice and exploration, and their attractiveness will also continue to grow to bring more high-quality education resources to learners around the world.

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## **Analysis of Anthropology Based on Ethnic Culture - Case Study of <Huayao Bride In Shangri-La, 2005>**

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### **Abstract**

In current image-media era, the scope and depth of spreading ethnic culture have been extended. This paper takes the movie <Huayao Bride In Shangri-La, 2005>, as a case of culture criticism of anthropology. This movie has been considered as an explanation of traditional ethnic culture by contemporary media culture, and from the perspective of anthropology, methods of document research, cultural relativism, and intercultural comparison are taken to analyze this explanation. This movie shows colorful Huayao Yi Culture, involving many symbols and elements of ethnic culture. This paper selects 5 types of ethnic elements to compare and analyze the ethnic culture of reality and of movie, to emphasize the objectivity and authenticity of shooting content of movie theme based on national minority, and to discuss the relationship between balanced audio-visual language ethnic culture applied in movie and its connotation. The option, that ethnic culture in the process of media should be fully respected and protected, has been put forward.

***Keywords-Huayao Yi;Anthropology;Ethnic Culture;Movie and TV Media***

### **1. Introduction**

In China, minority culture has become the transformation target of mainstream media. Many movies based on the topic of minority have been shot, views of anthropology have been applied to analyze ethnic culture in the movie, to study how ethnic culture is displayed in movie in media context. Movie & TV means are attempted to express deeper connotation by images forming through the camera.

Methods of document research, cultural relativism, and intercultural comparison are applied to do the anthropological analysis of Huayao Yi Culture in the movie of <Huayao Bride In Shangri-La, 2005>, from the perspectives of host culture and guest culture.

### **2. Literature Review**

Visual anthropology: Visual anthropology is a way using image and film to show anthropological theory, to record, display and explain culture of an ethnic group or to attempt to build up knowledge of comparative culture [1].

Huayao Yi, is a part of Nisu branch of Ethnic Yi of Yunnan minority. Due to women's elegant, generous and colorful clothing with exquisite bouquet beside the waist, they are kindly named as 'Huayao Ethnic Yi', with its nickname of 'Huayao Yi', who mainly inhabits in 2 towns, Longwu and Shaochong, locating in the north mountain area of Shiping County of Honghe Prefecture in Yunnan Province. The movie, <Huayao Bride In Shangri-La, 2005>, is named by it.

Boas thinks that each ethnic group has its own culture, and each culture is the special thing of each society and ethnic group, that will result in the theory of relativity. Boas said that there wasn't universal principle of human's culture development, as each culture has its existing value, each ethnic group has its

respectable value. It's wrong to evaluate whichever nationality's views and value system, as it cannot understand the real meaning of each ethnic group and its culture [2].

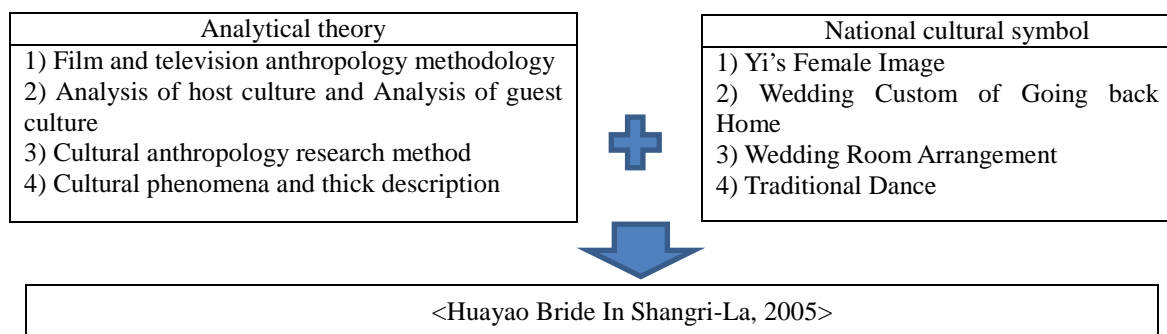
Anthropologist PiRe Kenneth has created Emic and Etic in 1960S, Emic-Analysis of host culture, that is insider; Etic-Analysis of guest culture, that is outsider [3].

The American anthropologist Geertz proposed that the analysis of culture is 'a science of interpretation of meaning' and that it needs to be 'deeply depicted' rather than merely describing the description of superficial phenomena. The 'deep description' of culture is to use the means of film and television to interpret culture and to think and study culture in visual language. Instead of just staying in the performance and display of various cultural phenomena, you should also use the image language of film and television to express the deeper things behind the image [4].

As for ethnic culture in the movie of <Huayao Bride In Shangri-La, 2005>, it's not only the superficial display of symbols of ethnic culture, but also the 'deep explanation' and display of spirits and connotations of ethnic culture.

### 3. Analytical Tool

Table 1. Analytical Tool



### 4. Case Studies-<Huayao Bride In Shangri-La, 2005>

<Huayao Bride In Shangri-La, 2005> takes Yunnan minority Huayao Yi as background, and traditional custom 'back home' of Huayao Yi as clue, to display minority youth's love story. It completely shows colorful ethnic culture, such as, natural landscape, special wedding customs, colorful ethnic clothing, various songs and dances, and female dragon dance,. The movie completely shows and widely spread many ethnic elements and symbols.



Fig. 1 Marriage custom of Huayao Yi



Fig. 2 Women's Dragon Dance of Huayao Yi

Ethnic culture displayed in the movie is not compatible with the real ethnic culture in reality, for example, the difference of ethnic woman's image, as traditional Yi woman's personality is tender, intrapersonal, diligent, hardworking, virtuous and warm-hearted, however, the 'brutal' image built by director disobeys judgment of Yi's traditional value, and insult ethnic woman's image of Huayao Yi; due to the misunderstanding of wedding custom 'back home', this film has misunderstood the application time of this wedding custom, and overstated its application, arrangement of wedding room is incompatible with reality.

Table 2. Cultural analysis table (Comparison Chart of Ethnic Culture in Reality and Ethnic Culture Displayed in Movie)

Content	Ethnic Culture in Reality	Ethnic Culture Displayed in Movie	Whether it matches
Yi's Female Image	Tende, intrapersonal, diligent,ardworking, virtuous and warm-hearted	Barbaric, naughty, stubborn	No
Wedding Custom of Going back Home	Couples cannot live together in the first 3 years, that is an ancient wedding custom existing in 19C50S or 60S, that doesn't exist in this society.	Hero and heroine live together at the first night, that disobeys ethnic regulation. The movie mistakes the previous wedding customs of 19C50s or 60s as today's custom.(Mistake application time)	No
Wedding Room Arrangement	Wedding room should be arranged on the first floor of soil palm room	Wedding room should be arranged on the second floor of soil palm room	No
Traditional Dance	Dance with cigarette cues is a mass folk dance of Suni of Yunnan Yi's branch	Dance with cigarette cues is a folk dance of Huayao Yi of Yunnan Yi's Nisu branch	No



Fig. 3 Village head and villager clothing comparison



Fig. 4 Heroine and man wrestling image

Above all, according to Boas' and Kenneth's theoretical analysis, the movie <Huayao Bride In Shangri-La, 2005>, has play an important role of widely spreading, inheriting and developing minority ethnic culture; besides, without objectivity and reality, director uses 'other person' perspective to rebuild a 'brutal' girl without Huayao Yi's ethnic characteristic. Director have strange views towards ecological landscape, clothing, folk ceremony of Huayao Yi's area. Minority symbols of ethnic elements are used to 'grafted', in order to achieve visual shock, however, they do not display ethnic cultural spirit and connotation, with representational form over real content. The root reason is that director, scriptwriter, actors as 'other person', they did not conduct sufficient field investigation or experience ethnic culture. Also, they didn't understand the nationality of Huayao Yi, that can be considered the hegemony of mainstream recognition of strong Han culture against weak minority culture, therefore, minority loses their rights to show themselves through the movie & TV media. Hence, it's quite important to respect minority ethnic couture and their living style.

## 5. Conclusion and Suggestions

Each ethnic group has their complete cultural traditions, meanings and values, that regulates the imaginations of their images, and defines 'self' and 'other person'. In the process of intergroup contact and cultural communication, each ethnic group shows their images to 'other person' in some ways. In current society, mass media, like movie & TV, has their own purposes to involve into the process of ethnic culture transmission. Some culture has been overstated, so movies about 'other person's self-image

have deviated their own imagination and definition, that will result in damages to their culture and emotions. The themes of minority movies should be based on the objectivity and reality of content, seek for the balance between visual image and ethnic cultural connotation, efficiently apply image media to fully respect and protect ethnic culture, and attempt to express deeper cultural connotation by images forming through the ways of video tools and cameras.

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# Temporal Expressions Extraction and Normalization for Cultural Heritage Archive Using Word Vector Representation

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## Abstract

Cultural Heritage refers to the legacy of the group of people. There are tangible cultural heritage and the intangible cultural heritage assets. The digital cultural heritage has become an issue to preserve the cultural heritage material as the assets. One of the important parts of the cultural heritage or historical archive is the time for identifying and understanding of the event happened. This paper introduces an approach for extracting temporal expression and normalizing values from various data sources. We design a model for extracting temporal expression based on semantic extraction rules and word vector representation and normalize values from various time format to the same format. We design a model for extracting the relationship between the event and temporal expression. The experimental results show the accuracy of time expression extraction for the normalized form date/time is 0.90 and the accuracy of relation extraction with time expression for the normalized form date/time is 0.85.

**Keywords-Temporal expression, Cultural heritage archive, digital preservation, word vector**

## 1. Introduction

Cultural Heritage [1][2] refers to the legacy of the group of people. There are tangible and intangible cultural heritage assets, that can be defined as Tangible cultural heritage assets are the physical items that can be perceived by the sense of touch include buildings, museums, monuments, and historical sites. Intangible cultural heritage assets are social customs and wealth of knowledge that are held and shared by people include traditions, music, and dancing. The digital cultural heritage has become an issue to preserve the cultural heritage material as the assets.

One of the important parts of the cultural heritage or historical archive is the time for identifying and understanding of the event happened. Two types of temporal information related to the events. The first is the temporal expression, also called Timex, it is the sequence of words, that show when something happened and the second is the temporal relation, that shows the relation between events and time. The temporal information extraction from raw text is the fundamental task of natural language processing (NLP) and deep learning. It is the key for many application such as question and answering (QA), information retrieval and information extraction. The problem of time identifying is there is a lot of data format of time that show both explicit and implicit forms in temporal expressions, for example:

1. วัดบ้านนาคำ เริ่มก่อตั้ง ปี พ .ศ.2492 ถึง พ .ศ.2499 (Bannakam is built in 2492-2499 B.E.)
2. พระเจดีย์บุษบา วัดสระแก้ว สร้างขึ้นเมื่อร้อยปีก่อน (Busaba pagoda at Srakeaw temple is built in hundred years ago.)
3. วัดหนองปลิง ตั้งขึ้นเมื่อ พ.ศ. ๒๕๒๖ (NongPling Temple is built in 2526 B.E.)



The idea of the temporal extraction works on the information of each article from cultural heritage archive. There are various techniques for temporal extraction and normalization. Angel X. Chang and Christopher D. Manning [3] present SUTIME, a temporal tagger for recognizing and normalizing temporal expressions in English. It is a rule-based system designed for extensibility. Prateek Jindal and Dan Roth [4] design the features for event extraction. Their features are to construct a clinical descriptor for any concept using medical ontologies. They develop an inference strategy which ensures that the attributes of related events are consistent with one another. They apply the HeidelTime system for use in clinical narratives and develop several rules which complement HeidelTime. Nils Reimers et al. present [5] a method to automatically anchor events in time. They create a decision tree and apply neural network based classifiers for the nodes. They use this tree to incrementally infer in a stepwise manner, at which time frame an event happened. They evaluate the approach on the TimeBank-EventTime Corpus. Naushad UzZaman and James F. Allen [6] present a system for extracting event, event features, temporal expression and normalizing values from raw text. Their system is a combination of deep semantic parsing with extraction rules, Markov Logic Network classifiers and Conditional Random Field classifiers. They evaluate the system on the TimeBank corpus.

This paper introduces an approach for extracting temporal expression and normalizing values from various data sources. The main challenges of work could be summarized as:

- We design a model for extracting temporal expression based on semantic extraction rules and word vector representation and normalize values from various time format to the same format.
- We design a model for extracting the relationship between the event and temporal expression.

The remaining of the paper is organized as follows. Section 2 gives an overview of the model. Section 3 shows the experimental results and Section 4 shows the conclusion and discussion of future directions.

## 2. System Overview

### 2.1. System Design

For this approach, Figure 1. Show the methods and components of the temporal expression extraction and normalization.

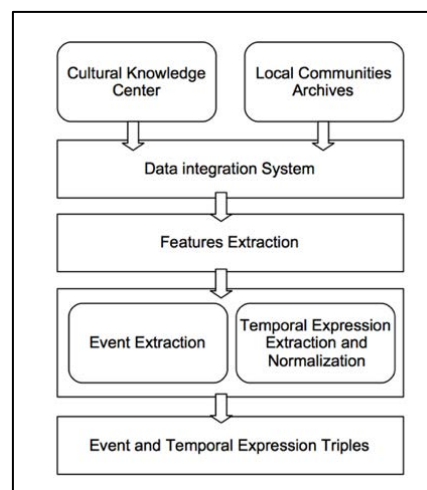


Fig. 1 The components of the temporal expression extraction and normalization system.

We integrate cultural heritage information from cultural knowledge center ([www.m-culture.in.th](http://www.m-culture.in.th)) and local community archives ([www.anurak.in.th](http://www.anurak.in.th)). We extract word feature such as POS and position of words. We extract event and temporal expression using the combination of the rule base and word vector representation. We normalize the value of the temporal expression from various time format to the same format. We discovered the relation between the event and temporal expression.

## 2.2 Temporal Expressions

The temporal expression is the sequence of words that shows when something happened or how long did it happen. The temporal expression can be explicit such as calendar date, time and inexplicit such as “almost 100 years”. The temporal expression will annotate with the following items:

- Lexical Triggers: The temporal expression must use at least one mark such as calendar date, era, semester, January.
- Type: The temporal expression needs to be assigned a type such as Date, Time, Duration and Set.
- Value: The value of temporal expression.

We focus on four form of time expression: Normalized form date/time (2018/08/10), Modifier form (80 years ago), Duration form (2018/09/10-2018/09/13) and Frequency form (every three years).

## 2.3 Temporal Expression Extraction

Word embeddings have become an essential part of deep learning based on natural language processing systems. Word embeddings represent the semantics of a word in a continuous vector space, where semantically similar words are mapped to nearby points. This paper, we use Skip-gram model [7][8] for predicting the surrounding words in the sentence focus on the event and temporal expression. The sequence of training words are  $w_1, w_2, \dots, w_T$ . The purpose of the model is to maximize the average log probability.

$$\frac{1}{T} \sum_{t=1}^T \sum_{-c \leq j \leq c, j \neq 0} \log p(w_{t+j} | w_t)$$

where  $c$  is the size of training context. The Skip-gram formulation defines  $p(w_{t+j} | w_t)$  using the softmax function:

$$p(w_o | w_l) = \frac{\exp(v'_{w_o} \cdot v_{w_l})}{\sum_{w=1}^W \exp(v'_{w_o} \cdot v_{w_l})}$$

where  $v_w$  and  $v'_w$  are the “input” and the “output” vector representations of  $w$ , and  $W$  is the number of words in the vocabulary.

The representations of time after reduction to two dimensions that shows the clusters of the semantically related words. Fig 2. shows the example of results for temporal expression represents by word vector.

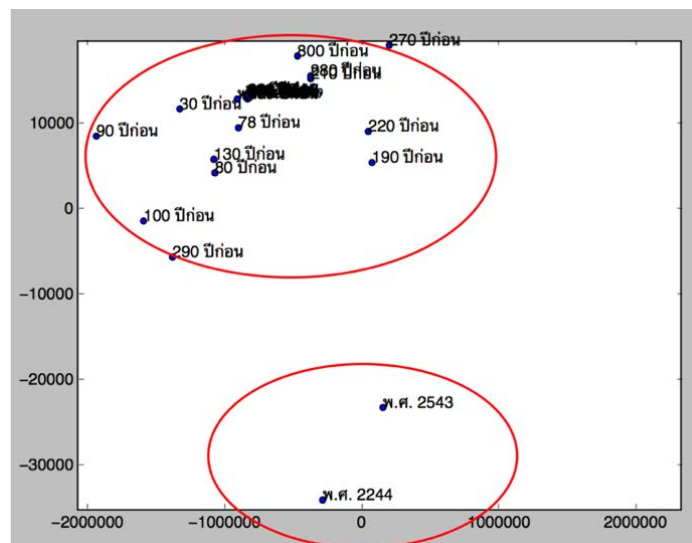


Fig.2 The temporal expression represented by word vector.

Besides the normalized form such as the month and the year, there are the interesting form to observe, for example, the modifier form e.g., 100 years ago), the duration form e.g., 2469 B.E. - 2475 B.E. Table 1 shows the closest words to a given term ordered by distance.

Table 1. The example of temporal expression form

Temporal Expression Form	The value of temporal expression
Normalized form date/time/era (Thai numeral/Arabic numeral)	พ.ศ. ๒๕๐๐ (2400 B.E.), พุทธศักราช ๒๕๐๕ (2405 Buddhist era), พ.ศ. 2484 (2484 B.E.)
Normalized form date/time/era (Text)	รัตนโกสินทร์ศก (Rattanakosin era), จุลศักราช (Culāsakaraj era)
Modifier Form (Thai numeral/Arabic numeral)	100 ปีก่อน (100 years ago), 200 ปีที่ผ่านมา (200 years ago)
Modifier Form (Text)	หนึ่งร้อยปีก่อน (one hundred years ago), แปดสิบปีก่อน (eighty years ago)
Duration Form	พ.ศ. 2469 – พ.ศ. 2475 (2469 B.E.-2475 B.E.)
Frequency Form (Thai lunar calendar)	ขึ้น 15 ค่ำเดือน 6 (the fifteenth day of the waxing moon the sixth month), แรม 8 ค่ำ เดือน 6 (the eight)

## 2.4 Relation Extraction

We discover the relation between event and temporal expression by searching temporal expression from the results of time expression extraction. We use POS tagging for finding the subject and predicate, that related to temporal expression. Fig. 3 show the triple of relation.

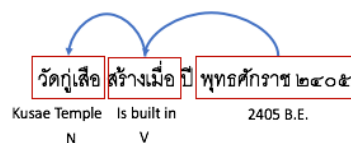


Fig. 3 the triple of relation extraction with temporal expression.

## 2.5 Temporal Expression Normalization

There are the year, month, date and the beginning and endpoint of each expression. Thai time have the various temporal expression, for example, มหาศักราช (Shalivahana era), จุลศักราช (Culāsakaraj era) and รัตนโกสินทร์ศก (Rattanakosin era). The original values of time also store. We convert Thai time expression into Buddhist era and Christian Eras by calculating as table 2.

Table 2. Temporal expression to normalized form

Temporal Expression	Normalized Form/ Buddhist Eras	Normalized Form/ Christian Eras
Normalized form date/time/era		
Shalivahana era	Shalivahana era +621	(Shalivahana era +621)-543
Culāsakaraj era	Culāsakaraj era +1181	(Culāsakaraj era +1181)-543
Rattanakosin era	Rattanakosin era +2324	(Rattanakosin era +2324)-543
Buddhist era	-	Buddhist era-543
Modifier Form		
Years ago	≈ Recorded year - Number of the previous years	≈ (Recorded year - Number of the previous years)-543
Duration Form		
Duration	-	The beginning year-543 The end year -543 (depend of type of calendar era)

Frequency Form		
Thai lunar calendar	-	≈Thai lunar year-543 (every year)

We use the triple of relation extraction for visualization as the timeline, which shows the history of Thailand. Fig. 4 shows the example of timeline visualization in Normalized Form (Buddhist Eras).

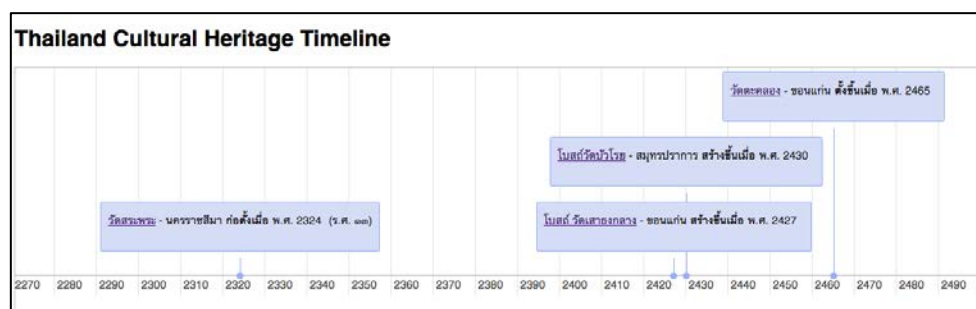


Fig. 4 The example of timeline visualization

### 3. Experimental Results

The data set for our approach collected from two resources. The first is cultural knowledge center of proposed Ministry of Culture. The second is cultural archives from local community archives. We focus on title and description of the article. We use 1,000 data for evaluation. The results are reported in Table 3.

Table 3. The experimental results

Temporal Expression Form	Temporal expression			RE with temporal expression		
	Precision	Recall	Accuracy	Precision	Recall	Accuracy
Normalized form date/time	0.92	0.97	0.90	0.88	0.95	0.85
Modifier Form	0.83	0.98	0.82	0.87	0.92	0.81
Duration Form	0.91	0.95	0.88	0.85	0.92	0.80
Frequency Form	0.76	0.86	0.69	0.83	0.86	0.75

### 4. Conclusion

This paper presents a methodology for extracting temporal expression and normalizing values from various data sources. We design a model for extracting temporal expression based on semantic extraction rules and word vector representation and normalize values from various time format to the same format. We design a model for extracting relationship between event and temporal expression. The experimental show the accuracy of time expression extraction for normalized form date/time is 0.90 and the accuracy of relation extraction with time expression for normalized form date/time is 0.85. In future work, we approach to extracting and normalizing the dependency temporal expression.

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# Considerations on Digital Autobiography of the Elderly in the Digital Age

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## Abstract

The New Silver Generation in Korea is different from the previous generation in digital enjoyment. They have a strong desire for media and social participation and self-representation. To develop their ego-integrity, they need the three interrelated and overlapping functions of recall, evaluation, and synthesis that constitute the process variables of the life review. Autobiography has been used as an excellent tool to help life review. The digital autobiography that we propose in this study means a long-life story with a plot composition recorded in digital narrative by using digital media. Comparing the existing autobiography to this digital autobiography, we expect: First, digital autobiography allows easy access to the process of life review. Second, it broadens the scope, and possibilities of self-representation by means of co-sensory production which was impossible in the existing text-type autobiography. Third, the interactivity of digital narratives provides active opportunities to engage in social participation and self-representation, a desire of the elderly in the digital age.

**Keywords** - *autobiography, life review, digital narrative, ego-integrity, self representation, New Silver Generation*

## 1. Introduction

According to data from World Population Ageing, globally the number of people aged 80 years or over, the “oldest-old” persons, is growing even faster than the number of older persons overall. A society is often defined to be an aging, aged, and super-aged society when the proportion of population 65 and older exceeds certain levels, such as 7%, 14%, 20% [1]. According to the Ministry of Public Administration and Security of Korea, the rate of the total population over 65 years old will be 14% in 2017 and 20% in 2026 [2]. Korea is one of the fastest aging nations in the world, and the elderly generation of the 21st century is called the New Silver Generation. They were born after 1945 and have led Korea's growth and development. They are unlike the previous silver generation. Instead of spending away the rest of the life, they actively seek out new jobs, enjoy sports and travel. And they strive to return to the society their experience and life wisdom that they have accumulated in their lifetime [3]. They're the first generations who will spend more years as old people than as young people. Their lack of aging readiness can also be a social problem.

The New Silver Generation has a distinctive feature in digital enjoyment and media needs that is far different from the previous generation. The development of communication technology and expression technology, and the development of digital media, provide a new and diverse experience for the New Silver Generation. In particular, after the interactivity of digital media has been accepted into human storytelling, the scope of narrative expression is expanded, and new ways of expressing are shown [4]. Now the New Silver Generation can use a various method of interactive digital narrative, not in one-way communication method.

According to Erikson's theory, the final stage occurs during old age and deals with the central issue of ego-integrity versus despair. The elderly need to look back on life and feel a sense of fulfillment. Success at this stage leads to feelings of integrity, while failure results in regret and despair that will come after retirement [5]. Ego - integrity refers to the internal desire to evaluate and accept one's life as having been inevitable, appropriate, and meaningful. Erikson viewed life review or reminiscence as vital to the task of stage eight, the stage associated with old age. Autobiographies have been used as an aid of helping to recall and review life [6].

In this study, we will examine the basic characteristics of autobiographies that promote ego - integrity in previous research and suggest some points to consider when applying them to digital autobiographies of the



New Silver Generation.

## 2. Review

### 2.1. Characteristics of the New Silver Generation

In Korea, 13 million people of the first Baby Boomers (1955-1963) and the second Baby Boomers (1968-1974) will begin turning 65 years old in 2020. People born during this people, equivalent to 59.66% of the total population, are called the New Silver Generation. This generation experienced various cultural contents in the 1960s and 1970s, when pop culture was introduced to Korea and Korean movies and popular music were in its heyday. The New Silver Generation was accustomed to the mass media and active in economic activity and consumption activity.

The characteristics of this generation are described as 'health, family, leisure, social participation, digital life' [7]. New Silver Generation has been exposed to digital environment. As digital media become popular, they show unique digital enjoyment and media desire, which are far different from previous generation [8]. For example, mobile devices are used as tools for leisure, social participation, and self-expression. It is claimed their intense desire for education in new areas is the manifestation of self-fulfillment [9].

According to Erikson's theory of psychosocial development, people experience eight stages of development over our lifespan, from infancy through late adulthood. At the final stage, they need to solve the task of ego-integrity versus despair. Older adults need to look back on the events of their lives. Those who feel proud of their accomplishments feel a sense of integrity, and they accept death as the inevitable end of life. But Those who are unsuccessful during this stage will feel that their life has been wasted and will experience many regrets. The failure results in bitterness and despair, because it seems they don't have the opportunity to live another life again [5]. The negative view of old age with its outworn stereotypes must be changed if the elderly had more opportunities for successful aging. It is time for a more balanced attitude. Reminiscence and life review are effective aides in this direction. It helps for the elderly to have a balanced view of old age and to finally achieve ego-integrity. [6]. The life review is a dynamic process involving not only the individual, but the past and present psychophysiological, sociocultural, and historical context as well. The three interrelated and overlapping functions of recall, evaluation, and synthesis constitute the process variables of the life review. The life review begins with a recall component. Memories, revised and elaborated during recall and evaluation, are reintegrated during synthesis. [10].

The New Silver Generation, which emerged as the central hierarchy of Korea's super-aged society, also requires this process of life review for a new balanced attitude. However, in the process of recalling memories of past events, actions, and cognitions drawn from the unique experiences of an individual over the life, there is a limit that the elderly only can depend on their own memories.

### 2.2. Writing an Autobiography

Autobiography is a self-written account of the life of oneself. Narrators selectively engage their lived experience and situate their social identities through personal storytelling. Rather than being simply the story of an individual life, it encodes or reinforces particular values in ways that may shape culture and history [11]. Autobiography has more to do with writing or recording the individual life. There are some forms of writing closely associated with autobiography, but they are not interchangeable. Personal narrative or autobiographical narrative is a type of writing that focuses on a few key events in the writer's life, while autobiography deals with the individual life from the beginning to the present. A memoir is a collection of memories that could be moments or events in history. It tends to focus less on the self and more on others. While biographers generally rely on a wide variety of documents and viewpoints, autobiography may be based entirely on the writer's memory during the writer's review of his or her life. The difference is more evident when we look at its constitutional qualities in terms of autobiographical storytelling.

Autobiographical story, also called life story, refers to a story about something that is important to the speaker throughout his or her life, or expresses his or her own worldview, beyond the situation of speaking. They want to realize various communication purposes through autobiographical stories. A more detailed view of the constitutional qualities of the autobiographical story is as follows: 1) Story is a representation of sequential structured time changes. 2) The plot constitutes a meaningful and cohesive story of unrelated events. 3) The fact that the event became a story is because the event was motivated by the speaker, that is, the speaker experienced the change or caused it as an act. 4) The autobiographical story has 'multi-value' that transcends the description of the story, conveying the evaluative elements or emotional experience and emotional evaluation, desire, motivation, etc. 5) The autobiographical story has a different viewpoint of the speaker from

the double point of view, that is, the moment of experience when talking about experience. 6) A story is an act of imitating their understanding of the world based on expectations, experiences, and desires that have a fundamental distance from the original experience. 7) An autobiographical story is a process of communication, which means interaction with the audience. It plays a role of socialization by providing our empirical narrative expression to others' critical consciousness, judgment and empathy ability [12].

Autobiography can have a rich meaning and multi-value only when it first establishes the constitutional qualities of autobiographical story, and it can function to naturally fill the desire for social participation through the interaction of the elderly. By writing an autobiography, older generations have the opportunity to reflect on their whole life development process, to develop their life-span competence, to solve the tasks of old age, to support the growth and development [13]. In the process of writing an autobiography, it can be a tool to rediscover the meaning of life in a new worldview through recall and to lead to ego-integrity [14].

The meaning of the autobiography for the elderly generation is 1) the moment of self-recognition 2) the purpose of conveying the self-experience to the future 3) the technique of self-consideration 4) the space of freedom and imagination. Autobiography is the product of the shaping, the remodeling the time in memory, and the process of finding identity. It is used as a space to reveal newly reconstructed magnetism. In addition, autobiography is a way of expressing the desire for recognition of the elderly generation suffering from lack of interaction and recognition of others [15].

As mentioned above, it is proved that autobiography is the best tool to achieve ego-integrity, the task of old age, but the first barrier for the elderly to encounter is the difficulty of writing. It's not easy to write, and there are still many people who want their autobiographies to be written by someone else. Long texts that cover the whole life need a lot of effort to go through various stages such as planning, preparing the data, organizing and writing. The task of matching pieces of blurred memory is like a long journey. It cannot be easily started with only one's decision. However, by describing the moments of life that they have lived through the journey, we can have the chance to reflect on the whole life process. The journey allows us to see our lives and surroundings from an angle we have never seen before. It will lead us to rediscover the merits and the joy of life that we have forgotten and to achieve ego-integrity by removing misunderstanding and regret in memory.

### 2.3. Use of Digital Narrative

Digital narrative is storytelling that uses digital media. Digital narrative has the characteristics as the following table, compared with the traditional narrative.

Table 1. Narrative vs Digital Narrative

	<b>Narrative (Storytelling)</b>	<b>Digital Narrative (Digital Storytelling)</b>
Media	oral or text	digital media
Method of delivery	unilateral Speaker communicates to listener	interactive, bilateral Speaker and listener exchange
Narrative Structure	linear	non-linear
Ending	(ending closed) Ending	(ending open) Openness
Component	narrative (text)	narration / video / sound combination
Characteristics	narrative time, causality, formality	reproducible spatio-temporal, multi-sensory, interactive

We focus on the characteristics of digital narrative related to digital autobiography. First, digital narrative can be expressed in various ways. Personal stories can be expressed through various media such as photographs, videos, music, and voices, thus expanding the scope of self-expression. Second, the photos taken on mobile, the data exchanged on the SNS, the location and time information left in the digital repository, and the video and audio recordings are not only assets of digital autobiography, but also practical materials to help recall old memories. This can be a new alternative for older generations who have had difficulty completing their autobiographies with conventional text writing.

Next, the interactivity of the digital media is the essence of the digital narrative and provides the possibility of new communication [4]. It created a relationship between the author and the reader with mutual interaction and interactivity. Digital narratives have formed a new narrative space and have a space of communication that has not been enjoyed since the oral tradition. In cyberspace, users of digital narratives talk and network over time and space constraints. When mutual empathy between users is achieved, communication becomes more active. At any time, readers can comment on the author as a netizen, add exploratory research, ask questions, or add stories. They can have equal and bi-directional relationships that can express sympathy or objection

[16]. As a result, through this relationship, older generations will be free from alienation and isolation and fully satisfy their social participation needs.

Finally, interactivity allows users of digital narrative to manipulate and change their content themselves as a provider, not just as an audience. In this sense, digital narrative is not simply a narrative that has been converted into digital information, but it can also be defined as a narrative that can manipulate or transform the content itself, such as hypertext novels or interactive movies [17]. In other words, readers can freely move, configure, write, and append texts of author-created digital narratives. Note, however, that content may be unauthorized, deleted, or duplicated without actually knowing to a shared platform such as YouTube. The ease of use and modification of digital narratives may be a vulnerability [18].

### 3. Considerations on Digital Autobiography

As we have seen, the New Silver Generation that enjoys the digital age has become easier to write using digital media than the existing text format. The purpose and process of autobiography is to achieve ego-integrity by looking back on the whole life. In addition, digital narrative allows free self-representation by utilizing various digital media. Interaction and interactivity can be a channel of communication linking older generations to other generations. From this perspective, digital autobiography should play a role as an appropriate tool for older generations in the digital age to meet their tasks and needs. Five considerations for this can be summarized as follows.

First, the purpose of digital autobiography is to look back on one's life. Digital autobiography should target the whole life cycle. To look back on your life, you need to go through the process from the beginning of life to the present. When people have difficulty recalling old memory, the digital autobiography can solve this problem. In the data collection stage for autobiography, accurate and large amount of data can be collected through digitalized photos, documents, blogs, and SNS. In the process of collecting, selecting, and arranging digitally stored data, it is possible to recall the forgotten old memory. This naturally starts the process of recall and retrospection. Therefore, it is necessary to develop a tool and service program that will help collect and edit one's entire life in time. Digital autobiographical writing strategy and method of collecting, evaluating and synthesizing is also a challenge for digital autobiography research in the future.

Second, digital autobiography can be seen as a story with a plot of one's life. To recall life, it is necessary to evaluate and synthesize the whole life. The authors reorganize the time and events in memory in the process of refining the autobiographical plot. At this point, unrelated events have new meaning and cohesion. The authors naturally talk about what experience was meaningful and important to them, and how their worldviews are. Through this process, they find out how they experienced their change, emotional experience, evaluation, desire, and motivation. As a result, they will experience new change and growth by looking at their past lives and surrounding relationship from a different angle than the moment they experienced. Therefore, the process of planning a digital autobiography should include a step of reconstructing the whole life into a story. It is necessary to compare and examine how to apply autobiographical writing techniques to digital autobiography in the future.

Third, digital autobiography can express self in various ways using digital media. You can reduce the emotional burden of writing autobiographies in text only, while choosing the way you want to express your pictures, music, videos, texts, and voices. It also helps to resolve the desire for digital enjoyment actively in the digital space. Digital autobiography will broaden the scope and possibilities of expression, along with methods of using synesthesia, which was impossible in traditional textual autobiography. The development of digital autobiographical models developed with various digital representation methods needs to be studied.

Fourth, digital autobiography can be a space to realize various communication purposes. Digital autobiography also has the characteristics of interaction, the essence of digital narrative. In other words, authors and readers can talk to each other over time and space, form a network, and mutually agree. In addition, digital autobiography is a record of the vivid historical scene through the story of the personal life of the old generation. This is also consistent with the purpose of autobiography delivered to posterity with his or her experiences. As a result, older generations will naturally fill their desire for social participation through interaction. The development of a service platform that can emotionally share the problems of each generation and the anxieties and wisdom of life in digital autobiography can be handled as a future research project.

Finally, copyright infringement and protection methods of digital autobiography should be considered. It is an advantage that it is easy to change and modify, and it is possible to delete or reproduce, but it is also a problem to be supplemented as autobiography. Autobiography made of digital media is a medium that can be used in various fields. Unlike the intention, the independence and stability of the contents should be ensured so that the autobiography written by the author is not manipulated or changed by the reader or others. Digital autobiography is a part of his/her entire life and personal intellectual property. Damage, deletion, and alteration of this may be another pain and injury to the author. The scope of the disclosure or whether it is confidential or

non-disclosure should also be determined by the individual. In the future, digital autobiographical copyright protection and alternatives to stability will also be studied.

#### 4. Conclusion

Previous research has confirmed that digital autobiography can be an appropriate tool for addressing the old age challenges of New Silver Generation, the elderly in the digital age. Previously, autobiography using life review was used to achieve ego-integrity. The life review using the digital media can overcome the limitation of the existing autobiography which depends only on the memory of the users, and also conforms to their digital enjoyment and media needs. In addition, through digital autobiography, they can talk about their lives in various ways and have an opportunity to communicate with other people (readers or listeners). This will satisfy the desire for self-representation and social participation of the New Silver Generation.

In this study, we propose the following five considerations for digital autobiography. First, the purpose of digital autobiography is to look back on one's life, and it is necessary to go through the whole cycle of life in a sequential manner. Second, digital autobiography can be seen as a plot of a story with a plot composition of his life. It can help a narrator to evaluate and synthesize his/her whole life through the process of reconstructing the time and events in memory. Third, digital autobiography can express self through various media using synesthesia. Fourth, digital autobiography can be a space for realizing various communication purposes with interactivity of digital narrative. Finally, copyright infringement in digital autobiographies and how to protect them should be considered. The ease of modification and the possibility of deletion or reproduction, are both advantages and problems that must be supplemented by digital autobiography.

Digital autobiography should continue to be studied and developed in the future in order to bring out the roles and significance of this era. First, we need to develop professional tools and service programs so that users can collect, edit, and store digital assets. Next, we need to develop customized education programs for older generation with a desire for new education; 1) autobiographical writing using digital narratives, 2) step-by-step training to create digital autobiographies using a variety of models, and 3) learning methods of memory-evaluation-synthesis thinking training. Third, we need to develop a service platform that provides a cyber space for communication between users who can share the problems of each generation, the anxieties of the times and the wisdom of life through digital autobiography. Finally, copyright protection measures of digital autobiography remain a challenge.

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# **Creative expression of moving images using the interaction between emotion and hue**

## **- A case of <peacock > the moving image work.**

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### **Abstract**

Hue is the primary characteristic of the color, which can be used as an abstract way of expressing emotion. Especially in the moving image works, it can express people's sub consciousness. The word hue is often used in the study of chromatics and optics, and it is scarce in the expression of emotional and subconscious visual information. From the perspective of visual information and psychological emotion, this paper takes the work Peacock as the research object, and explores the significance of the use of colors in the works of image devices to the psychological activities of people in space.

***Keywords-* hue; subconsciousness; image device**

## **1. The use of color in the image installation works**

Three elements of color are hue, saturation and transparency. Any color that the human eye sees is the integrated effect of these three characteristics. Images can be recorded intuitively or expressed abstractly. Visual information has more impact than text information. It has been 40 years since the film was born on December 28, 1895, until the color film Vanity World was published in 1935. But in the image, works until now, many artists are exploring the use of black and white and color hue.

### **1.1 Pipilotti Rist and her color world**

Pipilotti Rist is a very active international female artist. She is always full of wonders and eternal feelings about the world around her, just like her works being full of childhood fantasies, distorted picture composition and dazzling color use; she blends sensory pictures, music and words together to create some fascinating installation works.

In《pepperminta》, I think she summed up all her personal styles. Image, music and behavior art are integrated together. Although it was filmed in 2009, I still think I saw more fresh elements in Pipilotti rist's films than in today's popular films. I am fascinated by the control of the color of the lens under the lens of Pipilotti rist. It was once said that men were very good at grasping lines, and women were very good at grasping colors, which is no longer an exaggeration in Pipilotti's works. The use of color without scruples, colorful characteristics give people the absolute visual impact. Flowers are often used in her works, and the use of flowers is highly symbolic of women. (Fig. 1)





Fig. 1: scene in《peppermint》

Pipilotti loves to make actors appear in nude form. In the movie "peppermint," the heroine jumped into the pool as a child wrapped in towels and grew up naked in her own bathtub. Pipilotti used the turn of the scene in water to express peppermint's growth. Nudity seems to be the original form of human beings, just like we were just born and naked. Once people wear clothes, they have social, religious or other labels.

Pipilotti's work, from the picture to the music, conveys a strong hallucinatory color, as if the general drug, which I think is a very attractive point in her work. The connection of pictures in her works; the way of lens composition is full of surprises. "Messages delivered through emotional and sensory stimuli change people's prejudices and patterns of behavior, and they will be far more powerful than countless books and articles," she said in an interview with her. To a certain extent, she did this. Her work really conveys a more powerful force than words in a visual way.

Prepare Camera-Ready paper in full size format, on A4 size or 8 1/2" x 11" (215.9 mm x 279.4 mm) paper.

## 2. Experimental-a case of Video Installations “Peacock”

### 2.1 Equipment and software

#### Hardware

Camera: SONY A7S2 ( FE 24-70mm F2.8 GM ) .

Sound recording : SONY UWP-D11.

#### Software

Final Cut Pro / Logic Pro X.

#### Presentation

Four-channel video (color, sound) ,four monitors,four Acrylic case.

#### Length of time

8:00 min.

### 2.2 the work of “Peacock”

The theme of <peacock > is to explore equality between the opposite sex and the same sex. In early stage, she thought about many creation methods. Pipilotti rist and Bill Viola gave me a lot of inspiration for the use of color in their early works.

The <Peacock> consists of four monitors, each of which is briefly described below.

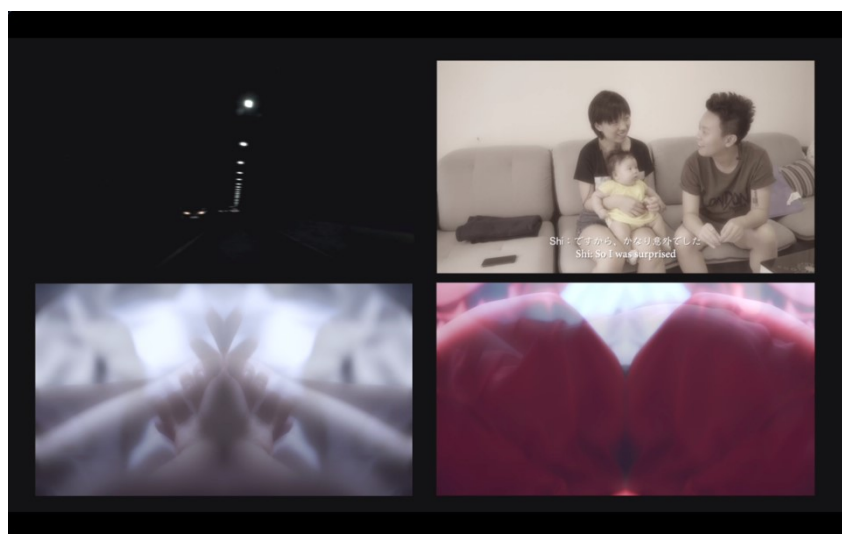


Fig. 2: contents of 4 screens

Birth (Upper left)/interview (upper right)/ opposite sex (lower left)/same sex (lower right)

Screen 1: figure 2 birth (upper left)

The process of birth is described by the combination of the motility of the sperm in a realistic medical examination and the expression of the motility of the sperm in the image. Until 6:00 are like the black and white picture, six minutes later I used their own childhood image as a manifestation of the birth of life, where the picture used a slightly orange design, with warm color to convey the value and beauty of life.

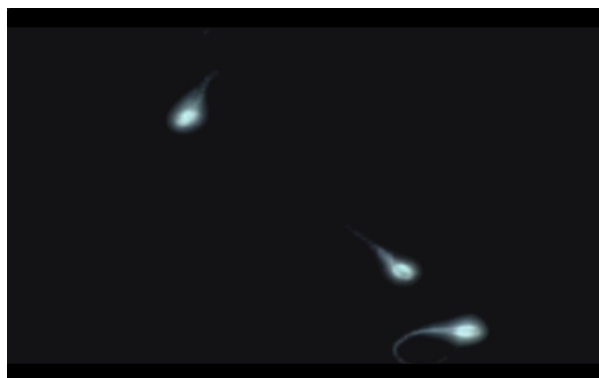


Fig. 3.1 excerpt of birth

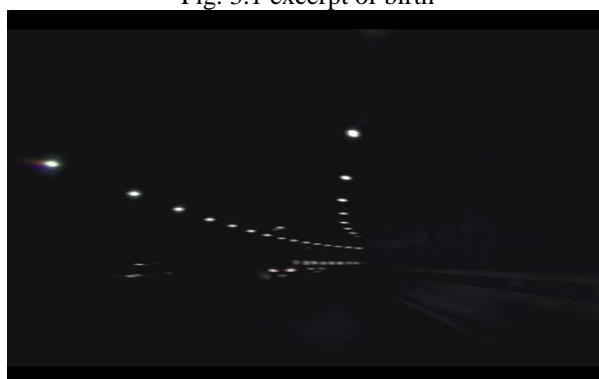


Fig. 3.2 excerpt of birth



Fig. 3.3 excerpt of birth

Screen 2: figure 2 interview (upper right)

The screen in the middle of the work shows the views of heterosexual, homosexual and other groups on love. Using interviews to present different people's ideas about love and marriage, I chose not to do too much color processing in the picture color.



Fig. 4.1 excerpt of interview



Fig. 4.2 excerpt of interview



Fig. 4.3 excerpt of interview



Fig. 4.4 excerpt of interview

Screen3/4: figure 2 opposite sex (lower left)/same sex (lower right)

Screens 3 and 4 are at the bottom of the work, and the images of heterosexual and homosexual love are on an equal footing, which is what I want to express, no matter what form, love deserves respect. The picture of heterosexual love and homosexual love is contrasted with black and red.

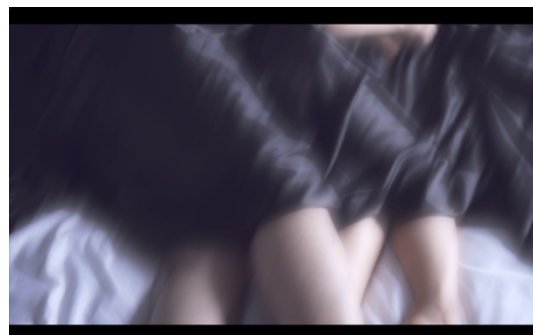


Fig. 5.1 excerpt of heterosexuality

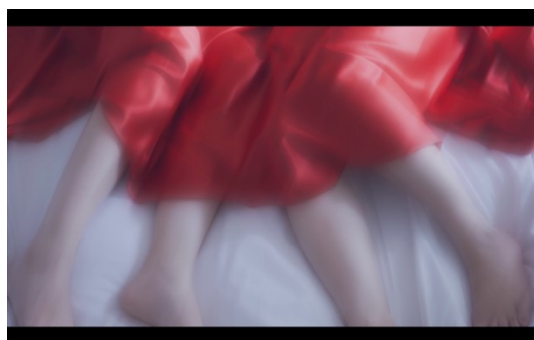


Fig. 5.2 excerpt of homosexuality

Here the choice of color first corresponds to the story line in the screenplay version, followed by the strong contrast between black and red impact, the image of the virtual adjustment of the two forms of love.

### 3. Result

Image installation "Peacock" at the Tokyo Metropolitan Art Museum of Japan from August 14 to 21, 2018 [21st JAALA International Exchange Exhibition] (Fig. 6)

Image installation "Peacock" at the Iwaki City, Fukushima from August 26 to September 23, 2018 [Art Meeting 2018 田人の森に遊ぶ] (Fig. 7/8)



Fig. 6 scene of [21st JAALA International Exchange Exhibition]



Fig. 7 scene of [Art Meeting2018 田人の森に遊ぶ]1



Fig. 8 scene of [Art Meeting2018 田人の森に遊ぶ]2

#### 4. Conclusion

This paper discusses the interaction of hue and emotion in Pipilotti Rist's works, and then briefly describes the expression of hue and emotion in my image installation work Peacock. Through the transmission of visual information of different hues, we can achieve more interpretation of people's potential psychological and spiritual world, and play a homosexual role in arousing our hearts.

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# Locating Algorithm for the Indoor Robot based on Li-Fi Using the Multi-Beam

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## Abstract

Nowadays, the emergence of mobile robots is very common in public places such as guiding robots in museums, galleries, military and family reconnaissance robots such as vacuum cleaners or systems family support. For robots to operate independently, positioning is the first and most important requirement, and now there are some very popular positioning methods such as GPS that are well suited for outdoor use, but The error of this method is very large when used indoors environments where space is limited. So, this paper proposed a new positioning method is “Locating Algorithm for Indoor Robot based On Li-Fi Using the Multi-Beam”. The proposed algorithm can work special LED lighting that is indispensable for indoor use. The present position can be estimated on the basis of the direction and data of the signal received from the photo diode that can be receive light signal.

**Keywords** –Robot, Li-Fi, Locating Algorithm, Multi-Beam, Indoor Positioning

## 1. Introduction

There have been many methods of localization that have been studied and applied to in-house robots such as infrared sensors, lasers, wireless, RFID radio wave which one of the major solutions for robot positioning. Today, with the launch and development of the LED, along with the Li-Fi communication technology [1]. Locating the robot based on Li-Fi technology is considered a promising method with more advantages than the wireless positioning technology using RF or Wi-Fi. Li-Fi technology has little impact on human health and incorporates lighting purposes. In addition, the LED lamp has a high lifespan of 100,000 hours and low cost allows the deployment of Li-fi navigation system without much cost.

So, In This paper proposed Locating Algorithm for the Indoor Robot based on Li-Fi Using the Multi-Beam. The proposed algorithm substitutes GPS, which is hard to operate indoors, with special LED lighting that is indispensable for indoor use. The present position can be estimated on the basis of the direction and data of the signal received from the photo diode that can be receive light signal.

The order of this paper is as follows. Chapter 1 introduces the background of this study, in Chapter 2, we describe the related technical research and the proposed algorithm. Finally, we conclude this paper in Chapter 3.

## 2. Proposed Algorithm

The typical  $W \times L \times H$   $m^3$  room model is assumed to build a lighting system and incorporate wireless communication (Li-fi) using visible light in the indoor environment, communication model with transmitter station access points with directional beams arranged evenly across the ceiling of the room [2]. Each transmitter station is an array of LEDs for illumination and data transmission, specially designed to include direction lights cluster (Beam), which have a beam  $N_b$  in the middle and perpendicular to the ceiling, and  $N_{b-1}$ . The remaining light beam is placed around the central beam with different angles so that each transmitter station covers a fixed area in the room [3]. With such a transmitter station configuration, in order to maintain continuous data transfer and to ensure uniform lighting throughout the



room, two issues were identified in the design:

- Ensure there is no blind area between the areas of the light beams in the same light station.
- Ensure there is no blind area between the areas covered by the light stations.

In this positioning system, the receiver station is simply designed to consist of 1 PD (Photodiode) directly attached to the robot to receive signals from the transmitter station, and a Gyro sensor to determine the direction of movement of the robot and the coordinates of the receiver station can be determined. The beams will be transmitted sequentially at a frequency of 24 times per second, and each broadcast will contain information on the light beam, each of which beams contains information about the transmitter, including the sequence number and coordinates of the central beam, information about the coordinates of the beam.

In order to be able to locate the robot, we will design a multi-beam light transmitter, which will be designed so that the light beams are small enough, each light beam is transmitted at a frequency of 24 times / s and is broadcast sequentially containing information about the light beam. Therefore, the station receiver can scans the coordinates of the robot.

Thanks to the support of Li-fi technology, users can monitor the LED system and move the robot through the control screen. When one of the transmitters or receivers is inactive, the robot's moving sensor fails, the system alerts the fault by sending the data to the control center and immediately the system is processed in time.

### 3. Conclusion

In this paper, we propose locating algorithm for the indoor robot based on Li-Fi using the multi-beam which supports indoor positioning using wireless solution used LED lighting and Photo Diode.

Using Locate the indoor robot based on Li-fi using the multi-beam to increase the accuracy of positioning, with the advantage of a compact design receiver, it is easy to integrate with small mobile devices such as telephones and the system can be controlled and operated automatically via a Li-fi network. However, the disadvantage of this method is that the transmitter structure is relatively complex, but it achieves high accuracy. In the future, it will be applied to large-scale complex buildings such as large shopping mall and intelligent building, and it will be used as a valuable feed for effective indoor location recognition and indoor self-driving. In addition, the proposed algorithm can be utilized as a large-scale indoor location estimation and network configuration solution based on the cloud network in conjunction with the IoT solution.

### Acknowledgment

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# Hand Gesture Recognition Assisted by Human Pose Information

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## Abstract

This paper proposes a monocular camera based hand gesture recognition system assisted by human pose information. The system consists of two modules. At first, we extract the human pose information with PoseNet [5] and the wrist joint information is refined by Kalman filtering. From the result, we obtain the ROI (region of interest) of hands, in which we robustly detect and track hands even for the variations in the background and illumination. Next, we classify hand gestures using the convolutional neural network (CNN). The hand gesture information assisted by the human pose information can be used for various applications. In order to demonstrate the usefulness of the system, we build a simple AR camera system in which several virtual objects are augmented on the human face according to the hand gestures.

**Keywords-component;** *Monocular camera, hand gesture recognition, human pose estimation, CNN, virtual object augmentation*

## 1. Introduction

As hardware and software advances, the importance of how a human interacts with a computer also increases [1]. In recent years, many studies have been conducted to provide a natural user interface through gesture recognition without using input devices. The visual interface involving gestures is one of the most familiar and convenient ways for human among various interface methods. Gesture recognition allows human to communicate with a smart device without touching the keyboard, mouse. Hands are suitable for the human-interaction interaction. Since they form a more sophisticated language system called sign language, which has more gesture patterns than other body parts. Thus, we propose a monocular camera based hand gesture recognition system assisted by human pose information. By using the pose information, our proposed system is robust to illumination, background change and allows rich interaction between a user and a computer.

## 2. Related work

Most hand gesture recognition systems perform background-foreground extraction primarily using RGB or RGBD cameras. The background-foreground segmentation based on the skin color is performed first to recognize the shape of a hand and then the gesture is recognized. Using the RGBD camera, it is possible to use the depth and skin color information together to find a hand in the scene. However, in an RGB camera environment, extracting the hand shape using the skin color is vulnerable to changes in illumination and background [2]. With recent advances in the GPU technology, it is possible to use the CNN more accurately to classify the gestures [3][4]. CNN is an artificial neural network primarily used to classify the data such as images and videos. The numbers of hand gestures are limited because the range of fingers moving around a hand is limited. Therefore, our proposed system can recognize the hand gesture using a monocular camera by estimating the human pose. The PoseNet is widely used for estimating the pose which is a bottom-up camera-based model [5]. This model is trained using COCO (Common Objects in Context) keypoint dataset and learns about 17 different joints including eyes, nose,

mouth, and ears. The learned information is returned as the output of the PoseNet model. Each joint information contains its position along with the confidence score. We used the wrist joint information to find the region of interest (ROI) of a hand and then the hand gesture is classified through a CNN. Later, we used shoulder joint information to precisely distinguish the gestures.

### 3. Implementation details

As shown in Fig.1, our proposed system has three main parts: 1) obtaining the wrist joint information, 2) fine-tuning for the hand gesture classification task, 3) augmenting the object.

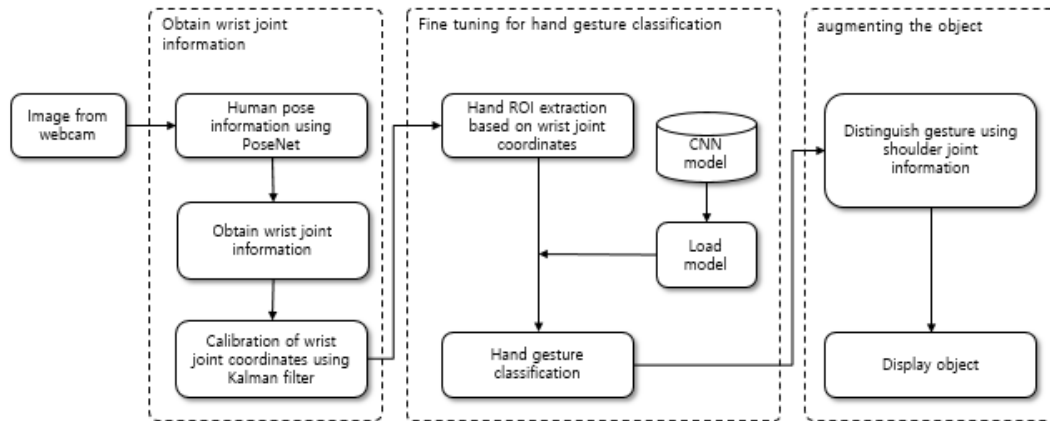


Fig.1 System architecture consisting of three main parts.

#### 3.1. Obtaining the joint information

The system gets a  $640 \times 480$  pixels input color image captured with a webcam. Then, Using the PoseNet, it estimates the posture and obtains keypoint positions and a keypoint reliability scores for user's 17 joints. The keypoint position provides (x, y) coordinates which exist on a two-dimensional plane of the joints. The keypoint reliability score determines the confidence to make sure that the estimated keypoint position is accurate and ranges between 0.0 and 1.0.

When testing the system in a real environment, the PoseNet returns incorrect position which is different from the actual joint coordinates given the low confidence score for a joint's keypoint. Therefore, when the keypoint confidence score is lower than the default minimum confidence value of 0.15 (as set by the PoseNet), we improved the accuracy using the Kalman filter (KF) to calibrate the joint coordinate information. The gesture recognition rate is improved by the KF as it can be seen in section 4. System analysis.

#### 3.2. Fine tuning for hand gesture classification

The system uses a CNN model obtained by fine-tuning the existing model learned with ImageNet. Two patches, each enclosing a hand, of size  $180 \times 200$  pixel is extracted per frame using a calibrated wrist coordinate with KF. These extracted patches form a dataset for training a CNN model. The classification of the input data is shown in Fig.2. We used the ResNet-101 model pre-trained on the ImageNet for fine tuning.

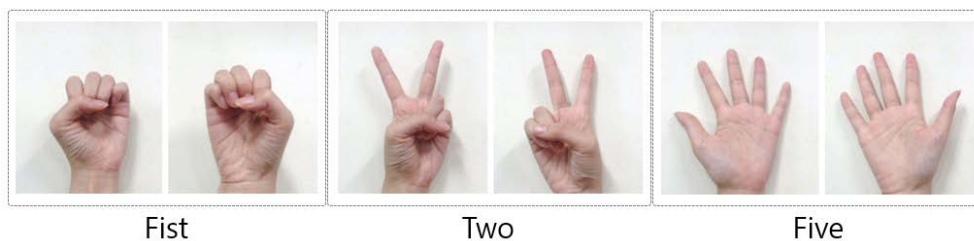


Fig.2 Three static hand gestures (names from left to right: Fist, Two, Five) for training.

### 3.3. Augmenting the object

The proposed system uses the joint information estimated from the PoseNet output. It can further distinguish the same gesture by comparing the position of a wrist with the position of a joint. The position is a coordinate existing on a two-dimensional plane. The comparison takes place in these two stages: 1) the system uses the wrist joint information value to decide whether there is a left or right hand, 2) it finds the wrist position as above, middle or below the shoulder line. If the wrist position lies on the shoulder line, it is distinguished as 'above'. The shoulder line means a line passing through the left and right shoulder joints. The system returns four different output values for each recognized hand gesture. Fig. 3 shows the system showing 12 different results using three hand gestures.



Fig.3 12 results using three classified hand gestures (names from top to bottom: Five, Two, Fist).

The system can also show several virtual objects since it has accurate joint information of a user. Fig. 4 shows the four different virtual objects when the system recognizes the 'Five' gesture.



Fig.4 The system recognizes four types of classified 'Five' gestures and then shows the virtual object (that are from left to right: cat ear, rabbit ear, heart, and glasses).

## 4. System analysis

We extracted the hand ROI using the wrist joint information. However, as mentioned in Section 3.1, the PoseNet may return wrong joint coordinates if the joint's keypoint confidence score is low. So, we used the KF to calibrate the wrist coordinates when the confidence score was less than 1.5. We further calculated the recognition rate to verify the improved accuracy for the hand recognition using the equation given as (1).

To calculate gesture recognition rate, we assume the missing error and the classification error. The missing error is used to count the occurrences when the hand was not detected at all. It is because the hand ROI is not extracted properly due to the wrong wrist coordinate value. The classification error denotes the inability of the system to correctly recognize hand gesture. This could be because of improper CNN classification using hand ROI. In Table 1,  $N$  is the total number of frames with gesture in the input video,  $N_r$  is the number of correctly recognized frames,  $N_m$  is the number of missing errors, and  $N_c$  is the number of classification errors, and  $R_r$  is the accuracy of gesture recognition. Also, '(K)' appended to the gesture name means that the KF is used. As shown in Table 1, using KF reduces the missing error and increases the recognition rate for the given gestures.

$$R_r = \frac{N_r}{N} \times 100\%. \quad (1)$$

Table 1. Hand gesture recognition accuracy without using Kalman filter

Gesture name	$N$	$N_r$	$N_m$	$N_c$	$R_r(\%)$
Fist	120	115	3	2	95.83
Two	120	115	4	1	95.83
Five	120	117	3	0	97.50
Fist(KF)	120	118	0	2	98.33
Two(KF)	120	119	0	1	99.16
Five(KF)	120	119	1	0	99.16

## 5. Conclusion

In this work, we developed a monocular camera-based hand gesture recognition system assisted by the human posture information. To improve the accuracy of this system, a user's wrist joint coordinates were calibrated using a Kalman filter. The system can detect the hands using the joint information in cases when illumination or the background is not kept constant. A user and a computer can interact efficiently since our system incorporates additional information to recognize hand gestures. However, it has a high dependency on the PoseNet. Furthermore, the processing speed is slow because the architecture of the ResNet-101 model is deep and take plenty of time for training. Future work will include the study on human pose estimation methods through deep learning to quickly recognize the hand gestures.

## Acknowledgment

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# A Deep Neural Network based Environment Emulator in Individual Indoor Environment

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## Abstract

In this paper, we propose an environment emulator based on the Deep Neural Network to predict the changed environment by the power consumption. The heater emulator and environmental parameters are components of the environment where the heater emulator consumes the power to change the environmental parameters. The Deep Neural Network based prediction model is trained using a dataset of an individual occupant which involves indoor and outdoor environmental data, and power consumption for the heater. Through the proposed environmental emulator, expected outcomes of heterogeneous control models can be tested in the indoor environment.

***Keywords-actuator; deep learning; neural network; heater; emulator***

## 1. Introduction

In the building, the heating systems use the largest energy consumption in many countries. The residential buildings install the programmable thermostat that can be used by users to specify the desired environment through setting setpoints. Based on the sensing data for each environment parameter, the thermostat operates actuators including the heating, ventilation, and air conditioning (HVAC) infrastructure to change the indoor environment for the user desired setpoint [1]. Most HVAC systems are controlled by the management station that actuates the system manually using the operating unit located in the room where the user wants to change the environment parameters through turning the system on or off, or setting the desired temperature setpoint [2]. For the automatic control based on the intelligent decision making, the prediction models enable to infer the desired parameters using the individual data.

For the awareness of the environmental trends in the indoor environment, the prediction approaches are used for predicting various parameters using the historical dataset including individual indoor parameters. Through the prediction model, not only the future data can be predicted but also the parameters at the same time with the inputs can be predicted. Based on the collected individual indoor environmental data with user states, the prediction model can predict the user desired comfortable environment [3]. The individual comfort index can be referred by the decision support system to suggest a power parameter for operating the actuators by the power controller [4]. Through the prediction model, the actuators enable to verify the expected outcomes with different conditions [5]. The verification approach is a data-driven model that is built by a large set of data.

In this paper, we propose an environment emulator based on the Deep Neural Network (DNN) to predict the changed environment by the power consumption. The proposed environment emulator is comprised of the heater emulator with environmental parameters. The DNN of the heater emulator is trained using indoor and outdoor environmental parameters, and heater power consumption. The training data is collected for an individual occupant who consumes energy to keep the indoor environment [6]. Through the inputs to the emulator, the prediction model infers the indoor environment while consuming the power with an environment.

Rest of the paper is structured as follows, Section 2 introduces the proposed environment emulator based on the prediction model. Finally, we conclude this paper in Section 3.



## 2. Proposed Prediction Model based Environment Emulator

Fig.1 illustrates the architecture of heater emulator using DNN based prediction model. The environment is comprised of indoor and outdoor environmental parameters which are affected by the heater emulator through power consumption. The power consumption can be generated by the power controller which may be operated by the decision-making system. The heater power parameter and environmental parameters are the inputs of the heater emulator that infer the new environmental parameters through the DNN based prediction model.

For training the DNN learning model, the neural network is comprised of 5 input dimensions, 2 output dimensions, 5 hidden layers, and 30 dimensions of each hidden layer.

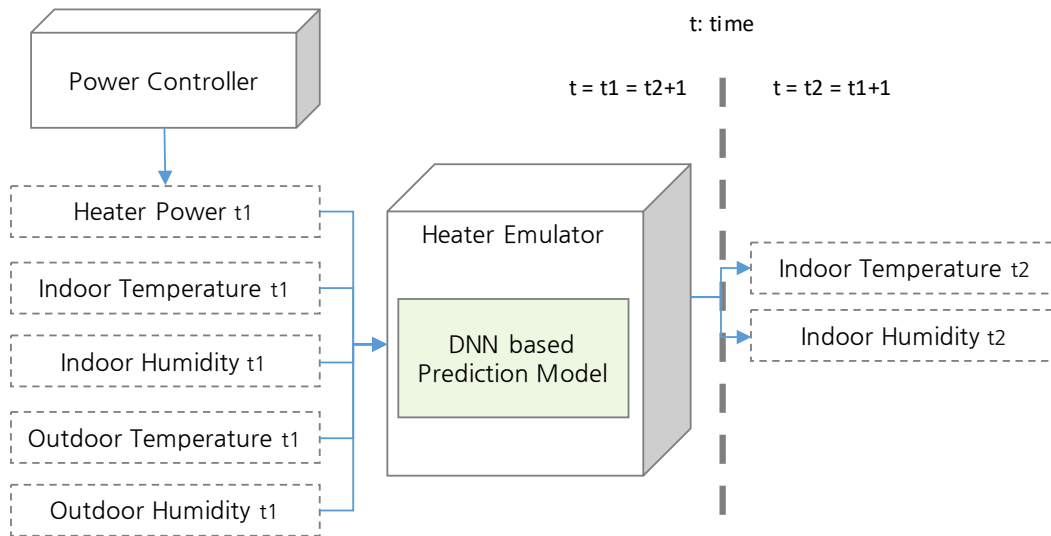


Fig. 1 Architecture of heater emulator using DNN based prediction model.

## 3. Conclusion

In order to provide an indoor environment for testing the expected environmental parameters including user comfort, various emulators are required to apply the parameters as the inputs [7]. For this purpose, we presented an environment emulator based on the prediction model to predict the changed environment by the power consumption. The heater emulator and environmental parameters are components of the environment where the heater emulator consumes the power to change the environmental parameters. Through the proposed model, using the temperature and humidity of an indoor and outdoor environment with the expected power consumption can infer the temperature and humidity in the changed indoor environment.

## Acknowledgment

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## Information Technology Governance Audit Using COBIT 5 Framework in the Disaster Management Office

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### Abstract

Audit of alignment of governance and information technology is carried out to assess the level of readiness and condition of the organization in managing information technology governance. One of the agencies that require the implementation of IT governance is the XYZ Disaster Management Operations Control Unit which has a function as the organizer of information systems, disaster data and information centers, namely recipients, processors, and information contributors as well as the center for implementing disaster services. This audit was conducted to determine the level of IT process capability based on COBIT 5 standards and determine the level of inequality owned by the XYZ Disaster Management Operations Control Unit. The IT process used is based on the mapping results of the identified business objectives, information technology objectives and information technology processes based on COBIT 5. Then for the questionnaire dissemination to select the IT process based on interest level questionnaire, the capability level questionnaire is disseminated to determine the value of current capability. Data processing from the capability level questionnaire uses the *Guttman* method, where this method is used to convert answers from respondents with a value of 0 (no answer) and 1 (yes answer) based on level. Data interpretation is done to determine the value of current capability and GAP value. The results of the capability level of the IT process are EDM01, EDM02 and APO09 processes which are at level 3 (Established). The gap found needs to be given an improvement strategy to achieve expected capability, namely, agency 4 (predictable process) by providing recommendations related to steps to achieve the expected capability value. Recommendations and improvements provided using ISO / IEC 15504: 2 2003 and ISO27002 standards obtained by mapping IT processes in COBIT 5.

***Keywords-component; Information Technology Audit; Capability Level; COBIT 5; Guttman***

### 1. Introduction

A very fast development of information technology demanding an organization / agency / company to be faster and better in carrying out operations and data processing related to the evaluation of information technology governance. The stages of conducting an audit require a standard that can help to become a valid and realable measurement, so that one of the standards is COBIT 5. The COBIT 5 standard (Control Objectives for Information and Related Technology) is chosen because the COBIT framework is considered to provide the most detailed description of manage and control the regulation of information technology processes that support governance and information technology objectives. COBIT 5 standard also contains data processing by calculating capability level values that represent the level of alignment of information technology objectives and organizational business objectives [1]. COBIT 5 is a development of COBIT 4 where COBIT 5 has adopted ISO / IEC 38500 and ISO / IEC 31000 series on areas of governance, ITIL V3 2011, ISO / IEC 20000, ISO / IEC 27000 series and TOGAF regarding management areas and PRINCE2® which discuss the area of portfolio management and project management [1]. COBIT 5 is not just about the IT process but has included IT governance and project portfolio management for organizations. The process used as a guideline in this study uses COBIT 5 standard, and for data processing performed using the Guttman scale method.

## 2. Methodology

This sub-chapter describes the stages of research conducted and the methodology of research data processing.

### A. Research Stages

The stages carried out in this research are in Figure 1.

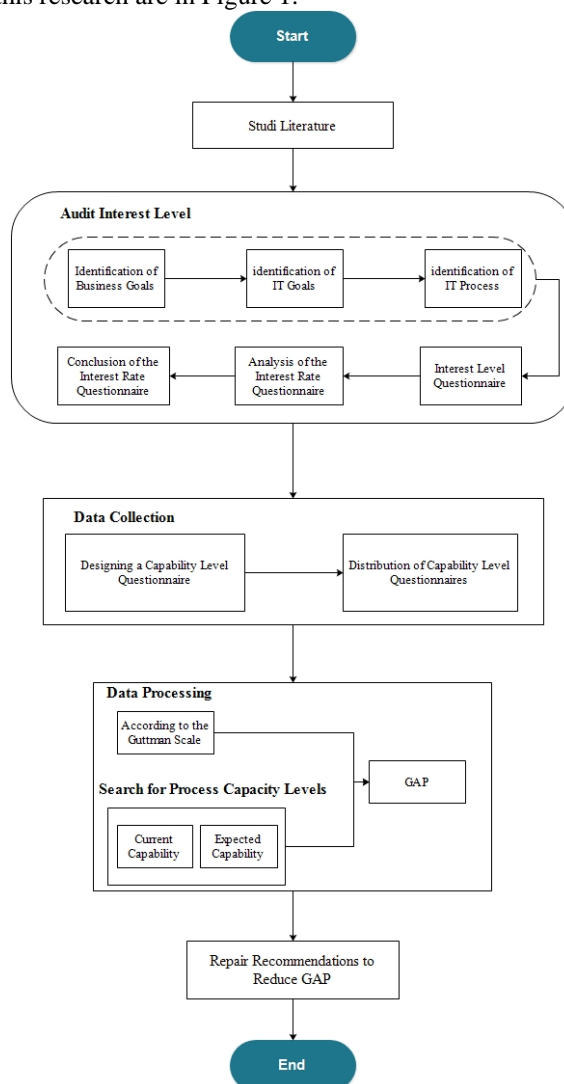


Fig.1 Audit Process

The steps taken include the selection of IT processes in COBIT 5, as well as data collection consisting of interviews, observation and questionnaires, questionnaires processing, data analysis including the value of current capabilities and the expected level of capability, improvement of strategies based on COBIT 5 and framework best practices of ISO27002 and ISO / IEC 15504: 2 2003 with COBIT mapping and final conclusions.

### B. Guttman Method

The Guttman Scale was developed by Louis Guttman (1944, 1950) and was first used as part of a classic work of the Americans soldiers. The Guttman scale is applied to a set of binary questions (0 and 1). The purpose of this analysis is to get one firm answer like "Yes" and "No", "True" and "False" etc. [2].

The initial stages of data processing can be done by converting answers to each respondent where the answer "no" is converted to a value of 0 and the answer "yes" to a value of 1. The conversion results are formulated by looking for the average conversion value from the binary value which is obtained, divided with the number of questions for respondents (the number of questions in question is the number of questions from level 0-5) (1) [3]. Then the normalization process is carried out where the value obtained from the average number of conversions per level (level 0 - level 5) is divided by the total number of overall conversions (2). Afterward, normalization process is conducted where value obtained from the results of the previous normalization multiplied by the level in each domain process consisting of levels 0-5 (3). Calculating capability level domain data is obtained from the results of the level normalization process which is summed to get the result value from the capability level based on the id process (4). The value of the IT process id is obtained from the number of capability level values in each respondent in each domain process divided by the number of respondents in each domain process (5). The value of the current capability (current condition) is obtained from the total number of capability values in each IT process id divided by the number of IT processes contained in each IT process (6) [4].

$$R.K = \frac{nK}{\Sigma Pi} \quad (1)$$

$$N = \frac{\Sigma RKi}{\Sigma RKa} \quad (2)$$

$$NL = N \times L \quad (3)$$

$$CLi = NL0 + NL1 + NL2 + NL3 + NL4 + NL5 \quad (4)$$

$$CLA = \frac{\Sigma CLi}{\Sigma R} \quad (5)$$

$$CC = \frac{\Sigma CLa}{OPo} \quad (6)$$

### 3. Results and Discussion

This section discusses the results of mapping using the COBIT 5 framework and the results of data processing using the Guttman scale method.

#### A. Data Processing Results of Interest Level

From the results of interest data processing, it can be seen that there are five IT processes having the highest value. The five processes are at the same level, which is very important based on the results of questionnaires with top level respondents and with the authorities responsible for IT in the organization. Of the five IT processes, only three were implemented, namely EDM01, EDM02 and APO09 according to the agreement with the agency. The diagram of the results of the interest level data is shown in Figure 2.

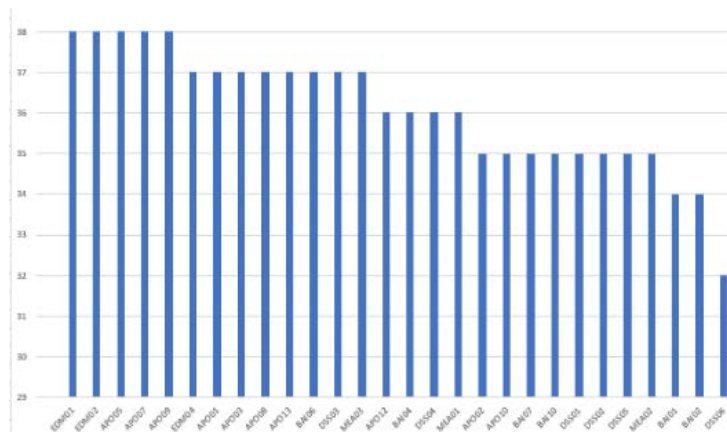


Fig.2. Data Results Level of Interest

### B. Capability Processing

Previous capability value processing has been discussed in the Guttman method formula. The data processing results in Figure 3 are the process after calculating the capability level domain data obtained from the level normalization process. Figure 3 below shows an example of calculating the capability level in the IT process of EDM01 id 01 at level 0-5:

Domain	Respondent	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5	Capability Level	Expected Level	Maximum Level
EDM01.01	R1	0	0	0	0	1.33	3.33	4.66	4	5
	R2	0	0	1.00	1.50	0	0	2.50	4	5
	R3	0	0	0	0.50	2.00	1.67	4.17	4	5
	R4	0	0	0	0	3.33	0.83	4.16	4	5
	R5	0	0	0.67	2.00	0	0	2.67	4	5
	R6	0	0.33	0.33	0.50	1.33	0	2.49	4	5
	R7	0	0	0	1.00	2.00	0.83	3.83	4	5
	R8	0	0	0.33	1.50	1.33	0	3.16	4	5
	R9	0	0	0	0	2.67	1.67	4.34	4	5
	R10	0	0	0.33	2.00	0.67	0	3.00	4	5
	R11	0	0	0.33	1.50	1.33	0	3.16	4	5
	R12	0	0	0	1.00	2.67	0	3.67	4	5
	R13	0	0	0	1.00	2.67	0	3.67	4	5
Average Capability Level								3.50	4	5

Fig. 3. Example of Capability Level Data Processing EDM01.01 by Ms. Exel

### C. Results of Capability Level Data Processing

Capability model is one method of measuring information technology processes by mapping each process to its capability status. The capability level represents the capability of the IT process at the Disaster Management Operation Control Center which is shown in the form of value. Capability level calculation is done by calculating compliance at each level and then obtaining the value of compliance level obtained. The values obtained from each level and then added up. The results of data processing values in the TI EDM01, EDM02 and APO09 processes so that values gap in Table 1 are found.

Table 1. Data Capability Level

IT Process	Current Capability (CC)	Expected Capability (EC)	GAP (EC-CC)
EDM01	3, 33	4	$4 - 3.33 = 0.67$
EDM02	3.20	4	$4 - 3.20 = 0.80$
APO09	3.25	4	$4 - 3.25 = 0.75$
Average Gap			0.74

### D. Audit Recommendation

Recommendation improvements is arranged in order to overcome and reduce the value of the gap (*GAP*) obtained. The following are recommendations prepared based on each IT process. Recommendations are prepared based on the acquisition of levels in the IT process EDM01, EDM02 and APO09.



## 4. Conclusion

In this paper, audit of governance and information technology alignment is carried out to determine the level of IT process capability based on COBIT 5 standard and determine the level of inequality owned by XYZ Disaster Management Operations Control Unit. The audit research on information technology governance that has been carried out which include observation and interviews within the agency/organization environment, planning, domain selection consisting of stages of identification of IT objectives, data collection, data processing, data analysis and providing advice and repair recommendations. It is found that there are 28 IT processes in COBIT 5 that are aligned with business goals and objectives. 3 IT processes are considered to have a very high level of interest by respondents, namely EDM01, EDM02 and APO09. The result of the organization's expected capability is at level 4 - Predictable Process with the GAP value of 0.74. From the resulting GAP, recommendations are made to improve the GAP value.

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# **The Effect of CEO Entrenchment on the Relationship between Corporate Governance and Firm Performance**

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## **Abstract**

The purpose of this study is to study the effect of Thai CEO entrenchment on the relationship between corporate governance and firm performance. This study collects the sample from the companies listed on the stock markets in Thailand. The period collecting is 5 years, from 2012 to 2016. Thai business culture is different from western country cultures. Thai people are generally very relaxed and easy-going and will rarely take offence. Hierarchy is a common thing for Thai people. Thus, a CEO who has the highest rank in the companies will be respected by all staffs in that firm. With the highest position, the CEO can use his or her power to interfere the corporate governance system. So CEO has more chances to take private benefits. As a result, the firm cannot achieve the best performance. This study uses the Multiple Regression Analysis to test the relationship between corporate governance and firm performance. In addition, this study tests the moderating effect of CEO entrenchment on the relationship between corporate governance and firm performance.

The empirical study found that corporate governance has a statistical significance effect on firm performance. Further from past empirical studies, this study is to test the moderating effect using CEO entrenchment. This study found that the interaction between CEO entrenchment and corporate governance is significantly negative to the firm performance at 0.01 levels. Therefore, CEO entrenchment is a moderator that affects to the relationship between corporate governance and firm performance. Thus, it can be concluded that CEO entrenchment causing from agency problem affects the corporate governance of the firm. As the result, the firm performance becomes worse.

***Keywords- Corporate governance; Firm performance; CEO entrenchment***

## **1. Introduction**

The Asian financial crisis began in July 199 and it is started in Thailand. This crisis is caused from the financial collapse known as Tom Yum Goong crisis. After this crisis, corporate governance become an important issue because it enhances efficiency, transparency and accountability of a firm. Thailand was never colonized, the business culture has been influenced to a lesser extent by western culture. Thai society count for hierarchies. Individual status is always taken into consideration in social and business interactions. CEOs have the highest management position will be on the top of the firm hierarchies. Thus, CEOs will have high power and it will be more easily to take private benefits from the firm. According to agency theory, CEOs are self-interested and have own goals that diverge from those of shareholders (Jensen and Meckling, 1976). Thus, CEOs will engage in maximizing their own wealth instead of maximizing shareholders' wealth. This study offers two contributions. First, it tests the moderation effect using CEO entrenchment as a moderator to the link between corporate governance and firm performance. The results can be used to confirm the Agency theory. Second, our findings offer practical implications for organizations such as the Securities and Exchange Commission Thailand (SEC) that prepares CG guidelines for the firms listed in the stock exchange of Thailand.

## 2. Literature Review and Hypothesis Development

### Agency Theory

One of the well-known financial theories that has been extensively applied in corporate finance is the agency theory. Jensen and Meckling (1976) define the agency relationship as a contract between two parties where one is a principal (shareholder) and the other is an agent (manager) who represents the principal in transactions with a third party. Agency relationships occur when the principals hire the agents to perform some services on the principal's behalf. Principals commonly delegate decision-making authority to the agents.

### Corporate governance

Corporate Governance is a managerial principle and it is used to balance the interests of stakeholders and enhance transparency and accountability of for a firm. Corporate governance has been discussed in academic areas since the 1930's (Lima and Sanvicente, 2013). The Organization of Economic Cooperation and Development (OECD) suggests five major principles of corporate governance which are the rights of shareholders, the equitable treatment of shareholders, the role of stakeholders in corporate governance, disclosure and transparency, and the responsibilities of the board. Also, the globalization of financial markets acts as a key assist in the implementation of codes of CG (Khanna and Palepu, 2004; Brown et al., 2011).

### CEO Entrenchment

"Entrenchment is defined as a voluntary of manager to neutralize the control mechanisms which are imposed by the principal; what to allow granting itself more important personal advantages (Walsh and Seward 1990)" cited in cited in Moussa et al (2013). They also explained that if CEOs cannot be easily dismissed by the board of directors, CEO is considered as entrenched (Moussa et al., 2013).

### Proposed conceptual model

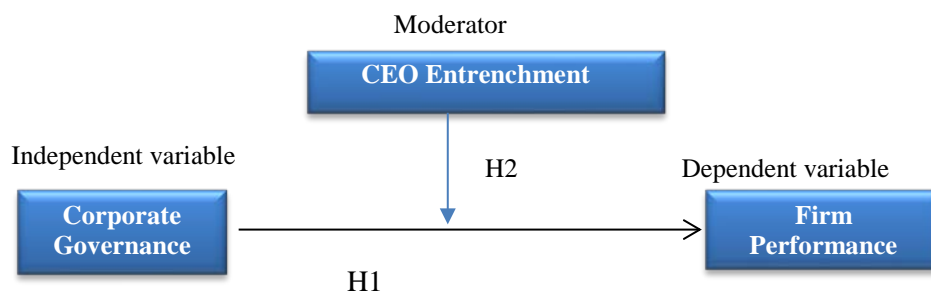


Figure 2.1 Conceptual Framework of the Relationship between Corporate governance and firm performance: the Effect of CEO Entrenchment

### Objectives

1. To test the the direct effect of the relationship between Corporate governance and firm performance.
2. To test the **CEO entrenchment** effect (Moderator effect)

### Hypotheses

- H1: Corporate governance is positively related to the firm performance.  
H2: CEO Entrenchment moderates the relationship between corporate governance is positively related to the firm performance

### 3. Research Method

#### Measuring Corporate Governance

Corporate governance, acting as a mechanism, can reduce the agency cost created by CEO entrenchment. Corporate governance device is chosen for this study framework is the corporate governance score from the Thai Institute of Directors (Thai IOD), which is reported in the Corporate Governance Report (CGR) every year.

#### Measuring Performance

This study measures firm performance using return on assets (ROA). ROA is calculated as income before extraordinary items scaled by total assets of the firm.

#### Measuring CEO entrenchment

Following Chava et al. (2010) and Kumar and Rabinovitch (2011), this study uses tenure to capture CEO entrenchment by calculating the total number of months that the CEO has served the position.

#### Multiple Regression Analysis

$$ROA_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 Profit_{it} + \beta_3 Debt_{it} + \beta_4 Size_{it} + \beta_5 INDDummy_{it} + \beta_6 YearDummy_{it} + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 CEN_{it} + \beta_3 CG_{it} * CEN_{it} + \beta_4 Profit_{it} + \beta_5 Debt_{it} + \beta_6 Size_{it} + \beta_7 INDDummy_{it} + \beta_8 YearDummy_{it} + \varepsilon_{it} \quad (2)$$

Where

The subscripts i and t denote firm and time, respectively

$CG_{it}$  = Corporate governance score/ Institutional ownership

$CG_{it} * CEN_{it}$  = Governance score\* CEO Entrenchment

$ROA_{it}$  = Return on assets = operating income to total assets

$Debt_{it}$  = Debt-to-Equity is calculated as total debt to total equity.

$SIZE_{it}$  = Firm size (LogMV) is measured as the natural logarithm of the market value

#### Data Collection and Sample

##### Sample

This study uses the data of the listed companies on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (mai). The data covers the period of 2012 to 2016 and is taken from financial statements and annual reports provided by the Stock Exchange Commission (SEC) and the SET. The missing variable in each field is excluded. Finally, we use 1,839 firm-years for this research.

##### Source of data

The research uses data from four separate sources that are the annual reports, Bloomberg database, and SET Market Analysis and Reporting Tool (SETSMART) on-line service.

##### Analysis Method

Multiple regression analysis is used to test our hypothesis. The primary objective of this study is to examine the relationship between corporate governance and firm performance. We also include CEO entrenchment in the full model to see if CEO entrenchment changes the relationship between corporate governance and firm performance.

## 4. Results

**Table 4.1 Descriptive Statistics of Variables**

Variable	N	Minimum	Maximum	Mean	Median	Std. Deviation
ROA	1839	-57.79	49.58	5.61	5.90	9.53
Profit	1839	-292.60	356.47	6.82	6.89	29.16
Debt	1839	0.00	134.41	23.43	20.65	21.12
Size	1839	5.57	20.02	11.98	11.61	2.40
CEN	1839	0.17	438.23	112.89	85.20	97.10

The descriptive statistics for the variables used in our regression model are presented in Table 4.1. Firm performance (ROA) shows that the mean (median) is 5.61 (5.90) with a minimum of -57.79 and a maximum of 49.58. The mean (median) value for CEO entrenchment (CEN) in our sample is 112.89 (85.20) months.

**Table 4.2 Pearson Correlation Matrix of Variables**

	ROA	Profit	Debt	Size	CEN	CG
ROA	1					
Profit	.582**	1				
Debt	-.252**	-.035	1			
Size	.305**	.254**	.112**	1		
CEN	.083**	.025	.016	-.085**	1	
CG	.339**	.228**	.005	.402**	.021	1

\*\* Correlation is significant at the 0.01 level (2-tailed)

Table 4.2 presents the Pearson correlation matrix between variables. This study performs the Pearson correlation test to gain an insight into the relationship between variables. The results of this correlation also act as a preliminary indication of the multi-collinearity problem. The result shows that ROA is significantly positively correlated with profit, size, CEO entrenchment (CEN), and corporate government (CG). In contrast, it shows significantly negative correlation with debt. In addition, the corporate governance (CG) is significantly positively correlated with almost every variable except debt and CEN.

### Model :1 Main Effect of Regression Analysis

**Table 4.3 Pooled Regression of Corporate governance and Performance**

$$ROA_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 Profit_{it} + \beta_3 Debt_{it} + \beta_4 Size_{it} + \beta_5 INDDummy_{it} + \beta_6 YearDummy_{it} + \varepsilon_{it}$$

Variables	Coefficient	t	VIF
Intercept		5.094	
CG	0.174**	9.199	1.224
Profit	0.488**	27.028	1.112
Debt	-0.252**	-14.585	1.019
Size	0.147**	7.593	1.281
Industry Dummies	Yes		
Year Dummies	Yes		
R <sup>2</sup>	0.462		
Adjust R <sup>2</sup>	0.461		
Durbin-Watson	1.975		
N	1839		

\*\* Correlation is significant at the 0.01 level (2-tailed)

This study performs a multiple regression analysis to test the hypothesis. The main objective of this analysis is to test the relationship between corporate governance and firm performance. This study hypothesizes that there is a significant relationship between corporate governance and firm performance. Therefore, first, we run a regression analysis for the main effect. The result of multiple regression analysis is presented in Table 4.3. From this table, the regression result shows that corporate governance is significantly positive with the firm performance at a 1% level. This result, therefore, provides statistical support for Hypothesis 1.

**Table 4.4 Moderator Regression Analysis (MRA) to Test Effect of CEO Entrenchment**

$$ROA_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 CEN_{it} + \beta_3 CG_{it} * CEN_{it} + \beta_4 Profit_{it} + \beta_5 Debt_{it} + \beta_6 Size_{it} + \beta_7 INDDummy_{it} + \beta_8 YearDummy_{it} + \varepsilon_{it}$$

	Model 1		Model 2	
Independent Variable	Coefficient	t	Coefficient	t
CG	**0.174	9.199	.210**	7.559
CEN			.123**	4.648
CG*CEN			-.067*	-2.013
R <sup>2</sup>	0.462		0.470	
Adjust R <sup>2</sup>	0.461		0.468	
Durbin-Watson	1.975		1.964	
N	1839		1839	

\*\* Correlation is significant at the 0.01 level (2-tailed), \* Correlation is significant at the 0.05 level (2-tailed)

Table 4.4 provides the results for the regressions of model 1 and 2. Table 4.4 shows that the coefficient on the interaction between CEO entrenchment (CEN) and the CG score (CG) is negatively significant to the firm performance ( $\beta = -0.067$ ). This suggests that the CEO entrenchment moderates the relationship between corporate governance and firm performance. The result shows that the positive effect of corporate governance on firm performance is weakened when CEO entrenchment acts as a moderator between that relationships. The direct relationship between corporate governance and firm performance is positive, but the interaction between CEO entrenchment (CEN) and the CG score (CG) shows the opposite direction to firm performance. It implies that the CEO entrenchment is important and it affects this relationship with greater influence. This supports Hypothesis 2.

## 5. Conclusion

This study has two objectives. First, it is to investigate the relationship between corporate governance and firm performance. Previous empirical studies such as Brown, Breeks, and Verhoeven (2011) and Hansen and Hill (1991) showed that corporate governance has a positive effect to firm performance. Because Thai business culture is different from western country cultures. Thus, this study collects the data of the firms listed in the stock market in Thailand. The result from table 4.3 confirms that for Thai business culture, corporate governance has a positive effect to firm performance. Second, it is to test the moderator effect using CEO entrenchment. According to the Agency theory, CEOs will maximize their own benefit instead of shareholders' benefit. Corporate governance can be a tool in order to enhance the company's efficiency and credibility. Normally shareholders cannot participate in the company's operation, and they give their power to CEOs to manage the firms on their behalf. Good corporate governance can be applied by appointing the board of directors to monitor and supervise the CEO's management. The results from table 4.4 show that CEO entrenchment affects the relationship between corporate governance and firm performance. Thus, it can be concluded that good corporate governance may not work well in some firms if CEO entrenchment is high.



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## Thai Khon skill assessment tool

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### Abstract

Thai Khon Skill Assessment Tools or TKSAT is an applied research in Computer Vision which constructs a tool for traditional Thai performance called “Khon” skill assessment for beginners. When students want to do Khon self-assessments, the Khon schools have to invite experts to evaluate them that takes both time and cost. The school cannot setup evaluation sessions many times, this causes students to have to wait for a long time to know their performances’ progress. The purpose of this research is to build a tools for Khon’s beginners to do their self-assessments, they can improve their performance many times while they wait for formal skill assessment. TKSAT covers 32 of Khon postures, students have to do Khon posture in-front of Microsoft Kinect II camera. Kinect will transform video output to virtual human model. The human virtual model from Kinect composes of 24 joints and edges. Analysis of these virtual model using angle relationship between edges in specific joints in each posture. Student motions were detected against TKSAT model, one by one, step by step. The system will give warning messages when students did incorrect postures. If the students pass all of the 32 postures; it means that they are qualified to see the Khon expert in real assessment. These are quality cycles for students to do self-assessment for the Khon’s performance. Students can repeat many times to improve their performance in Thai Khon traditional dance. TKSAT was evaluated by some of the Khon experts with satisfactory results.

***Keywords-Thai Khon; Computer Vision; Kinect; Culture Technology***

### 1. Introduction

Thai Khon or Khon is Thai national art and contemporary social culture media. When the generation and social context changings influence on the culture in two main points. First, Khon is less important than it used to be. Second, most people know and understand less information about the Khon (masked play), so the audience don’t understand what the Khon performers want to state to them[4].

Khon- it’s traditional performed solely in the royal court by men in mask accompanied by narrators and piphat ensemble-is an advanced Thai performing art that gathered gorgeous arts to the audience, such as dancing art, literature, antiphony, giving instrument performances (Thai orchestra or others), yet Khon is disappearing right now because it’s difficult to arrange the Khon performances. On these days, especially, both students and new generation aren’t interested in the Thai traditional culture which is Thai identity, so Khon-the advanced Thai performing art-is disappearing from the Thai life style. Moreover, there is a lack of dance teacher to transfer them the knowledge and skills. The researcher foresees the importance of Khon conservation. Especially, when the learners practice by themselves, they cannot know how much progress they can. They have to wait for teachers to consider and assess. This makes the self-learning is difficult, so the researcher would like to develop the Khon practicing skill application by applying the Kinect camera to help the Khon learners to assess their practices more easily. The reason why selected the Kinect camera is its cheap price and easy usage, color image (RGB image), depth image and the virtual human structure model. Besides, there is a software that can save all information to continue the project. A lot of people also use this kind of camera in various fields, such as entertainment, services and medical care, games, military and public health[1].

## 2. Khon Performance

This research is a program that related to the motions of learners. It's the model in checking the basic performance development. Before doing that, the researcher had studied the basic Khon performances and create model to develop the program correctly and be the most realistic. The Khon initial practice is basic performance for all level Khon learners. They have to prepare their bodies to practice in the higher levels. In this initial practice, there are art and neat patterns and practicing ways, and different subjects- rhythms, motions, and ways to build up their bodies. There are Khon practicing and royal drama in the initial practice, so they are similar, except the way to practice. The performances are the hero, the heroine, the ogre and the monkey. In this research includes basic performances 3 styles in ogre motion 5 styles, in monkey motion 5 styles in the table 1.

Table 1. Thai Khon postures

Names of posture	Number in each posture
Nudging with the elbow on the waist	3
Pole dancing	3
Slapping knee	3
Introducing yourself (monkey)	2
Smiling ( monkey)	2
Crying ( monkey)	3
Showing love ( monkey)	3
Being sad ( monkey)	3
Introducing yourself (ogre)	2
Smiling (ogre)	3
Crying (ogre)	3
Showing love (ogre)	2

## 3. Analysis

### 3.1 Analysis of the virtual human structure model

The virtual human structure model [3] that we got from the Kinect camera is including 25 joints with 0-24 joints each. The names of variable in equation are taken from the number on the joints that are shown in figure 1. Name of all joints are show in table 2, which assigned to variavles in table 2

Joints = {spinebase, spine, neck, head, shoulderLeft ,elbowLeft,wristLeft, handLeft, houlderRight, elbowRight, wristRigth,handRight, hipLeft, kneeLeft, ankleLeft, footLeft, hipRight, kneeRight, ankleRight, footRight, spinesShoulder, handtipLeft, thumbLeft, handtipRight, thumbRight}

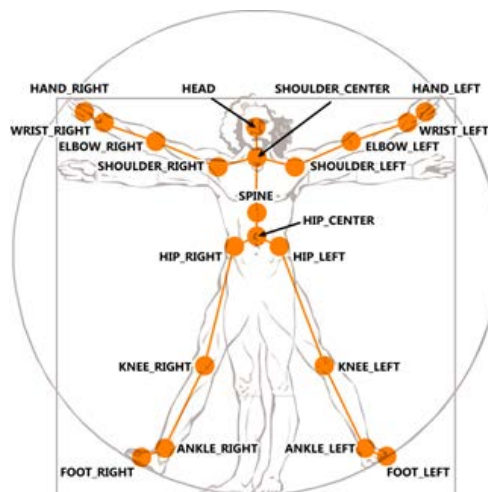


Fig 1. All joints from Microsoft Kinect II [2]

Table 2. The numbers of joints, names of joints and the names of variable

Numbers of joints	Joint names	Variable names	Numbers of joints	Joint names	Variable names
0	Spine Base	spinebase	13	Knee Left	kneeLeft
1	Spine Midle	spine	14	Ankle Left	ankleLeft
2	Neck	neck	15	Foot Left	footLeft
3	Head	head	16	Hip Right	hipRight
4	Shoulder Left	shoulderLeft	17	Knee Right	kneeRight
5	Elbow Left	elbowLeft	18	Ankle Right	ankleRight
6	Wrist Left	wristLeft	19	Foot Right	footRight
7	Hand Left	handLeft	20	Spines Shoulder	spinesShoulder
8	Shoulder Right	shoulderRight	21	Hand Tip Left	handtipLeft
9	Elbow Right	elbowRight	22	Thumb Left	thumbLeft
10	Wrist Right	wristRighth	23	Hand Tip Right	handtipRight
11	Hand Right	handRight	24	Thumb Right	thumbRight
12	Hip Left	hipLeft			

### 3.1 Posture accuracy checking

We can use the information that we got from the Kinect camera after we have analyzed. In each dancing style, there are various different dancing steps. All styles have been presented correctly in each step and it must be “True” as in this equation. There are many functions in each step. If we want all are correct, that means all functions must be “True” like in the second equation.  $n$  = the number of steps.

$$f(Khon) = \text{True} ; \forall \text{ Step}(i) \text{ is true}, i = 1, \dots, n \quad (1)$$

$$\text{Step}(i) = \text{True} ; \forall \text{ func}(j) \text{ is true} \quad (2)$$

While *Khon* is the Khon dancing posture, *Step* is the order of each posture, and *func()* is the function that we use to check the relationship of joint. There are relationship functions that we have checked as follows:

1. CheckPos Function – we use this to check whether two positions are the same place or in the near area or not. If it's true, the function will be back to Boolean in “True”, but if not, it shows “False”.

#### CheckPos(handRight.Y, kneeRight.Y)

This function means we want to check whether the position of the right hand on “Y” point and the same position at “Y” point of the right knee or not. Fig 2 show result of this function.

2. CheckDegree Function- we use this to check whether two position are in the same or near the fixed angle or not. If they are near, the function will be back at Boolean, that means “True”, but if not, it shows “False”.

#### CheckDegree((handRight, kneeRight), 30)

This function means we want to check whether the right knee at 30 degree angle or not.

These three following steps are the analysis and the checking for each posture. There are 3 steps to hit your knee.

$$f(\text{slapping knee}) = \text{True} ; \forall \text{ Step}(i) \text{ is true}; i = 1, 2, 3.$$

$$\text{Step}(1) = \text{True}; \forall \text{ func}(j) \text{ is true};$$

$$j = \{ \text{SamePos}(\text{kneeLeft.Y}, \text{kneeRight.Y}) \text{ return Boolean,}$$

SamePos (handLeft.Y,kneeLeft.Y) return Boolean,  
SamePos (handRight.Y,kneeRight.Y) return Boolean}

There are three conditions to check.

- (1) The position of the left knee is on “Y” point at the same point as the right knee.
- (2) The position of the left hand is on “X” point at the same point as the left knee.
- (3) The position of the right hand is on “X” point at the same point as the right knee.

*Step(2) = True;  $\forall func(j)$  is true;*  
 $j = \{ \text{SamePos (kneeLeft.Y, kneeRight.Y) return Boolean,}$   
 $\text{SamePos (handRight.Y,kneeRight.Y) return Boolean,}$   
 $\text{CheckDG((elbowRight,shoulderLef),180) return Boolean} \}$

There are three conditions to check.

- (1) The position of the left knee is on “Y” point at the same point as the right knee.
- (2) The position of the right hand is on “X” point at the same point as the right knee.
- (2) The right elbow is at 80 degree angle of the left shoulder.

*Step(3) = True;  $\forall func(j)$  is true;*  
 $j = \{ \text{SamePos(kneeLeft.Y, kneeRight.Y) return Boolean,}$   
 $\text{SamePos(handLeft.Y,kneeLeft.Y) return Boolean,}$   
 $\text{CheckDG((elbowLeft,shoulderRight),180) return Boolean} \}$

There are three conditions to check.

- (1) The position of the left knee is on “Y” point at the same point as the right knee.
- (2) The position of the left hand is on “X” point at the same point as the left knee.
- (3) The left elbow is at 80 degree angle of the right shoulder.

#### 4. Test and Results

In the process of testing TKSAT, five Khon learners assigned to perform in the basic posture of the Pole dancing and Slapping knee, and they can pass these. However, only one person cannot pass in nudging with the elbow on the waist posture, as in table 3. For the monkey performance, we test only one posture- introducing yourself, all five learners can pass, as in table 4. Moreover, for the orge or giant performance, we test them three postures, all five of them can pass: introducing yourself posture, showing love posture, and being sad posture, as in table 5.

Table 3. The test result in the basic postures




Names of posture	pass	not pass	Note	
1. Slapping knee	5	-		
2. Nudging with the elbow on the waist	4	1	One person can perform till step 2.	
3. Pole dancing	5	-		

Table 4. The test result in the monkey performances











Names of posture	pass	Not pass	note	
1. Introducing yourself	5	-	Two persons can perform till step 2.	
2. Smiling	3	2	-Two persons can perform till step 1. -One person can perform till step 2.	
3. Showing love	2	3	One person can perform till step 2.	
4. crying	4	1	One person can perform till step 1.	
5. being sad	3	2	One person can perform till step 2.	

Table 5. The test result in the ogre performances

Names of posture	pass	Not pass	note	
1.Introducing yourself	5	-		
2.Smiling	3	2	One person can perform till step 2.	
3.Showing love	5	-		
4.crying	4	1	One person can perform till step 2.	



5.being sad	5	-		
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#### 4. Conclusion

The objective of this Khon assessment tool project is to build the Khon learning model and to create the suitably great self-assessment by applying the Kinect's technology. From this study, we can learn that the developed program can work well and get the accurate data, even though the postures cover on other joints cannot work well, because there are some limited abilities of the Kinect camera. Therefore, this makes some deviation. In Khon performance, the dancers have to move so often, it's difficult to separate each step of the dance. This also makes the skill assessment not cover all details. This research will be first step of successful, more Kinect camera can add to capture, check and take the joint that covers on each other, to be able to check a lot of angles. In addition, we ought to apply the knowledge about "Machine Learning" to make our analysis more accurate.

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## **Zhang Yiqing's *Rosewood with Noble Character* 君紫檀 : From Zhouzhou to Gu Yongqi**

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### **Abstract**

Anybody who remembers Zhang Yiqing 张以庆's past films will recognize the dramatic change from *Zhouzhou's World* 舟舟的世界(1997) to *Rosewood with Noble Character* 君紫檀 (2017). But there is not only dramatic change but consistence as well in his work *Rosewood with Noble Character*. This review will consider on what changes happened in the director's works, and describe briefly the cause and the meaning of the changes through Zhang Yiqing's new film *Rosewood with Noble Character*.

**Keywords;** *Zhang Yiqing; dramatic change; consistence; Rosewood with Noble Character*

### **1. Introduction**

*Rosewood with Noble Character* 君紫檀 (2017) is director Zhang Yiqing 张以庆's new documentary film. You could wonder if this is the same director's work who made *Zhouzhou's World* 舟舟的世界(1997). Anybody who remembers Zhang Yiqing's past films will recognize the dramatic change from *Zhouzhou's World* to *Rosewood with Noble Character*. But there is not only dramatic change but consistence as well in his work *Rosewood with Noble Character*. This review will consider on what changes happened in the director's works, and describe briefly the cause and the meaning of the changes through Zhang Yiqing's new film *Rosewood with Noble Character*.

### **2. From Zhouzhou 舟舟 to Gu Yongqi 顾永琦**

First of all, there is a big difference in the subjects of his documentary films. Twenty years ago, director Zhang Yiqing focused on Zhouzhou who suffered from Down's syndrome in *Zhouzhou's World*. Zhouzhou was a congenital feeble minded child who could not live happily together with common people. (At the age of nineteen, he has intelligence of an infant.) Even though he was physically handicapped, he was warm-hearted, had a talent in music, had special gift as a conductor. If someone looks awkward and slow because he/she has low intelligence and handicapped body, people do not appreciate his/her true worth. Through this film we can feel Zhang Yiqing's concern and love for the alienated people. He is asking us our attitude and position about the people in a kind of roundabout way as well. As his care about so-called the marginal people continued from a short documentary film *Director*(1996) to a full length documentary film *Ying and Bai* 英和白(1999) and *The Kindergarten* 幼 (2004), we can call it the typical character of his film. By contrasting and comparing the relationship between normal and abnormal, green and fresh director and professional director, animal and human, children and adults, at that time Zhang Yiqing's humanism has been presented as a kind of equalitarianism.

However *Rosewood with Noble Character* portrays a heroic character Gu Yongqi 顾永琦 who had made a very great achievement in making furniture. Gu Yongqi is a joiner from Nantong 南通 city, Jiangsu 江苏 province. He is proud of himself and said ‘Throughout history nobody can make furniture like me.’<sup>1</sup> He is not exaggerating at all because he himself settled thousands of years of dilemma. Gu Yongqi solved the insoluble problem since Song Dynasty, which was cracking, twisting, edge ripping of rosewood furniture. Because of the problem called ‘millennial curse’, it was necessary to leave some small space for expanding to rosewood furniture in case of changes of temperature<sup>2</sup>. Not only he solved the big problem, but his rosewood furniture has absolute softness, and already it joined the rank of world-wide masterpiece. One of his workers in the film told comparing Gu Yongqi’s rosewood furniture, even the furniture displayed in Gugong Museum 故宫博物院 and rough. Some of the world’s best known luxury brand companies, including Hermes, Steinway, are collaborating with him, and his rosewood furniture was chosen as the second luxury item next to Maotai by Chinese Luxury Society 中国奢侈品协会. The change of director Zhang Yiqing’s concern from the marginal people to a hero of great achievement is very sudden and dramatic. It seems that Zhang Yiqing’s equalitarianism turned into thorough heroism. However, despite the dramatic change of subject matter and the characters in his documentary films, which looks so different and conflicting, still we can find there is great humanism in the deep structure of all his films.

### 3. Documentary dreaming to be a poem

Whenever Zhang Yiqing’s Documentary showed, a lot of attention was paid to its original character. Considering that he neither follow existing customs nor care about public’s taste, and he has always tried to create original works, he could be called one of typical auteurism directors. This can be affirmed through Zhang Yiqing’s documentary trilogy, *Zhouzhou’s World*, *Ying and Bai* and *The Kindergarten*. He pursued his own world of art by merging lyric with epic, and realistic aesthetics with poetic aesthetics without taking much care of the existing customs. Culture critics say that it is not easy to define the relieve on the furniture made by Gu Yongqi, because there are some special qualities unlike any other existing arts and crafts. The same evaluation can be applied for Zhang Yiqing’s film *Rosewood with Noble Character*. The wide ranging experiment about documentary form conducted in *Rosewood with Noble Character* which is hard to see in other films. Even though Zhang Yiqing has been always trying to do experiment about the forms, but in this film it appeared more extensive and various. The most outstanding point about Gu Yongqi’s furniture is lied on its distinguishing unreal tactile sensation. Though his rosewood furniture is famous for beautiful three dimensional artwork and its semipermanent durability, above all things, the softness of the furniture gives us a kind of surreal feeling when we touch it. Tactility is one of the most primitive and physical sense of human and could be referred to the most surreal and mental sense as well. Facing the challenge to express tactility on the screen in *Rosewood with Noble Character*, Zhang Yiqing must have grappled to solve the problem. To show the great artist who made furniture ranked in the global masterpiece, and to show the value of the master’s work of beautiful luxury furniture, Zhang Yiqing made the film *Rosewood with Noble Character* a poem, not only by traversing the various artistic genres, but using metaphors and symbols on the screen. For master Gu Yongqi and his workers, making rosewood furniture is not just making a piece of furniture but a kind of writing a poem. Similarly, for director Zhang Yiqing, making the film *Rosewood with Noble Character* was a kind of writing a poem as well. The only difference between the poem and their works is that the poem is personal creation and the furniture and the film by Gu Yongqi and Zhang Yiqing are the result of group work.

<sup>1</sup> In *Rosewood with Noble Character*, Gu Yongqi said, “我做家具超过历史任何大师”, directed by Zhang Yiqing, 2017.

<sup>2</sup> In *Rosewood with Noble Character*, “顾解决了自宋以来，紫檀家具预留伸缩缝的千年劫”, directed by Zhang Yiqing, 2017.

In the film, the softness of the furniture compared to water drops, a baby's or a woman's skin, the touch of silk and symbolized by smooth melody played by Guqin 古琴 and songs and music harmonized with other eastern or western music instruments. The distinguishing quality of the furniture expressed through Shuo Chang 说唱 and dancing of the supreme traditional artists who are the highest in artistic achievement: Guan Dongtian 关栋天 and Wang Xiaoyan 王晓燕 masters in Peking Opera 京剧 Hu Xiaolu 胡小路, master in Pinghua 评话. Furthermore Zhang Yiqing also renewed his formal experiment about the style of film. The director himself appeared on the documentary film and asked questions and suggested interpretation of Gu Yongqi's inner world. The top class culture critics dare to discuss and argue with Gu Yongqi about his character and the quality of his furniture. These techniques are very much different from those of customary documentary films, realistic re-creation about the subjects, and it could make his film look a little awkward. However, if we remember the fact that a documentary film does not depend on its formality, the various experiments in form conducted by Zhang Yiqing need to be evaluated by the truthfulness which his film reached up to and the audiences' impression of the film. Zhang Yiqing's experiment about his film *Rosewood with Noble Character* looks quite successful: his direct intervention in the film, merging two incongruous factors together, like description with evaluation, metaphors with symbols, epic with lyric, realistic aesthetics with poetic aesthetics. His endeavor to overcome the limit of the former films and to get to the new land of truth made his film a poem as a result.

#### 4. Dream for cultural powerhouse and the world best rosewood furniture

As Luo Xiaoyan 罗晓燕 referred correctly, the cultural confidence emphasized by premier Xi Jinping 习近平 and Chinese government does not mean only the confidence of Chinese ancient culture. However, comparing the splendid Chinese ancient culture, the contribution of Chinese people to modern culture seems not so impressive. The four great invention, Compass, gunpowder, printing technique, paper, were accomplished by ancient Chinese people, but it is not easy to find out any important modern invention in China. If the revival of the culture and cultural confidence is confined only to its ancient culture, it could be a sign of cultural reactionism and historical regression. The real meaning of cultural revival and confidence is possible only on the basis of the new and modern cultural creativity. Zhang Yiqing found it in Gu Yongqi's supreme rosewood furniture and this can be called the most concrete form of Chinese dream for the cultural powerhouse. Zhang Yiqing saw the power of cultural creativity in genius Gu Yongqi to create global luxury furniture and named it 'thing in the body 身内之物' be kept in only one man and can not be inherited or borrowed to anybody, therefore, if he died, the power of his creativity will be extinguished consequently. Gu Yongqi referred his works as 'things outside the body 身外之物' and he said that he has the original creativity and he himself never need to own anything. From the master's viewpoint, it could be logical: if he obsessed by 'things outside the body', it causes 'thing in the body' shrink and disturbs the creation of the other 'things outside the body'. But we common people can make a rough guess about master's 'thing in the body' only through his 'things outside the body', and it's natural we want to own 'things outside the body' as many as possible.

Until now Zhang Yiqing has been one of the most famous minority artistic documentary directors, but he came to us as a mainstream artist by the newest work *Rosewood with Noble Character*. Is this a sign of the change in his artistic view and artistic pursuit? Is he thinking Chinese society matured enough to put aside the concern for marginal people who are socially alienated? Not so many yet, but a few distinguishing people are appearing in China, and is he thinking it is necessary to pay attention to them? Whether Zhang Yiqing intended it or not, *Rosewood with Noble Character* has an air of social atmosphere which emphasizes the cultural revival and confidence. Nevertheless Zhang Yiqing himself explained his dramatic change from *Zhouzhou's World* to *Rosewood with Noble Character* like this: 'I tried to find out the character like Gu Yongqi before and I never succeeded, so I only had to focus on the socially alienated people. Now I found Gu Yongqi and wanted to describe him.'

Even if each played an active part in different areas, Zhang Yiqing found his second self from Gu Yongqi, and this could be the real inner motivation for him to film *Rosewood with Noble Character*. In other words, Gu Yongqi's abnormal obsession and artisan spirit for the supreme masterpiece, never giving up pursuit for the road not taken, heroic spirit resulted in the solution of millennial dilemma, led Zhang

Yiqing to make the film. The assessment whether his film *Rosewood with Noble Character* got the same achievement as Gu Yongqi's supreme rosewood furniture is left to the audiences.

## 5. Conclusion

*Rosewood with Noble Character* is a kind of dedication presented to Gu Yongqi, the master of rosewood furniture, who verified the cultural revival and confidence of China with his talented creativity. Director Zhang Yiqing, like Gu Yongqi, chased the road not taken with abnormal obsession to create new and modern Chinese culture in the realm of documentary. It is meaningful that the film *Rosewood with Noble Character* finished with the last scene with Gu Yongqi's these words:

I will say it again,  
We are not making just a piece of furniture  
But the backbone of Chinese people  
And the result is not a tenon and a mortise  
But the knee joint

Finally Zhang Yiqing found out his second self in Gu Yongqi.

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# The Transmedia storytelling strategy and structures of heroes in Marvel Avengers films

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## Abstract

The transmedia storytelling contributes on creating new contents with fusions and expansions. The content that has established this and actively using is the Marvel Cinematic Universe (MCU). Marvel's contents are applying the transmedia storytelling – a newly evolved form of beyond explaining the phenomenon that cannot be explained by original story repeating OSMU or crossmedia. The Avengers series is a new series recreated by combining the individual hero series and made the result of overcoming the box office performance and cinematic quality than other Marvel contents. This study focuses on the transmedia storytelling structure of the Avengers series that is gaining responses with a new story expansion. The analysis was made on how these features and strategies have diverged and extended successfully while making the contents group started as a comics into movies.

***Keywords-Transmedia; Transmedia storytelling; Movie; Avengers; Hero***

## 1. Introduction

The phenomenon of diverging or extending the original story into another independent story is called as Transmedia storytelling. A new story diverged from original story shares the concept or background of the original story and becomes an expended storytelling. This is distinguished from OSMU (One-Source Multi-Use) or Crossmedia.

OSMU uses one source to tell an identical story with various media. Which means, that the same story is recreated repeatedly depending on the media [1].

The crossmedia is a method of delivering one story with various platforms. Which means, that a consistent story is repeatedly delivered to users suiting with various media.

The transmedia storytelling is created as an individual story with multiplatforming<sup>1</sup> on various media. During the process, the story is not created repeatedly, but expended. However, the basic story concept or original story is shared in same category. In addition, each individual story becomes a connecting story to original story or make a big contribution on understanding the concept.

The Marvel hero series contents were distributed in comic book type since its establishment in 1939. It continuously grown as published comic books from 1939 to 1950's, but faced management crisis with comics code authority (CCA) after the 50's saying that the comics are harmful and economy hold back [2]. The Marvel maintained the company with selling copyrights of hero characters and faced bankruptcy crisis in 1996. The Marvel came out of crisis by making profits from toy character business of the film rights of Spiderman sold to Sony/Columbia Pictures in 2002 with huge success of the movie. Afterwards, X-Men, Dare Devil, Hulk, Punisher, Fantastic 4 and others made success in movies and related character businesses started making profits. The company with 90 million dollar business loss in 2000 made business profit of 74 million dollars in 2007.

The Marvel saw the success of copyright sold hero characters and started to make films. The Marvel

<sup>1</sup> Multiplatforming means that either the contents or the media user goes back and forth on various platforms simultaneously or non-simultaneously. Source: Naver Media Encyclopedia



selected their 8,000 characters, introduced 'MCU (Marvel Cinematic Universe), and started making movies. The movie 'Iron Man' filmed by Marvel in 2008 made box-office profit of 8.5 billion dollars. Since then, 19 movies were filmed until 2018 with profits of 16.5 billion dollars. And about 6 mega hit movies made over 10 billion dollar profits.

Table. 1 MCU Box-Office Record<sup>2</sup>

Box-office Profit	2012	2013	2014	2015	2016	2017	2018
20 billion							Avengers: Infinity War \$2.046 billion
15 billion	The Avengers \$1.518 billion			The Avengers : Age of Ultron \$1.405 billion			Black Panther \$1.347 billion
10 billion		Iron Man 3 \$1.215 billion	Guardians of the Galaxy 1 \$773.3 million		Captain America: Civil War \$1.153 billion	Guardians of the Galaxy Vol. 2 \$863.8 million Spider-Man: Homecoming \$880.2 million Thor: Ragnarok \$854 million	

The table. 1 shows that the Avengers in 2012 made box-office profit of about 1,518,812,000 dollars. 1,405,000,000 dollars for Avengers: Age of Ultron in 2015 and 2,046,548,000 dollars for the Avengers: Infinity War in 2018. The profit of Avengers: Infinity War was recorded as the world's fifth most profited movie. [3].

The Marvel's hero characters built transmedia form from comic books to movies. The Marvel characters succeeded in comic books have their own series but the narrative structures are incomplete and continues until now. It does not reproduce the existing stories with movies but connects with the comic books or expanded into new series. Sometimes, the comic books work as the story connection of movie series.

A noticeable transmedia storytelling from the Avengers series is that the main story forms multiple narratives and multiple characters and properly places the weight of each role. In order to form a transmedia storytelling structure, a study for a certain structural strategy like the Avengers series is necessary [4].

## 2. Transmedia storytelling Structure

The transmedia storytelling has the feature of self-breeding narrative with sharing or enjoyment as the base and individual texts are independent and non-sequential. It is a concept which the sum of variant

<sup>2</sup> <https://www.boxofficemojo.com/>

individual stories from multiple media within the entire story sharing its concept or showing the story theme. Multiple separate stories having identical concept are multiplied and mutually connects with others to build a transmedia world. The term calling such contents creating method is called as Media Franchise or Transmedia Franchise [5].

The parts marked as a media includes novels, movies, TV, animations, performances (musicals) and various media. The starting point of original story for each content starts from various media. Transmedia storytelling can be considered as the concept expanded to include the story expansion of prologue, main story, spinoff, reboot, sequel, prequel and others or the storytelling method of various forms of narratives containing the story's connections.

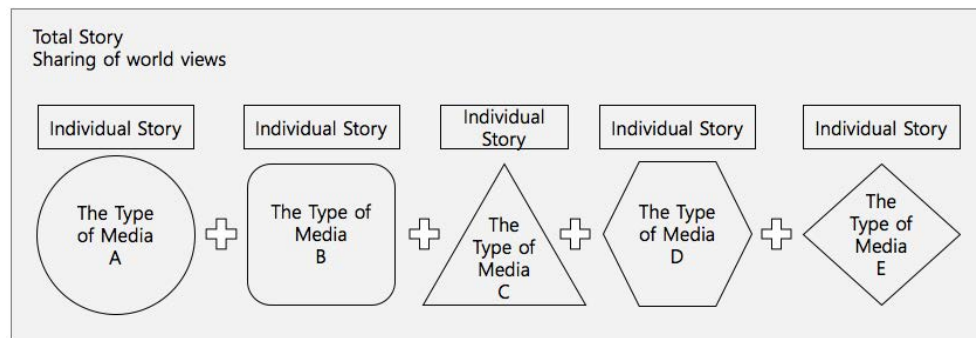


Fig. 1 Transmedia Storytelling Structure of Individual Story's Sum (Plus) Expressing Entire Story<sup>3</sup>

### 3. Transmedia storytelling structure of the Avengers series

Since the success of Iron Man 1 movie filmed in 2008 after the establishment of Marvel Studios, the Marvel has released a movie making line of its own comics as the base as a term called MCU.

Twenty movies made until now since 2008 shows that each film proceeds its story individually but shares MCU. Also, all movies include Avengers series related themes. Seven heroes appear in the Avengers 1 and nine heroes appear in the Avengers 2. The Avengers 3 has twenty-three super heroes, the most heroes for the series.

Fig. 2 shows that each movie are mostly based on the comic books. The Marvel continues its superhero series with no endings accumulated since its establishment. When a known comic book is made into a movie with only its popularity does not guarantee its success. When a story is simply made into a movie repeating the story, it has high risks of having audiences fed up with the story. In order to overcome this from happening, the Marvel came up with a strategy of making individual stories for the movies and include them in the MCU. It means, making a concept and allow all works made as movies get connected with each other and share the hero character or include a portion of another related movie as an event. The movie Avengers series is also base on the classic Avengers comics of its own. But its story is different from the comics. Sometimes, only the concept itself is applied and goes different entirely, and the characters in the movie Avengers differ very much from the comics. Even when the movie series tells separate stories of its own, the audiences will experience a new narrative as a movie media.

Even if the audiences do not know the original narrative, they can experience the connected concept or narrative world with the transmedia storytelling structure.

When transmedia storytelling has various contents for each media, and when these are opened simultaneously with connection; it is called as a synchronization type; and when these are opened sequentially; it is called as an asynchronous type. Also, it can be distinguished with a small and a large type and the small type has less connective contents and the large type has massive contents [6].

<sup>3</sup> JunHee Lee, "Storytelling Ecosystem Model Based on Expanded-Type Transmedia Storytelling," *Journal of Korean Society of Media & Arts*, pp. 10, vol.11 No.3, December 2013. Fig 2 restructure

The transmedia storytelling of the Avengers is opening the movie contents sequentially and the story structure includes the large narrative world. This is an asynchronous type and structured with the large type.

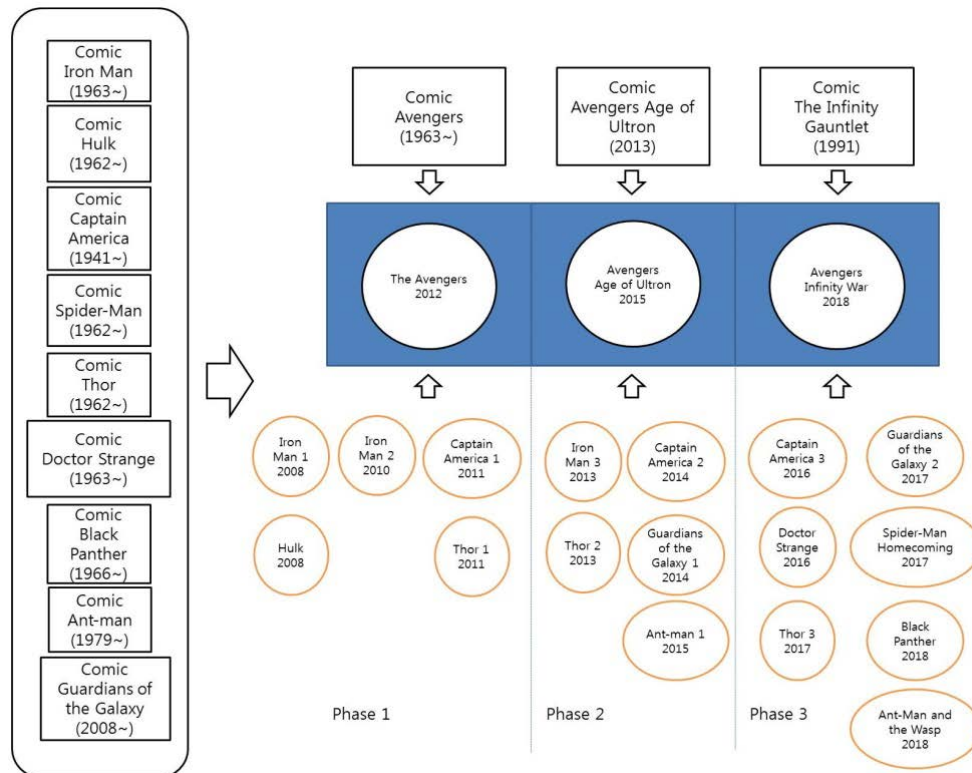


Fig. 2 Avengers Series Transmedia storytelling Structure

## 4. Transmedia Storytelling analysis of Avengers series movies

### 4.1. Avengers 1

The Fig. 2 shows that Iron man 1 & 2, Thor 1 and Captain America 1 premiered before the Avengers 1. The narrative line of the Avengers 1 filmed in 2012 starts with the appearance of a villain. The villain leading the story of the entire story line of the Avengers 1 is Loki, the younger brother of Thor who appeared in Thor 1. The other villain who invades earth and made New York a battlefield is Chitauri Army, Loki's collaborators. The conversation between Chitauri Army and Loki implies the existence of a strong villain. The story of the Avengers 1 is that the team avengers was formed to stop Loki; and the conflicts between the Iron Man and Captain America were told in depth during the team forming process. The story tells one story of continuous attack of villain with how Iron Man is organized, conflicts, splits, sacrifices and cooperates; another story of how the villain attracts collaborators; and these two stories progress together. In the middle of the story, Thor tells the existence of infinity stone – the core story of the Avengers 3 – and the existence of gauntlet is implied. For the consistency of the series, the events that will occur on the next episode are continuously informed.

### 4.2. Avengers 2: Age of Ultron

The movie starts with the actions of the Avengers in the beginning. The conflicts between heroes are also shown. Hulk and Iron Man get into a fight and a city is damaged from the fight. The birth of the villain lead the main story was born within the Avengers. A strong villain called Ultron appears by an error during the artificial intelligence building process and the Avengers team struggles to stop the villain. A new hero called Vision was born during the Ultron's birth process. The Vision possesses the Infinity stone and contributes to the elimination of Ultron. The Vision possessing the Infinity stone appears as a

key role in the next episode. The characters in the Avengers 2 conflict and confront each other in the Captain America 3: Civil War. The story continues with the Avengers 2. The independent contents has consistency with a separate series, but there is no repulsion. Even if the audiences seeing the series for the first time have no prior knowledge, they can enjoy the contents with texture speculations and potential story concept.

### 4.3. Avengers 3: Infinity War

The Avengers 1 and 2 had weight on the conflicts between heroes while the Avengers 3 shows the cooperation of heroes to stop the strongest villain, Thanos.

The beginning of the movie continues from the Thor 3, the story of Asgard's fall, the home of Thor. The characters of individual contents made in advance with the Marvel's transmedia storytelling structure possess continuity and expandability in the Avengers film. Also, the connections of events occurred in individual series share unity and concept.

## 5. Conclusion

The transmedia storytelling structure of the Avengers has continuity and expandability. Fig. 4 shows that each hero contents filmed separately to share the story's concept introduces a part of the Avenger's events. Sometimes, the continuity of main story like the Captain America: Civil War is told. The Marvel built a concept called MCU and combines the story lines or proposes events in order for the individual content stories to have continuities. These show the form of crossing (Trans) or expandability of the stories between contents – the feature of Transmedia storytelling. It can be said that the Marvel, actively using the new form of story with the conversion from comic books to movie, overcame its crisis by making contents with the transmedia storytelling. Also, not only the Marvel has gained huge fans with these types of movies filmed during the past 10 years, but also built a structure to continuously make series. I have looked at how the transmedia storytelling was successfully activated with expandability between comics and movie media through the Avengers series. I hope this study is able to offer some helps on creating comics and movie media contents.

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## Critical Success Factors for E-learning: An Indian Perspective

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### Abstract

Being free from the constraints of time and place, the importance of e-learning is increasing in the education system across the globe. This paper attempts to identify the critical factors attributing to the success of e-learning in higher education sector through a student perspective. A questionnaire is constructed based on the previous research. Using a convenience sampling technique, the data is collected from the undergraduate, postgraduate, and doctoral students of CHRIST (Deemed to be University), Bangalore, India. The participants in the survey were invited to provide their views about the importance of a number of factors attributing to different dimensions in the success of e-learning. An exploratory factor analysis is conducted by employing Principal Component Analysis to assess the factor loading of each variable onto different factors. The study identifies five factors as critical in the success of e-learning viz. technological support, e-learning resources, e-learning support and training, characteristics of student, and characteristics of instructor in their order of relative importance with technological support being the most critical factor.

**Keywords-** *e-learning system; critical success factors; higher education; exploratory factor analysis*

### 1. Introduction

The pedagogy and the learning styles have evolved over time and continue to evolve even today given the developments in the technology being used. The educational institutions undergo unprecedented transformations in their teaching-learning practices with the influence of information technology. Such transformations are of significant importance as they add different dimensions to education with the help of electronically mediated tools in order to smoothen and enhance the process of learning [1]. This revolution in educational sector is referred to as e-learning. It refers to the usage of information technology blended with communication technology to enable the access to quality and real-time resources that enrich the teaching-learning systems in educational institutions. It cannot be considered as a mere substitute of the traditional methods of teaching-learning with the help of technology, but reinforces and magnifies the reach of learning [2]. With the growing importance of e-learning, it has been implemented in many educational institutions across the globe [3], which requires huge investments to be made.

The significance of e-learning systems is that they offer learning opportunities beyond the constraints of time and place. They also support to have experiments in teaching-learning by having new approaches to teaching and learning. However, the literature provides that the extent to which these systems are being used by the students are often low, despite of the huge cost involved in putting them in place [4]. There are a number of studies addressing this issue by contributing possible solutions [5]. The studies were also attempted to measure the satisfaction of users with regard to the e-learning platforms [6] [7].

A potential aspect of e-learning which is not widely studied is to identify the critical success factors for e-learning. This essentially relates to the evaluation of the participants' experience of e-learning which can be used as a benchmark for the enhancement of e-learning systems. Such critical success factors

measure the best or essential characteristics of e-learning systems from the perspective of its users attributing to their success. A critical success factor approach to the evaluation of e-learning systems not only produces a vibrant agenda for the management but also enhances the system as such [8].

A limited number of studies has attempted to identify the critical success factors for e-learning. These studies have been done in a broad range of circumstances that include schools [9] and higher educational institutions [10] [11]. The studies also vary significantly based on the country in which they have been conducted. However, empirical attempts are found lacking to identify the critical factors attributing to the success of e-learning systems in India being one of the leaders of developing countries. Therefore, this study attempts to examine and identify the factors affecting the success of e-learning from a student perspective.

## 2. Data and Methodology

### 2.1. The participants

In order to achieve the objectives of the study, a convenience sampling survey was used employing a self-administered questionnaire. The samples selected consist of the undergraduate, postgraduate and doctoral students of CHRIST (Deemed to be University), Bangalore, India. The responses were gathered from 158 students out of which more than half were females (52.53%). Majority of the survey participants were pursuing their Master's degree and Bachelor degree (89.87%) on years 1 and 2 of their course (69.62%).

### 2.2. Procedures adopted

A questionnaire was designed to collect the relevant data from the population of the study. A number of critical success factors related to e-learning were identified from the literature and used to prepare the questionnaire. These factors were grouped into different categories viz. those related to the instructor's characteristics, the participant's characteristics as a student, the role of technology infrastructure available, the importance of online learning resources, and the role of support and training as exhibited in Table 1. Though the critical success factors identified vary from study to study, they possess some common patterns based on which they were categorized. The list of these factors as presented in Table 1 was used as the basis for designing the questionnaire. The fundamental of the designed questionnaire was thirty four five-point Likert-scale statements relating to various aspects of e-learning, for which each participant was asked to express his/her view about their significance as factors contributing to the success of e-learning.

The data is cleaned for missing values and the questionnaires with incomplete responses were removed from the analysis. Descriptive statistics were calculated for the demographic factors to understand the basic nature of the sample considered for the study. Exploratory factor analysis was carried out to identify the factors that are considered as critical in the success of e-learning by the students.

Table 1. E-learning critical success factors from literature

Categories	Variables
The instructor's characteristics	Enthusiasm of the instructor while teaching aiding e-learning tools
	Ability of the instructor to motivate his/her students
	Clarity of instructor's explanation
	Capability of the instructor for using the e-learning system efficiently
	The style of teaching of the instructor aiding e-learning technologies
Participant's characteristics as a student	The approachability of instructor in general and during teaching
	My readiness to take part in e-learning
	My learning style
	My aptitude to find topics in e-learning system
	My knowledge and acquaintance about computers
The role of technology infrastructure available	The extent of my satisfaction while using technology
	My understanding about the use of various parts of the e-learning systems
	Easy access to internet
	Easiness in browsing
	Accessibility of online communication tools
	Speed of internet



	Accessibility to multimedia technologies Facility to explore learning material using the e-learning system Adequate computer labs Reliability of technical infrastructure
The importance of online learning resources	Easiness in registration for the e-learning course Accessibility to the e-learning resources while being in and out of the campus The design and layout in which the information is provided Adequacy of the learning materials provided Interaction of the course Adequacy of communication with the instructor in the e-learning system Accessibility to and adequacy of online test/quizzes Possibility to return to uncompleted tasks Ability to measure the progress of learning Up-to-dateness of the learning materials
The role of support and training	Availability of offline technical support Openness and sociability of the support team Accessibility to the online help desk Adequacy of training sessions on the usage of e-learning systems

### 3. Results and Discussions

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were employed in order to ensure that the data collected was suitable and adequate for exploratory factor analysis. Table 2 reports the results of KMO and Bartlett's Test. From the result of Bartlett's Test of Sphericity, it can be inferred that the correlations between the variables considered in the study, when taken collectively were significant at one percent level. This indicates that there exists non-zero correlations among the variables selected. The table also shows an overall measure of sampling adequacy value of 0.920 which falls in the acceptable range i.e. above 0.50. As both these test are fulfilling the basic assumptions of exploratory factor analysis, the data is deemed suitable for exploratory factor analysis.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.920
Approx. Chi-Square	3206.969
Bartlett's Test of Sphericity	df
	561
	Sig.
	.000

A Principal Component Analysis was employed to find out the factors which explain the most variance in the data used. The Eigenvalues were considered as the criterion to decide the number of factors to be identified along with the cumulative percentage of variance explained. Only those factors which were having Eigenvalue above 1 were extracted. This criterion had provided for five factors from the set of thirty five variables.

Varimax rotation is used to generate the component matrix. As an orthogonal rotation, it ensures that the factors remain uncorrelated throughout the process of rotation. The component matrix displays loading for the rotated factor matrix. The factor loadings represent the extent to which a variable is associated with a factor. The variables were examined for their factor loadings. All the factor loadings were found to be above the value of 0.5. Therefore none of the variables were excluded from the analysis and all the variables were retained with their corresponding factors. As a final step of Exploratory Factor Analysis, the five factors derived were named in such a way that the name reflect the characteristics of the variables loaded to the factor. Table 3 exhibits the final factors along with the variables loaded onto them. The five factors derived are found to be explaining a total of 78.064% of the variances in the data considered for the study.

Table 3. Final factors extracted

Factor	Variables	Component
Technological Support	Accessibility to multimedia technologies	0.834
	Accessibility of online communication tools	0.802
	Adequate computer labs	0.798
	Reliability of technical infrastructure	0.794
	Facility to explore learning material using the e-learning system	0.765
	Speed of internet	0.751
	Easiness in browsing	0.74
	Knowledge and acquaintance about computers	0.611
	Easy access to internet	0.604
e-Learning Resources	Interaction of the course	0.776
	Accessibility to the e-learning resources while being in and out of the campus	0.772
	Adequacy of communication with the instructor in the e-learning system	0.72
	Adequacy of the learning materials provided	0.667
	The design and layout in which the information is provided	0.666
	Easiness in registration for the e-learning course	0.663
	Accessibility to and adequacy of online test/quizzes	0.659
	Possibility to return to uncompleted tasks	0.599
e-Learning Support and Training	Adequacy of training sessions on the usage of e-learning systems	0.842
	Openness and sociability of the support team	0.816
	Accessibility to the online help desk	0.791
	Availability of offline technical support	0.685
	Up-to-dateness of the learning materials	0.649
	Ability to measure the progress of learning	0.626
Characteristics of Student	Readiness to take part in e-learning	0.762
	Learning style	0.748
	Aptitude to find topics in e-learning system	0.689
	The extent of my satisfaction while using technology	0.685
	Understanding about the use of various parts of the e-learning systems	0.658
Characteristics of Instructor	Clarity of instructor's explanation	0.699
	The style of teaching of the instructor aiding e-learning technologies	0.679
	Capability of the instructor for using the e-learning system efficiently	0.641
	Ability of the instructor to motivate his/her students	0.638
	The approachability of instructor in general and during teaching	0.61
	Enthusiasm of the instructor while teaching aiding e-learning tools	0.605

The questionnaire used for the study had five categories to which variables were broadly classified. The results of exploratory factor analysis also provided five factors with almost the same variables loaded to each factor. The factors identified are named as technological support, e-learning resources, e-learning support and training, characteristics of student, and characteristics of instructor.

The factor technological support includes the variables such as accessibility to multimedia technologies, accessibility of online communication tools, adequate computer labs, reliability of technical infrastructure, facility to explore learning material using the e-learning system, speed of internet, easiness in browsing, knowledge and acquaintance about computers, and easy access to internet. Among these variables loaded

to the critical success factor viz. technological support, all the variables except the knowledge and acquaintance of the participant about computers was categorised as the role of technology infrastructure available as identified by the literature [10] [12] [13] [14]. This indicates that, in line with the trend across the globe, Indian students also consider technological support as one of the most critical factor in the success of e-learning system in the country. Though the variable the knowledge and acquaintance of the participant about computers was initially categorised as participant's characteristics as a student, its loading to the technological support is reliable as it is also related to the technological aspect. Accessibility to multimedia technologies and easy access to internet are found to be having the maximum and minimum association with the factor technological support (83.4% and 60.4%).

The variables viz. interaction of the course, accessibility to the e-learning resources while being in and out of the campus, adequacy of communication with the instructor in the e-learning system, adequacy of the learning materials provided, the design and layout in which the information is provided, easiness in registration for the e-learning course, accessibility to and adequacy of online test/quizzes, and possibility to return to uncompleted tasks which were initially categorized as the importance of online learning resources are loaded to one common factor which is renamed as e-learning resources. Among these eight variables, interaction of the course is found to be recognized by the students as highly associated with the factor (77.6%) followed by accessibility to the e-learning resources while being in and out of the campus (77.2%).

The third critical success factor explored from the exploratory factor analysis is e-learning support and training with six variables viz. adequacy of training sessions on the usage of e-learning systems, openness and sociability of the support team, accessibility to the online help desk, availability of offline technical support, up-to-dateness of the learning materials, and ability to measure the progress of learning, loaded to it. Among these the first four were initially categorized as the role of support and training whereas the last two were categorized originally as the importance of online learning resources but loaded to e-learning support and training. However, the misclassification of the last two variables can be validated with the help of correlation matrix of the variables used in the study which exhibits statistically high correlation of the up-to-dateness of the learning materials and ability to measure the progress of learning with the variables representing support and training aspects. On the other hand, the loadings of adequacy of training sessions on the usage of e-learning systems, openness and sociability of the support team, accessibility to the online help desk, and availability of offline technical support to the e-learning support and training factor can be supplemented with the literature [11] [12] [15] [16].

The readiness to take part in e-learning, learning style, aptitude to find topics in e-learning system, the extent of satisfaction while using technology, and understanding about the use of various parts of the e-learning systems which were categorized as the participant's characteristics as a student as identified from the literature are loaded together to form a new factor [10] [11] [13]. As all these variables are focused towards the same dimension, it is renamed considering their original categorization as characteristics of student. Among these student characteristics, his/her readiness to take part in e-learning is found to be having the maximum association with the factor (76.2%) followed by the learner's style of learning (74.8%). Understanding about the use of various parts of the e-learning systems is identified as the least associated variable (65.8%).

The fifth and the last critical success factor identified from the study is named as characteristics of instructor as all the variables initially categorized as those related to the instructor's characteristics are loaded to this factor. They include the clarity of instructor's explanation, the style of teaching of the instructor aiding e-learning technologies, capability of the instructor for using the e-learning system efficiently, ability of the instructor to motivate his/her students, the approachability of instructor in general and during teaching, and enthusiasm of the instructor while teaching aiding e-learning tools. However, the loading of these variables to the factor is comparatively lower with a maximum value of 69.9% for the clarity of instructor's explanation and the minimum value of 60.5% for enthusiasm of the instructor while teaching aiding e-learning tools. Comparing this with the factor loadings for the previous factors, it can be inferred that rather than the characteristics of the instructor, it is the technological support, the availability of e-learning resources, and e-learning support and training are critical in the success of e-learning systems in Indian higher education sector though demands for empirical confirmation.

Finally, Table 4 presents the relative ranking of critical success factors for e-learning among the students pursuing higher education in India. The most important three critical success factors (in order of importance reflected by the percentage variance they explain) are technological support, e-learning resources, and e-learning support and training. This empirically confirms the significantly high factor

loadings of the variables onto these factors.

Table 4. Total variance explained

Component	Factor name	Eigenvalue	% of Variance
1	Technological Support	19.565	57.543
2	E-learning resources	2.89	8.499
3	E-learning support and training	1.536	4.518
4	Characteristics of student	1.376	4.047
5	Characteristics of instructor	1.176	3.458
Total			78.064

The factors presented in Table 4 are regarded as the most important factors for the success of e-learning as identified by the students pursuing higher education in India with special reference to CHRIST (Deemed to be University). This is a substantial indicator of their perspective on e-learning systems. For instance, the participants who are students, prioritizing the technology infrastructure, consider technological support and the e-learning resources as important over other factors. In other words, while they acknowledge the importance of their own characteristics or the characteristics of instructors, they regard the technological support and the e-learning resources as of prime importance as this system of learning cannot exist and grow without the most suitable and relevant technology and learning resources rather than the instructor.

The critical success factors identified in this study are unique, like many other earlier studies. There are a good number of studies attempted to identify the factors critical for the success of e-learning, but these factors vary substantially from a study to another. For instance, ref. [10] acknowledged seven different factors with three derived from the characteristics of students. The remaining four are technology, characteristics of instructor, e-learning system being followed, and the support system in place. On the other hand, ref. [9] identified just four factors viz. the characteristics of students, characteristics of the instructor, the technology in use, and the content and design. Even though there are a number of persistent factors identified in different studies, there lacks a consensus on the number of factors critical for the success of e-learning. This study is of no difference. It suggests five factors among which majority are identified as important individually in different papers. The potential reasons for such differences can be attributed to the differences of studies in terms of their objectives, nature, approach, environment in which they are conducted, and so on. Further, if there is any consensus on the number of factors and their categories, their relative importance may differ from study to study. Therefore, as a whole, there is an ample scope for future research to identify the critical success factors for e-learning. The further studies in Indian context can be attempted to identify the critical success factors for e-learning from the instructors' point of view. Attempts can also be made to model the factors critical for the success of e-learning which can be generalized.

## 5. Conclusion

This study attempted to identify the critical success factors for e-learning in Indian higher education sector with special reference to the students of CHRIST (Deemed to be University), Bangalore, India. Using a convenience sampling technique, data is collected from 158 respondents and the exploratory factor analysis is employed to identify the important categories of factors critical for the success of e-learning in Indian context. It reports five factors viz. technological support, e-learning resources, e-learning support and training, characteristics of student, and characteristics of instructor as critical for the success of e-learning in their order of importance as identified by the students pursuing various higher educational courses ranging from undergraduate programmes to doctoral programmes.

The study contributes significantly to the existing literature as it identifies the factors that can have impact on the success of e-learning. This is of immense use for the policy makers in such a way that this provides first-hand information about the areas to be focused to make e-learning successful in the country's higher education sector. It enables to design and implement the e-learning system in a better way and to have systematic investments in e-learning. This systematic approach not only saves the resources of educational institutions in terms of labour, money, and time but also enhances the image of such institutions [9]. Therefore, it is suggested to focus on these factors before designing new e-learning systems or while improvising or enhancing the existing e-learning system.

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# **Disseminating Text through Cultural Technology: An Analysis With Reference To Indian Epics**

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## **Abstract**

The epics are a form of folklore where the narrations are passed on through oral interaction. Now epics are looked upon from management perspectives. They can be a platform of imparting very useful lessons for all the employees' right from the board of directors to the ground staffs. It can prove as a very useful guide for all leaders and the managers contributing to organizational excellences, who are basically involved with traits, style, responsible for signing carious contracts, handling, responsible for the behavior of the employees and also their role as facilitator between the employees and the management. For instance in case of Rama's coronation in The Ramayana, the flaw which led to the exile of Shri Ram was failure in planning strategy for the coronation as one could see problems arose in the last moment. However, with the advancement of technology, assimilation of texts has become much easier. The original texts were written long ago and it becomes very difficult to retrieve them in original form. Digitalisation is the only process through which they can be retrieved. The technique of Digitalisation not only helps to retrieve the epics, but also functions in a much multidimensional way. Therefore the paper would emphasizes on the following points: Popularising epics through social network, Marketing the texts through Digitalisation, Retrieving the lost archived texts, Incorporating the epics in research and Presenting them in soaps, animated forms

**Keywords: Digitalization, Epics, archive, texts, manuscripts**

## **1. Introduction**

Interpersonal communication originated more than 35,000 years back among human beings after which different forms of oral, visual and aural modes of communication developed which resulted in emergence of chirographic forms of language. Technological inventions took place in the second half of 19th century which gave rise to telegraphic, telephonic, gramophonic and photographic technological means of communication. 20th century witnessed the surge of radio and film media. It was during the middle of the last century, cybernetics and electronics development took place, and computer was invented. After which there was no looking back. The satellite technology, cell phones followed soon after, which brought revolution in the global exchange system. The highest point was reached when Tim Berners-Lee gave the idea of World Wide Web (www) in the 90's which connected millions of users over the world. There are various techniques that are quite prevalent like Archaeological GIS, digital historical mapping, literary text mining, etc which shape our understanding of our classical texts. Digital communications have succeeded in overcoming all types of barriers and permit scholars of literature in exploring the epigraphical inscriptions. It is beneficial to Archaeologists. They can locate their inferences on digital historical maps. Philosophers can explore their technique and now they can argue with improved methods of their search. India is abound with very rich oral traditions comprising of folktales, regional myths, and legendary narratives of warriors, places, history. The oral traditions have proved to be enriching sources



that provide moral education and they entertain the mass especially young children in the form of bed time stories. In this way they uphold the rich, versatile, unique culture as well as customs and traditions. Digitalisation has in fact brought about a revolution in culture amalgamation. Rest of the paper is divided in following section. Section 2, discuss about popularizing epics through social network, Section 3 explain Marketing the texts through Digitalisation. Section 4 explains the technique to retrieving the lost archived texts. In Section 5, we will discuss how these Epics can be incorporate with research. Section 6, discuss how it can be present in the form of SOAP or Animated form.

## **2. Popularizing epics through social network**

Epics find an important place in the world history. They were written long back and social media is a very powerful media to popularise them [1]. There are Traditional media like theatres which are more credible and have impact on the audience because they are considered to be media for diverting the minds of audience which are quite conventional and make them modernize. They work with an objective of informing, educating and entertaining the audience. Folk media is a term that conveys the concept of new communication methodology thereby preparing the audience in accepting the digital mode of media in a very positive way. In the present era, an increasing number of academicians are inclined towards religion and online research provides them with ample opportunities. At times transformations of content do take place when the subject is accessed online. Even though this transformation looses the original content, yet the readers can get information through various websites [9]. There are numerous online websites devoted to religious studies and epics which are very interactive. They form a common platform for the users where they could post their inquisitiveness or any query [10]. It forms a sharing platform too where users could share their own divine experiences and get enlightened about the epics. Social media provides space for debates among the believers and non believers who raise the authenticity of the epics like Ramayana and Ram or Mahabharata or Krishna. In the process of step by step learning, the users could easily enhance their learning process and feel enriched. In India, Hinduism and Buddhism is a household name but it is quite an unknown term for people of other countries who do not seem to know about it.

It is obviously due to the media who made them a household term. Similarly Lord Rama and Krishna came to be known by people all over the world. Sometimes it was due to media that Tibet made headlines when there was any scandal or maybe the ISCON Temple portraying Indian gurus. Therefore it cannot be overlooked that digital media has played a major role in popularizing the Indian epics due to which it is made available to increasingly number of people in Europe America and other continents. Hinduism is followed by people of Asia like India, Nepal, Sri Lanka, Mauritius, and Buddhism is followed in Asian countries like China, Japan, Thailand, Korea etc and now people in America and Europe have joined the Asians in propagating the essence of Gita through various preaching which are available in digital media. A large number of Tibetans migrated to various corners of the world which led to popularization of texts of Buddha known as Jataka tales. As a result people took interest in them and their culture and their religion was accepted. There are as many as 200 Centers of Buddhist learning in Taiwan where as in France, people prefer calling themselves as followers of Buddhism than a Jew or a Protestant. The theory of Karma which means one's actions and the consequences of those actions have become so popular that people especially Europeans and Americans use it as any vowel or consonant. The term Dharma, meaning duty, Ahimsa meaning Non violence. Buddhism has maintained its stand of giving the universal philosophy to the world through its teachings. These are conceptualized by the Buddhists as valid and also it could be used by common people irrespective of their economic, social or historical backgrounds. The concept of 'ahimsa' is more related to nonviolence and it is seen much from the environment and ecological point of view. It also talks about connectivity with living beings, loving them and taking care of them without hurting them. This practice is propagated through digitalisation and makes people access them and practice them in their daily life.

## **3. Marketing the texts through Digitalisation**

Ample amount of revenue opportunities can be created through Digitalization. It has not only helped in reducing the cost of the epics which are otherwise high priced, it has also created revenue opportunities for millions of unemployed youths. The epics consisting of creative work on the basis of investing zero marginal cost on publicizing through media. All one needs to do is just to open an account online and get

started. Therefore Digitalisation has enabled the users of marketing the texts in a much effective way. For example Amazon and Flipkart are the best online marketing sources of epics and texts. It helps the viewers to look for the texts they would like to get and make an order online [6]. The text gets delivered to them as per the address that they have given. This system is very easy, quick and reliable. Secondly, with zero investment on publicity and very less investment on distribution it would successfully create revenue opportunities to the seller. Apart from this facility, it helps in protecting the piracy of the texts. Plagiarism can be stopped to a certain extent. The publishing company or the commercial sellers can consider it safe by selling the texts through digital mode and they get the direct profits which unlikely happen when they sell their texts through various franchises in different places [7]. As a result the sellers would be more interested to bring out their new texts and epics to the market which would definitely benefit the sellers as well as the buyers. The customers get these texts without going anywhere thus saving the cost of transportation. Therefore on record, digitization has helped the online market to increase the growth of various texts and epics which are written and help the customers by making them available [8].

#### 4. Retrieving the lost archived texts

As it is known that the Epics are written long ago. Ramayana was written by Saint Tulasidas and Mahabharata was written by Ved Vyas in different Yugas, Traiteya and Dwapar respectively in palm leaves. So it is very natural that the original texts have Well the Vedas were transmitted orally for thousands of years before being written down and Mahabharata etc. all these were written on palm leaf manuscripts. Every 10 years it needed renovation which they did by copying the valuable texts onto new palm leaves and discarding the old scriptures into sacred rivers. After sometime, people used to throw away the manuscripts into rivers or burn them on Sankranti which resulted in loss of the original manuscripts. However some rulers would get the scriptures inscribed on copper plates which are present till date in temples. After that when paper came, the manuscripts were copied to papers. During British rule, Hindu scriptures were copied and published in Newspapers. Due to this numerous copies of scriptures could be retrieved. With advancement of modern technology, preservation, restoration and promotion of epics and texts has been possible which has efficiently preserved our cultural heritage. Digitalisation involves encompassing and representation of every types of materials whether it is textual or it is audio visual forms into its holistic mode. The http or World Wide Web (www) has successfully reached the common people and a wide range of activities could be conducted with its access. Digitalization of ancient texts, manuscripts and scriptures offers accessibility to various libraries which is made available to a wide reader group and it also aids in conserving the old documents. Museums too can exhibit these texts and scriptures. The online users could easily access the digitalized document easily or search them online by enriching them by various search engines that are easily available on internet. This has benefitted the libraries which have been motivated to develop digitized manuscript's management system.

#### 5. Incorporating the epics in research

Manu, the lawmaker has stated that the king appoints an ambassador, the army depends on its Commander and the subjects are dependent on the army in the same way as the Government of the kingdom relies on the King and finally the war and peace completely depends on an Ambassador [5]. How correct the statement is for the religion that originated and followed in India i.e. Hinduism and Buddhism went to Nepal, China, Korea and Japan. A cultural high power delegation from South Korea visited Ayodhya to revive two millennia-old ties with the temple town in Uttar Pradesh.. The South Koreans had an interesting discovery which suggested that a Princess of Ayodhya had a matrimonial alimony with a Korean King named Suro, who was the king of Kimhay kingdom or the present Korea during the first century CE. India's tradition of diplomacy of implementing extroversive interests has been continuing which dates back to ancient times which lead us to the concept of Strategic Culture. The well-known Hindu epics like *Ramayana* and *Mahabharata* can be greatest exemplar of the institution of diplomacy. In *Mahabharata* also, Lord Krishna had gone to Hastinapur as an envoy on a diplomatic mission to have a talk with Duryadhon and played the role of a mediator to avoid war between the Pandavas and the Kaurvas. The war itself was termed as Dharmayuddha meaning War of Righteousness which was fought with well- defined norms with highly efficient diplomatic contact between the two

warring sides. The concepts of immunity and amnesty were well established and were respected. A diplomat needs to be treated with dignity and respect. In today's world, an ambassador is a diplomat who pursues the interest of his own country with other countries by implementing the policies of the state and adopts different techniques of strengthening the public relations and he / she participates in high level social gatherings and attends public functions. It's true that role of international relations has undergone remarkable change in the context of changing power environment, nuclear policies, technological revolution and the world faces many more challenges regarding international security, disarmament, terrorism global warming and many more. The role played by Lord Krishna visualizes his wisdom and vision and terrific technique of diplomatic practice which is also suggested by Manu, Kautilya, Shukracharya, etc. They certainly provide a meaningful input for the refinement of modern trends of diplomacy. The *Mahabharata* is considered to be the notable work of the diversity of Indian and Hindu thought in existence. Lord Krishna, at the same time recommends a different approach of using treachery and deceitful strategies in order to retrieve back the moral cause.

Rama, who is the protagonist of this epic, displays extraordinary qualities of a leader. For instance, when Devi Sita was kidnapped, his condition was unconsolable, yet he maintains his dignity and composure. He handled the situation in a very mature way with his head high never lost patience for even a moment. It was never an easy task for someone who is fulfilling the promise of his father to go exile for fourteen long years with his wife and brother. His love and commitment for Devi Sita was incredible. Everyone knows that he took revenge but it was not of that kind which could have been done by an ordinary person. He gave Ravana numerous chances to return his wife to him. The beautiful Ramsetu was built under his leadership and he crosses the sea to reach Sri Lanka in order to rescue her. Tulsidas's Ramacharitmanas explains the reason why Ravana needs to be given the death penalty which was quite logical. Even though he had various noble qualities, yet the bad qualities superseded those virtuous qualities. Rama shows his leadership skills by saying that a person need not be condemned and shunned if he possesses bad qualities. Rather one should condemn those qualities which made brought a human to that level, not the person. This quality can be implemented by a corporate leader who believes in spiritual leadership.

This epic Ramayana, is not just a story only to be told as a grandma's lullaby or heard for entertainment, rather it provides immense opportunities to explore and analyzed from different perceptive. New research can be carried out on Leadership and management from this most popular epic.

## 6. Presenting them in soaps, animated forms

Digitalisation of epics took a new dimension when it was given the form of soap. The great Indian epic, The Ramayana was first aired on Indian National television Doordarshan from 25 January 1987 [11]. It became so popular that nearly eighty to one hundred million Indians irrespective of age group, ethnicity waited every Mornings on Sunday to watch each episode that was being aired [12]. It continued till 31 July 1988. It was a 78 episode series which proved that epics still hold place in mind of Indians. After that another Indian epic followed suit which was Mahabharata which was directed by B.R. Chopra and was more lucrative and lustrous. It also succeeded in making everlasting impact with Indian audience [13]. After this there have been so many remakes of these epics. The soaps of Devon Ke Dev Mahadev were immensely popular among the Indian audience. Interestingly to cater the children's viewing animated versions of the epics were aired on television like Shri Ganesha and Hanumaan. It was hugely popular among the children.

## 7. Conclusion

Therefore Indian epics have proved to be source of guidance and inspiration other than providing scope of ample research opportunities and Digitalisation has proved to be boon in disguise [14]. It has aided in popularizing them and making the readers aware about our rich epics, marketing the epics successfully that is very quick and easily available, retrieving the archived texts for the readers and bringing out visual depiction of the epics in the form of soaps and animations.

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## Case Study of Adapting AutoCAD, BIM and VR Software Used in AEC Industry

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### Abstract

The evolution of information and communication technology (ICT) has had a significant influence on our life in all aspects. For the successful implementation of ICT in the Architectural, Engineering, and Contractor (AEC) industry, the innovation of the AEC industry participants using ICT tools and systems is the key. So, it is necessary to motivate AEC industry participants by changing their cultural behaviors instinctively programmed resistance to any form of changes. Therefore, this paper presents a framework of measuring the productivity of using a new Building Information Modeling technology and comparing with the productivity of using a traditional AutoCAD tool. Using a case study of a conceptual residential housing project, both BIM Revit Architecture and AutoCAD software training performance was measured and summary results was reported in this paper. In addition, using Modelo Revit Add-in software, it is introduced to convert the 3D Revit BIM model into a VR-ready model for Google Cardboard.

***Keywords-component; 3D Modeling; AEC; Revit Architecture; BIM; VR***

### 1. Introduction

The evolution of information and communication technology (ICT) has had a significant influence on our life in all aspects. Although the technology itself is an important matter, Weippert and Kajewski [1] emphasized the importance of the human factor especially for the successful implementation of ICT in the Architectural, Engineering, and Contractor (AEC) industry. Eventually, Weippert and Kajewski [1] insisted that the innovation of the AEC industry participants using ICT tools and systems will determine the success of the technological developments in the future. In this perspective, they found that it is necessary to motivate AEC industry participants by changing their cultural behaviors instinctively programmed resistance to any form of changes.

There have been numerous technological improvements available for the AEC industry. However, the AEC industry is enormously slow to adopt those available technologies [2]. For the successful technology implementation in the AEC industry, Davis and Songer [2] recommended a people focused change model instead of a technology focused model because AEC industry participants are the drivers of technology adoption and change.

Davis and Songer [2] insisted that the importance of cultural issues for technological implementation within the building and construction industry has been neither studied enough nor documented well. Therefore, they studied individuals and their change processes for successful implementation of technology change and proposed a social architecture factor model to promote use of new technologies based on a people focused technology implementation model.



## 2. Virtualization Technologies in the AEC Industry

### 2.1. Building Information Modeling

It is well known that visualization is an effective tool to improve the understanding of complex relationships and systems [3, 4, 5]. Having an embodiment of construction projects prior to its implementation was an incentive to move from computer aided design (CAD) towards advanced evolution of CAD or 3D modeling. This technique is used by Architects, Engineers and Constructors to build a digital virtual model of the building prior to the actual construction. Technique known as Building Information Modeling (BIM) can be used for planning, design, construction and operation of the facility in order to identify the issues. Although its definition for the majority of the users as stated, is finding issues prior to the performance of the actual construction, every participant have their own perspective on how it can facilitate projects process. Aranda Mena [6] mentioned that BIM is a 3D graphic software application as well as a process for designing and documenting information on buildings.

### 2.2. Virtual Reality

There are many software that you can convert your 3D models into Virtual Reality. Iris VR, Blender, VR Sketch, Yulio, and Modelo are most well-known software converting the 3D model into VR. Among them, Modelo is a web-based multipurpose platform supporting Virtual Reality platforms such as a handset-based headset, Google Cardboard. It also supports desktop, mobile, and tablet-based interfaces. First, it is required to upload your model into Modelo to change your model into VR. Then, using Modelo, three different files such as Revit, SketchUp, and Rhino files are easily converted into VR. Once 3D models are uploaded to Modelo, the users can easily have a VR experience using a simple VR device. Figure 1 shows the screenshots uploading and converting a Revit 3D BIM model house into a VR-ready house for the Google Cardboard.

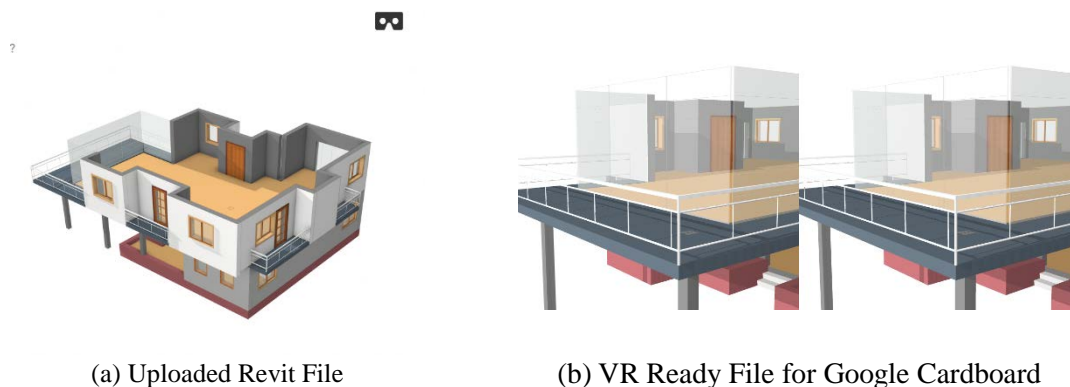


Fig. 1 Screenshots for Converting a Revit BIM Model to VR Using Modelo

### 2.3. New Technology Implementation Issues

Professionals in the AEC industry have been looking for many techniques to minimize costs and time due to human errors, mistakes and uncertainties in construction projects. It is well-known that the BIM technology has been very effective to achieve these goals and at the same time has enhanced projects quality. However, it is also true that there are many professionals in the AEC industry who are still hesitating to become BIM users. Challenges with regard to implementing BIM are mostly divided into technical, social or legal, process related problems and implementation costs. Initial implementation costs and required training time for BIM might be a common barriers to the AEC industry.

One of the most common barriers for the implementation of BIM is the issue of a productivity loss. Obviously, it is inevitable to suffer productivity during the training period. However, based on several



case studies, Rundell [7] found that a significant productivity increase after relatively short training periods. Table 1 shows the results of time spent comparison between new BIM Revit Architecture and traditional CAD technologies performed by Lott + Barber Architects. It indicates that the implementation of new BIM technology increase productivity by saving overall time spent approximately 37 %.

Table 1. Productivity Comparison between BIM Revit Architecture and traditional CAD Tools Performed by Lott + Barber Architects [1]

Task	CAD (Hours)	BIM (Hours)	Hours Saved	Time Savings (%)
Schematic Design	190	90	110	53%
Design Development	436	220	216	50%
Construction Documents	1023	815	208	20%
Checking and Coordination	175	16	159	91%
Total	1,824	1,141	683	

In summary, correct understanding of the relationship between productivity and new technology implementation in the AEC industry will remove a potential barriers for the successful implementation of the technology. Therefore, the researchers studied graphic design, BIM, and Virtual Reality tools useful for the AEC industry as a framework measuring the impact of productivity.

### 3. Research Methodology

One of the main problems for investing in BIM is training the staff and enhancing their knowledge in the AEC industry. The intent of this research is to evaluate the outcomes of using a BIM 3D modeling software and a traditional CAD software. The method used for quantifying BIM software time efficiency in this case study is simple working hour comparison for each task. The amount of time spent for students to learn and understand the basic drawing tools in Autodesk Revit Architecture and AutoCAD (traditional CAD software) to perform a housing project modeling was compared.

### 4. Research Outcomes

The researchers measured the time required for training and using Revit and AutoCAD to complete a 2 level residential housing project, and compared the project elements completed. AutoCAD, as a non-BIM (2D) software was simpler in learning and needed less instruction on different features. However, while working a residential housing project, AutoCAD took more time in overall and required substantial attention to draw the exact details compared to the Revit BIM software. Table 2 below shows the amount of time applied to complete each section of the project.

Using AutoCAD, Project tasks were completed within assigned time including a 2-level plan with exact columns and doorways. However, the AutoCAD model was missing many components such as windows and doors, dimensions, and grids. In addition, it has only one section and one elevation without any details which was required for the project such as 3D within the assigned time.

Initially, Autodesk Revit took a little more learning hours to learn various functions in the main commands and various aspects of many drawing tools. However, the total time used to draw the project was much less than AutoCAD. It showed that there was a significant difference in terms of the progress and amount of work completed in a couple of hours. One of the main features in the outcomes was the 3D model of the project completed with Revit Architecture software as shown in Figure 2.



Fig. 2 BIM 3D Model Used for Productivity Study

By comparing the project completed tasks, it indicated that Revit had a significant impact on project details and amount of time allocated to complete each part of the project. Table 2 shows the number of hours required to train and complete each project task using AutoCAD and Revit. Average of total hours in AutoCAD was 19.1 hours and for Revit was 8.2 hours which indicates a considerable difference.

Table 2. Working Hours Comparison between BIM Revit Architecture and Traditional CAD Tools

Task	Trainee AutoCAD (Hours)	Trainee Revit BIM (Hours)	Trainer AutoCAD (Hours)	Trainer Revit BIM (Hours)
Level 1	8.5	3.8	2	2
Level 2	6.8	3.4	2	1
Section	1.9	0	1.5	0
Elevation	1.8	0	1.5	0
3D	-	1	-	1
Total	19.1	8.2	7	4

## 5. Conclusions

The outcomes of a simple case study using a BIM Revit and traditional AutoCAD software shows a significant differences in working hours to complete assigned tasks for modeling a residential house project. An average working hours saved was 57% to perform the assigned tasks using Revit Architecture BIM software among the trainee group. The outcomes of the Revit project were more comprehensive and detailed. In conclusion, adopting an advance information technology tool will require initial time and efforts for students to learn functions and get familiar with a new user interface. However, it was significantly improve the productivity by saving time and producing a better product during the study period.

In addition, residential housing projects using Autodesk Revit software can be easily uploaded on the Modelo website and using Modelo Add-in software, the 3D Revit models can instantly converted into VR-ready models for Google Cardboard. This will benefit the users to review their designs and improve communications.

## 6. Research Limitation and Recommendations

This study was performed as a framework using a case study including a small sample size. Because of this limitation, the above conclusions cannot be generalized. However, it is recommended to study the same research with a large sample for more meaningful conclusions.

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## **Evaluation of Framework System for Making Safety Training VR Simulation**

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### **Abstract**

This thesis proposes and assess the system framework to produce VR safety education simulation. The framework of this thesis consists in three modules: 1) Collaborative Distributed Safety Learning (CDSL), 2) Hazard Inspection and Safety Cognition (HISC), 3) Active Safety Game-based Learning (ASGL). The result from the system assessment of VR simulation, which was personally produced with these three frameworks applied, is more effective to improve the car safety drive cognition and safety training than existing safety education.

***Keywords-virtual reality; VR simulation; framework;***

### **1. Introduction**

High level education is required in order to prevent safety accidents and conduct duties effectively in disaster. Because hazard disaster situation can't be encountered except actual disaster scene, safety knowledge gets acquired through various safety accident cases, and improve on-site response capability with various tactical training. But these type of training takes too much time, and gets restricted to limited training space and location. Thus, VR technology, which is safe and reenacts real-life situation, has been applied to safety education simulations and produced them consistently for safety, repeatability, and economical reason. Safety education simulation using VR carries more weight on learning and delivering on educational information than regular VR contents, thus the research on framework for higher efficiency is necessary. In this thesis, safety education VR simulation platform was created and, based on the framework to create systematic safety education VR simulation, and assessed framework system. This thesis will be considered as a useful reference during VR simulation platform development stages.

### **2. Frame Work of Safety Education Based Virtual Reality**

Safety education based on VR simulation is consisted to three modules. First, CDSL is a traditional education method that generally provides safety educational information. Second, HISC applies driver's driving information and each testers experiences potential dangerous accidents indirectly through VR. Lastly, ASGL is produced in a VR game form to build behavioral know-how, countermeasure, and other experiences. Read Figure 1 for summary. [1]



Fig 1. The VR-based safety education system framework

## 2.1. Active Safety Game-Based Learning

In this thesis, safety drive training simulation was built based on three educational methods: CDSL to learn basic information, HISC to experience indirect accidents, and ASGL to learn how to handle accidents. The main discussion is ASGL module. ASGL consists two stages: safety game preparation and individual safety game. First mission in safety game preparation is to write a security education scenario by making 3D model script. 3D security scenario reflects a real-life scene that includes unsafe site condition and unsafe drive behavior. Testers for individual safety game can select accident story in VR mode. A Warning message appears if there is an error or unsafe incident occur during the game. Testers can improve safety knowledge effectively and usefully in their daily life. Read Figure 2 for summary. [2]

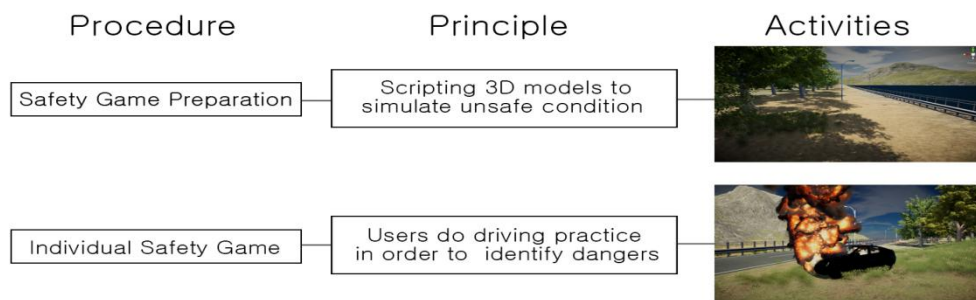


Fig 2. Active safety game-based learning

## 3. Assessment Target: The Car Safety VR Simulation

The car safety VR simulation was made based on the framework which was proposed earlier. This VR simulation consists three forms: providing basic information, indirect accident experience, and accident response training. Accident situation was set to flood accident, rain accident, fire accident, and speed accident. Testers can select each accident situation and turn on VR simulation. You can view the setting in Figure 3..



Fig 3. The Car Safety VR Simulation

## 4. System Evaluation

The conclusion was drawn after the assessment on framework system in order to grasp the strength and weakness of VR simulation system.

### 4.1 Evaluation of Framework System

Assessment was done with questionnaire to organize the result. In first step, 15 participants will join in a VR system prototype to test its applicability. After that, an interview with participants is executed for usability evaluation. then set assessment items after questionnaire discussion. Questionnaire was written based on five standards Dustin B. Chertoff (2010) suggested[3]: 1) Ease Of Use (Sensory), 2) Visual Output (Sensory), 3) Safety Cognition (Cognitive), 4) Safety Memory (Affective), and 5) Safety Accessibility (Active). In second step, the total of 20 testers were divided in half to make two groups. First group ten testers progressed safety education with The Car Safety VR Simulation that was made for this project, and second group ten testers progressed safety education with traditional method. Then all testers took the test about the car safety; the framework system that the thesis proposed was assessed based on the result. Read Figure 4 for summary.

Step1	Step2	
Practicing using VR	Group1 VR Method	Group2 Traditional Method
Questionnaire interview	Safety Test	
Usability Evaluation	Result Evaluation	

Fig 4. System evaluation process

### 4.2. Evaluation Result

The assessment of the framework system was done in Likert Scale to digitize the result: 1–very unsatisfied, 2–unsatisfied, 3–neutral, 4–satisfied, and 5–very satisfied. Most of testers judged that the Car Safety VR Simulation based on framework system brought higher empirical educational effect. They especially judged that ease of use was outstanding compare to traditional educational method, and safety cognition due to visual output had increased. Also, there was outstanding results on safety memory. But safety accessibility was lower than traditional education method. Because of VR contents' characteristics, space, hardware, and many elements may have brought this result. Table 1 summarizes the questionnaire articles, questionnaire, and the result.

Table 1. Summary of questionnaire and interview result

Article	Issues	Mean
1.Ease Of Use (Sensory)	Did you feel ease of use when you tried to interact with VR system?	4.2
2.Visual Output (Sensory)	How realistic was the virtual output in this system?	3.9
3.Safety Cognition(Cognitive)	Does educational contents from this system contribute to safety cognition?	3.7
4.Safety Memory(Affective)	Did you think this system helped to improve on safety memory?	3.8
5.Safety Accessibility(Active)	Did you think this VR education was more accessible than traditional education?	3.1



## 5. Conclusion

The thesis proposed and assessed the system framework to create VR simulation safety education platform. System framework was consisted with three modules. First, CDSL is the traditional education method, second, HISC increases safety cognition indirectly, and third, ASGL implements safety education through games. In this thesis, the Car Safety VR Simulation platform was created based on three modules. Usability was assessed to prove framework practicality. Assessment was progressed with two methods: using VR simulation platform and traditional education method. As a result, virtual reality platform based on framework that the thesis proposed was more effective and easy to use to improve car safety cognition compare to existing safety education. Also, the result brought the possibility of safety education and responsive education. Subsequent research is planning to assess the feasibility by creating safety education VR simulation for disasters such as fire, earthquake, hurricane, typhoon, etc. based on the framework system presented in this thesis.

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# **Aesthetic Effect Expressed by the Theory of Truth and Fiction in CUC Technique: Focusing on Animation Movie**

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## **Abstract**

The objectives of this study are to evaluate the Cucoloris (CUC) technique expressed in the animation movie, Chinese theory of truth and fiction in the viewpoint of the video direction technique and the philosophical aspect and analyze the aesthetic effect. In order to achieve these objectives, present study describes the aesthetic effect regarding the theory of truth and fiction and the juxtaposing truth and fiction among Chinese classic aesthetic theories. In addition, several animation movie scenes utilizing CUC technique are selected to analyze the aesthetic effect using the theory of truth and fiction and the juxtaposing truth and fiction. The results indicate that the scene direction using the CUC technique enriches the emotion of a character and is effective in delivering the story and scene production. This directing method expands audiences' fun and excitement to enjoy an animation movie through the collision between the visual effect and psychological factor. What's more, it is meaningful to apply CUC technique on scene directing method, which can explain the aesthetic characteristics of the theory of truth and fiction.

**Keywords-***CUC technique; theory of truth and fiction; juxtaposing truth and fiction; animation movie*

## **1. Introduction**

Recent animation movies deal with various cultures and topics. And experimental directing techniques are used along with technological development and innovation. Especially, stories and scenes are often maximized by using the Cucoloris (CUC) techniques. CUC technique makes viewers imagine the meaning of a scene by putting a shadow with particular shape on a person or background, like the silhouette animation made using the shadow of paper. Animation movie scenes using this expression technique can be described as "juxtaposing truth and fiction" referred to Chinese theory of truth and fiction. In the theory of truth and fiction, juxtaposing truth and fiction deals with the problem of 'fiction' and 'truth' and draws artistic effects from artistic expression, which is one of the Chinese artistic aesthetics.

In this paper, the theory of juxtaposing truth and fiction is described, and representative animation movies scenes expressed by CUC technique have been selected to analyze whether they satisfy the artistic aesthetic standard of the theory of truth and fiction. Finally, it shows that the "juxtaposing truth and fiction" can be regarded as the theoretical basis of the CUC technique application in image direction.

## **2. Theoretical Background**

The theory of truth and fiction is the core of the ancient art dialectic philosophy and it is one of the key principles of Chinese classical aesthetics. Author in [1] studied the theory of truth and fiction in the traditional arts and concluded that juxtaposing truth and fiction is an important aesthetic characteristic in the field of art. And the juxtaposing truth and fiction is regarded as the core of the theory of truth and

fiction referring to the aesthetic characteristics that arise at the boundary between 'truth' and 'fiction'.

The advanced philosophers explained their philosophical thoughts through artworks. Conversely, their philosophical thoughts had a profound impact on the development of later arts. The relationship between 'truth' and 'fiction' were brought up by advanced philosophers in China. For example, even though the original voice of clock bell and chime stone could already bring the beauty, the ancient artisan did not simply make a frame of 'gouyu', and instead the whole instrument was regarded as an unified image to design. In detail, the beast shapes such as a tiger or a leopard was placed under a drum, which makes people see the shapes of tiger or leopard while listening to the drums. The fictional combination of shape and sound in people's brain makes them think the tiger or leopard was barking. Furthermore, the carving of tiger or leopard on this instrument became more vibrant and the sound of the drum was shaped. Especially, the appeal of the whole artwork impressed on audiences can be doubled. They thought that the image created by an artist was "the truth" and people's imagination was "the fiction". And the boundary of the shape created by "the truth" and "the fiction" was the combination of the truth and the false.

### 2.1. Definition of CUC

It can be said that CUC is a silhouette created by illuminating the outline of a letter or an object, as presented by Fig.1. And the silhouette is a shadow expression, which is also called 'black shadow' with many advantages, such as simple tool requirement, temporal and spatial limitations, and fast production time in addition to the simple and bright decoration function. It was a kind of royal palace art and popular in Europe at the end of the 18th century.

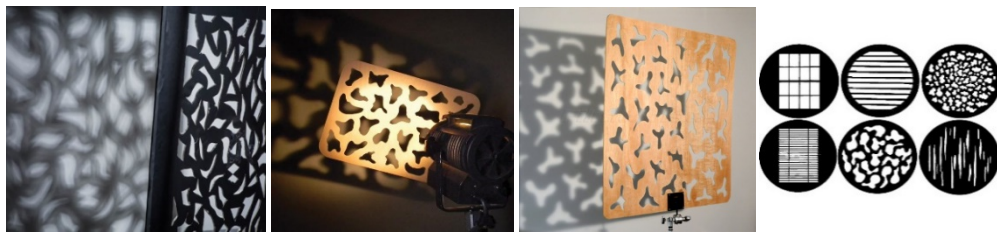


Fig. 1 Various shapes of 'Cucoloris' made by diverse materials.

The direction using the CUC technique was pioneered by George J. Folsey (1898-1988), a photographer. When taking pictures, the tone of shadow in the shadowed area on an object was adjusted to highlight the effect of the bright skin color and white shirts of an actor, which is shown by Fig. 2. In addition, one ladder was fixed in front of the lighting instrument, by adjusting the distance between the light and ladder, the size and softness of the projected shadow were controlled to highlight the brightness of an actor's face and the white shirt has gone dark because of the shadow of the ladder. Afterward, the scene direction using CUC technique has been greatly expanded and used in various fields.

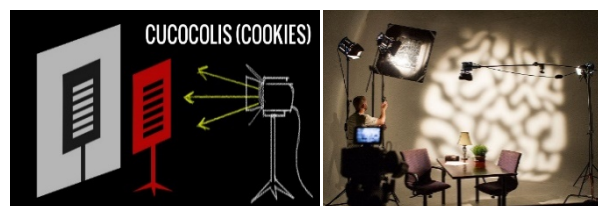


Fig. 2 Creation of projected shadow using a CUC technique.

### 2.2. Aesthetic Effects of CUC Techniques

CUC technique is a shadow direction which uses illumination. In [2], Herbert Zettl concluded that the lighting has an outward-oriented function and an inward-oriented function, which indicates that the shadow direction made by the lighting can be viewed or interpreted differently depending on the imagination of an observer. Moreover, he explained that it would be possible to give diverse interpretations of the imagined object through the shadow and make various psychological descriptions using it.

Ross Lowell in [3] said that the enriched imagination of the people in the dark became a magical material. It means that the viewer's imagination can be stimulated through the shadow made by the lighting and the fun of appreciation can be effectively emphasized, which can be illustrated by Fig. 3.

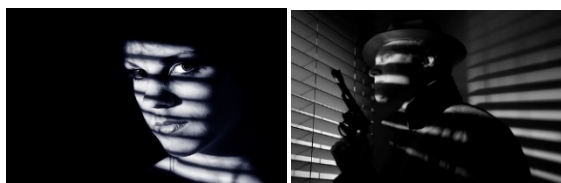






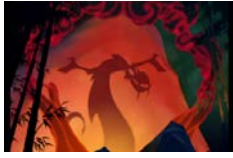
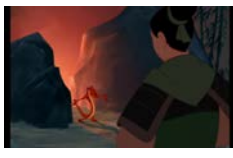


Fig. 3 Examples of shadow for aesthetic effect.

### 3. Case Study

In present paper, several animation movie scenes are selected to analyze the aesthetic presentation of juxtaposing truth and fiction, which is a core of the theory of truth and fiction. The selected movies for analysis are as follows: <Hotel Transylvania>, <Mulan>, and <Toy Story>.

A successful character must have five features, which are innovation, creativity, artistry, fun, and exaggeration [4]. Animation movies utilizes CUC techniques to express these five elements for a character. For example, a virtual image created by the CUC technique is expressed by a very dark and simple silhouette. Following scenes presented in Table 1, expresses much more than a viewer imagines or it is expressed much less than a viewer imagines. This creates sameness or difference between audiences' imagination and actual presentation. Moreover, it gives a deep impression on audiences and stimulates fun. The characteristics of a story or a character are strengthened by a scene expressing the effects of "juxtaposing truth and fiction" which can bring dramatic direction.

Table 1. Analysis of animation movie scenes

Classification	Scene using a CUC technique (A 'fiction' part of juxtaposing truth and fiction)		Next scene in scene using CUC technique (A 'truth' part of juxtaposing truth and fiction)	
1		A scene describes a panic atmosphere in <Hotel Transylvania>.		Actually, it describes a father who loves his daughter.
2		A scene directs to make people imagine a terrible monster attacking people in <Hotel Transylvania>.		Actually, it expresses a friendly monster.
3		A scene suggests the appearance of a very scary dragon expressed in <Mulan>.		Actually, a cute little dragon appears.
4		A scene describes the appearance of a scary monster in <Toy Story>.		Actually, it describes a lifeless toy.

In <Hotel Transylvania>, it is directed to make people imagine a scary monster that will attack a young baby. However, the next scene introduces a father who loves his daughter greatly. These two scenes are designed to emphasize the character. Another scene in <Hotel Transylvania> use the same technique, which shows that a terrible monster tries to attack humans, but the following scene describes a very kind

and friendly person. This scene can also be found in <Mulan>, in which a very scary dragon was firstly displayed, but actually it introduces a very small and cute dragon, which adds the disappointment of the character. Also, in <Toy Story>, one scene directs an appearance of a very scary monster using lighting. However, the following scene informs that it is not a scary object. Therefore, it shows a contrast difference from the imagination can bring the fun of imagination.

#### 4. Conclusion

This study examined that the juxtaposing truth and fiction of the theory of truth and fiction is a theoretical basis which helps people to understand the direction using CUC techniques. Firstly, the juxtaposing truth and fiction, which is one of the most important principles of Chinese classical aesthetics and a core ancient artistic dialectical thought, was introduced. And then with the study of juxtaposing truth and fiction, as one of the effective aesthetic features in artistic expression, the video direction using the CUC techniques could be interpreted in the viewpoint of Chinese theory of truth and fiction. The CUC technique or the artistic expression method using the shadow can increase the cinematic quality and aesthetic value by stimulating the imagination of a viewer. Furthermore, it can be used for video contents (e.g., animation) and the stage art effectively. And we hope that there will be more valuable studies for developing various cultural contents by conducting an aesthetic analysis on artworks using the CUC technique.

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## Analysis on the Chinese Market of Children's VR books

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### Abstract

Children's VR book market not only can directly reflect the market demand for VR books and the trend of children's reading, it also reflects the issues that need to be solved in many aspects such as science and technology, economy, society, education ecology, children's physical and mental health. However, these issues have not been studied in depth by relevant scholars in China. This study attempts to understand the current situation and problems of Chinese children's VR books through the research methods of literature collection, field research and Interview. Through the survey of the book market, this research found that the children's VR books market is huge. However, there are a series of problems hidden in it, such as technical barrier, insufficient research, limited types, no age stratification, and no effect evaluation criteria. Therefore, combined with China's national conditions and national policies, this paper proposes that Chinese children's VR books need to speed up research, set quality standards to guide the development of Chinese children's digital reading in a healthy and feasible direction.

**Keywords-** *Virtual Reality; VR Book ; Children's Book; Chinese Market*

### 1. Introduction

Virtual Reality (VR) books are one of the swiftest growing trends in children's publishing business. The opportunities to engage younger readers with digital content above and beyond the two-dimensional words and illustrations on the page opens up a world of possibilities and opportunities for individuals willing to work with the technology. As a digital publishing method, children's VR books have been valued by governments and various platforms. For example, Singapore's augmented and virtual reality app and platform SnapLearn started to offer AR and VR enhancements for book publishers from 2016. Virtual reality techniques in novels such as Harry Potter and Parramon's Alice in Wonderland is famous and welcomed by children from all over the world. VR version of "Dinosaur World" almost every child's favorite adventure journey. In order to make children interested in science and technology, China also has developed a series of VR books such as "Exploring the Arctic" published by Press of Beijing University of Technology (Figure1).



Fig. 1 Popular VR books on Chinese market (from left to right is *Harry Potter*, *Dinosaur World*, *Alice in Wonderland* and *Exploring the Arctic*)



## 2. Theory Background

VR (Visual Reality) is a new technology based on the theory of human-computer interaction. Technology plays an important role in VR research. In some previous studies the term “technology” is part of the definition of VR. For example, Klopfer and Sheldon defined VR as a “technology” that blends real and virtual world experience together. It views VR as a form of virtual reality with a head-mounted display [1]. This definition reflects the VR technology that usually included head-mounted apparatus overlaying virtual information to immerse someone into it. With a rapid evolution of technology, it refers to the computer providing users with a virtual world created through various sensory channels, enabling users to immerse themselves in this virtual world and to be free from the real world [2]. VR books can not only restore the abstract scientific concepts in textbooks through stereoscopic images, but also allow children to see the details in book, better understand certain physical and chemical knowledge, provide an environment for simulated exercises, consolidate and strengthen knowledge, so as to greatly enhance children's learning interests and learning effects (Figure2) [3].

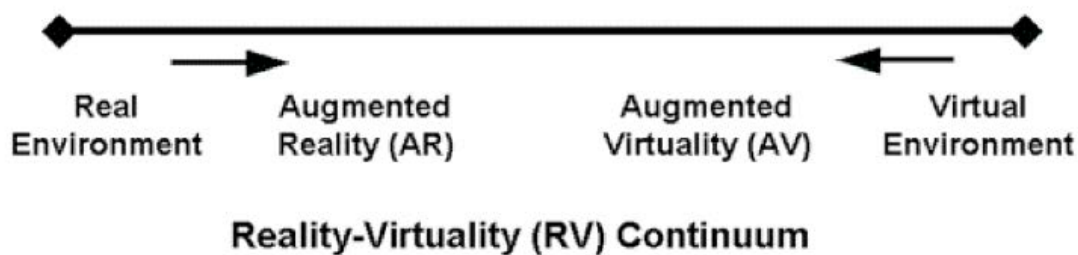


Fig. 2 Milgrams Reality-Virtuality continuum[4]

## 3. Status of Children's VR Books Market of China

The year of 2016 is the first peak period for the development of Chinese children's VR books. In 2016, Chinese CITIC (China International Trust and Investment Corporation) Publishing House launched AR&VR cross-media products such as “Science Run Out” series. In the same year, Beijing Children's Publishing House and Yi Shi interactively compiled the “Open Eyes: Dinosaur World Adventure Series Books”, and the accompanying VR glasses to achieve cross-media integration to create a virtual world of dinosaurs (Figure3) [5]. As far as we know this is the first popular science book in China that combines VR technology. After entering the traditional children's publishing market, VR books are looting the attention of parents and children with their unique “three-dimensional, intuitive, scientific and novelty”, and quickly rank among the top of the children's book sales. According to the latest market data, the average monthly sales of an VR children's book on Dangdang (Chinese online bookstore), Tmall (Chinese online shopping mall), Amazon and other platforms can exceed 10,000. Some dealers have indicated that their VR book sales can reach 50,000, while the traditional book sales volume is only up to 10,000. to 20,000 sets [6].

Ms. Victoria, the founder of Victoria AR, the world's largest AR&VR book development company, believes that the world's largest and most mature AR&VR market is in China, and Chinese parents have a strong interest in AR books. The huge market also attracts digital book developers from all over the world. In recent years, the Asian VR&AR Expo and Summit Forum held in Guangzhou (a southern city of China) every year, which means that China have been officially opens its billion RMB of VR market to over-sea capitals in order to encourage the entry of foreign investment since premier Li Keqiang emphasized that China would ardently protect the intellectual property rights of oversea companies. Otherwise, National Development and Reform Commission has also revealed that high-tech foreign companies may enjoy preferential policies such as tariff exemptions for imported equipment, priority in land use, etc. Therefore, Korean video companies have begun to cooperate with Chinese institutions to customize VR products for Chinese children.



Figure. 3 A child reader held VR glasses at the 2016 Beijing Book Fair(left), the Asian VR&AR Expo and Summit Forum (right)

#### 4. Issues on Children's VR Books Market of China

First of all, China does not pay attention to the development of original content for children's VR books. Most of VR and New Oriental education institutions such as "Black Crystal Technology" and "Time digital" are focusing on creating VR virtual classrooms to capture the VR digital all-media platform. According to incomplete statistics, the current domestic companies focusing on children's VR books mainly include Beijing's Yi Shi Interactive, Shanghai's Little Bear Nio, Shenzhen's Mo Aike, Hangzhou's Egg World, and Dalian's Xinrui and other companies [7].

Secondly, China's production technology on children's VR book needs to be improved. VR books are a kind of cross-media production. It needs to use 3D modeling and calculation to realize human-computer interaction. The virtual reality scene is relatively complicated [8], it is difficult for companies to conduct in-depth research and development.

Thirdly, Most of VR contents have no age stratification and putting on market without a certain amount of testing. Some products even use VR gimmicks to raise the price of the book. Furthermore, there is no evaluation organizations, no assessment of whether children's vision and psychology are negatively affected at present, and children's education professionals and scholars are also less involved in regulation making.

#### 5. Conclusion

As we know, children's digital books are both of cultural products and social public products. The regulation and construction of children's VR books is a public affair related to all citizens and requires laws and regulations as the basis which rely on the overall planning and coordination of government departments [9]. The Korean government has a higher level of participation in the publishing industry, including pricing. A well-made AR book at the Sasang-gu children's Library in Busan, South Korea, which was priced at only 11,000 won (¥60), even cheaper than an ordinary adult book.

What is more, market surveillance agencies should quickly establish to help long-term development of the industry. children's VR books are a kind of "technology + publishing." Digital books can motivate children's interests, but they are also a new medium that interferes reading. Although there is no empirical research on how children's acceptance of these artificial visions will change the way of brain accepting and processing visual information. However, it is certain that children's long-term use of this multimedia products can not only effectively cultivate deep reading, but also easily lead to decreased concentration and eye diseases, resulting in deviations of behavioral perception, even game migration and brain damage. Pediatricians recommend to limit the VR using time of children to 5-15 minutes.

The last point without mentioned is China's digital reading research team should invest more time in contents. According to UNICEF's 2015 statistics, there are 270 million children between ages of 2 and 12 in China [10] (the actual number is far more than '*the second-child policy*'). These children have the possibility to use VR digital products in science, language, moral education, literature, painting, etc. Therefore, Companies should try to integrate Chinese traditional stories into digital books instead of import VR books produced by other countries.

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# Application of Virtual Simulation Technology on the Practical Teaching Platform for Furniture Design

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## Abstract

Under the background of University-Industry Cooperation[1], colleges and universities can combine furniture design course teaching content and training objective, the virtual simulation technology is applied to the furniture design practice teaching platform, which can make the students realize 3D visualization[2] of simulation furniture and real-time interaction virtual objects in the process of project design. The students can accurately grasp the furniture product design effect and the furniture assessors or customer take an active part in immersive with the Virtual products Based on Real-Time 3D Modeling[3], which can also help the students improve and confirm the real-time 3D modeling and the final product Structure. The virtual techniques of Interactive 3D design and product exhibition can help enterprises save consumables, avoid the waste in the test progress and improve order success rate in certain degree.

***Keywords-component; Application; virtual simulation; furniture design; teaching (key words)***

## 1. Introduction

Virtual Simulation Technology is an interactive computer-generated experience taking place within a simulated environment (image), that simulates human multiple sensory systems, including visual, tactile and force sensing etc. There are Augmented Reality (AR) that the real-world is "augmented" by computer-generated perceptual information, or Virtual Reality (VR) that the real objects are placed in a virtual environment. The interaction between virtual and real environment can bring a strong sense of realism and on-the-spot experience to audience. The three - dimensional matching technology, by combination of factual information and real-time interactive, has good application prospect in many areas, such as television and movie industry, game development, real estate advertising, medicinal health, industry manufacturing, higher education, tourism, emergency maneuver, and military aerospace etc.

## 2. Problems in the traditional practical teaching platform in colleges for furniture design

As a professional curriculum of creative design with the need for experimental practical operation, furniture design mainly involves many critical contents: furniture function category, computer-aided design, ergonomics, furniture material and process, plastic art, color matching, structure design, environmental and spatial relation, design process management, design evaluation system, and so on.

On one side, students should understand the relation between users and furniture, i.e. the effect of human physiology and emotional needs on furniture design, and the relation between furniture product and spatial living environment. Thus, cultivating empathy and practical awareness of experiencing environment is needed; on the other side, furniture structure and its manufacturing process need strengthened memorizing and understanding through practice. Traditional teaching approach which mainly relies on lecturing by teachers or multimedia could not meet the expected theoretical teaching aims. Meanwhile, traditional teaching system could not demonstrate the evaluation on feasibility of

design scheme or operability of industrial manufacture for design outcomes, and then could not meet the expected practical teaching aims.

In order to meet the teaching demand for indoor furniture design talents, it is needed to improve practical and innovative design ability of students by using experimental teaching base and a large amount of practical teaching equipment. However, it is very difficult to purchase a complete supporting facility as there are limitation of floor area, investment cost, capital and teaching area. Consequently, students can only learn basic theoretical curriculums, only understand superficial words and pictures of materials, process, modelling, human and machine, and environment. The design outcomes of students can only stay on the drawings or concept design, which is not in line with practical production. The distance between students and vocational skills requirements has been increased. The social need for innovative talents could not be met. Therefore, colleges try to integrate enterprise resources into teaching system, and use workshops or manufacturing facilities of enterprise to complete practical teaching. But the teaching schedule for furniture design is fixed and limited, which often does not match the flexibility of enterprise project schedule. Teaching process and rules could be disturbed and changed by the intervention of enterprise due to the restriction of mentality for industrial interests. As a result, it brings difficulties and obstacles for the implementation of practical teaching for furniture design.

### **3. Advantages of application of Virtual Simulation Technology in practical teaching for furniture design.**

With the advent of virtual simulation technology, it can be effectively introduced into the practical teaching for furniture design and indoor design to improve teaching level and promote upgrade of the teaching system.

#### **3.1. Improve safety of the practical teaching**

During the study process of material application and molding process for furniture design, students have to frequently use mechanical production equipment and experimental tools. There are safety risks in misuse or malfunction of equipment. Virtual simulation technology can help students to avoid the use of high-power, high-risk, hard-to-operate equipment to protect teachers and students and reduce accidents.

#### **3.2. Save consumables and avoid waste**

In the teaching practice of furniture design using virtual simulation technology, students can use three dimensional software to establish furniture model without using real materials, select and render materials through render software, test furniture material, process, structure, functions repeatedly and compare the results through visual environment and human simulation, and complete final design under visual status. Then, use real materials to prepare the experimental project. The whole process can effectively reduce cost, avoid waste and save development cost.

#### **3.3. Three-dimensional visual experience and real-time interaction**

During the process of simulation design, students can use three-dimensional visualized technology to establish real-time three-dimensional model, visual scenes and material rendering. A series of interactions to observe and edit model structure, surface texture, and spatial scene effect can be conducted under visual environment. Moreover, simulation environment can be established through sensor or television merge software to experience all design elements, including visual sense, texture, form, structure, function and use method etc. The design effect can be observed and monitored at any time. The design efficiency can be improved.

#### **3.4. Enhance the effect of visualized display of design results**

During the R&D or visualized design process for contracted project from enterprise, Virtual Simulation Technology teaching platform breaks the limitation of time and location. The design

resource and results can be shared by both sides. There is no need to prepare real thing. Design achievements in stages can be presented three-dimensionally to contractor using visual 3D technology without the need to prepare real objects. More details of the design can be viewed clearly. Reasonable and objective evaluation opinion of design can be raised more quickly. The interaction between college and enterprise can be strengthened. The workload for 3D model establishment and rendering can be reduced significantly.

### **3.5. Reversible revision of design results**

For traditional practical design, the space for revision is very limited once error happens. Comparably, virtual simulation technology has the advantage of reversibility. On furniture design experiment, the step with observed issue can be returned and revised by computer software. It can save time and cost for design effect experiment for large furniture material preparation and complicated design.

## **4. Application strategy of Virtual Simulation Technology in practical teaching platform for furniture design.**

Personalized customization is now focused by market for furniture. College teaching system should reform and innovate to meet market demands to let students to pay attention to customization for client during practical design, meanwhile, guide client to experience immersive interaction of product on the virtual simulation technology platform. Students can improve and optimize design scheme according to the results of their experience and go to factory for production after several experience qualifications. Under the background of integration of production and teaching, college should introduce virtual simulation technology into furniture design practical teaching platform to develop 3D contents and realize the demand for customization, according to reasonable application process and strategy management. This application strategy for virtual simulation technology not only cultivates expertise for professional talents of furniture design in college, but also, to some extent, help enterprise to reduce cost of design and production, and increase probability of success for purchasing orders.

### **4.1. Carry out design adjustment with introduction of 3D data into software**

According to design need, seamlessly connect to 3D model establishing software technology platform, for example, Maya, Rhino, 3ds Max, PROE, UG, SolidWorks etc. Export general model format, fbx, dae, 3ds, obj, stl from the furniture design model (including structure, modelling, color, size and material) established by a 3D application program. Then, import them into the editor of virtual simulation software. The editor includes Unity3D and DVS3D etc. Data integrity should be maintained during reading and optimize data volume efficiently

### **4.2. Environment match and real-time render for imported 3D data**

Students can preset a visualized scene with a Unity3D, DVS3D or other visual reality software according to real scene conditions for furniture. This 3D visual environment can provide sensory attributes, such as background, floor, lights, weather, and space in the real environment. Then, present the imported three-dimensional furniture model and interact. Students can measure and analyze each part and reconstruct design data including furniture material, color, size etc. and edit texture mapping, optimize 3D design model and match and integrate the whole design results with visual simulation scene to test if the ideal design effect can be reached.

### **4.3. Conduct 3D immersive and realistic interaction experience**

After rendering, students can interact with designed furniture model in visual simulation



environment using VR sensory device which simulates human sensory, such as visual, tactile and auditory. Visually inspect design parts, assembly effect and production simulation when dismantling, moving, hiding or adding parts through visual device. The presentation effect on furniture product is optimized.

#### 4.4. Visual results presentation and scheme evaluation

After completion of design results, students should present them to evaluator or client. Students can use visual 3D technology to present design results at stages and guide them to visual experience. Then, complete feasibility evaluation on design scheme according to comments from designer and demander. Finally, perform reversible revision on design parameters through 3D software and confirm the production scheme for real objects.

#### 4.5. Produce real object in workshop

After evaluation on feasibility of visual scheme, students can go into to factory or workshop for production. Teachers can guide, arrange and monitor implementation of teaching for furniture design practical project. Both college and enterprise can interact and feedback on teaching effect of the whole curriculum. It can promote the practical teaching platform for practical furniture design talents to be upgraded and improved.

If college has teaching equipment platform with augment reality or similar effect, students can integrate the designed furniture object with visual special environment, including background, floor, building, lights and sky, using augment reality or mixed reality technology. Simulate user's status and behavior feedback. Edit and optimize design scheme on visual simulation platform.

#### 4.6. Guide students to prepare visual assembly instructions for furniture product

In order to let contractor to understand furniture material source, structure characteristics, preparation process and brand visual identification information, students can prepare assembly or use instructions for furniture using simulation platform technology to complete the whole design project.

### 5. Conclusion

The application of visual simulation technology in practical teaching for indoor design and furniture design has become a trend. Through education system reform, furniture design visual simulation practice teaching platform can effectively integrate the up-to-date simulation technology, visual reality and augment reality, with furniture design teaching system, continuously enrich furniture design experimental content and teaching methods. Especially, enhance the cooperation between college and enterprise. Optimize experiment practice teaching system. Improve students design R&D practice ability and they can really benefit from the teaching reform. It can help to cultivate professional design talents who can meet the social practical need.

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# IMPROVING CUSTOMIZED DESIGN WITH 3D PRINTING

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## Abstract

Design, especially industrial design, is connected firmly to the industrial and technology revolutions. After the first Industrial Revolution, the mode of production has been changed gradually from handicraft production to mass production with the use of steam power. However, with this method, the individuality and uniqueness of the products are reduced. All the products look the same, which can not satisfy the needs of consumers nowadays. This paper, based on the critical thinking about the mass production, analyses the limitations of existing production and design method, and suggests the customized design as a solution. Moreover, based on two case studies, try to explore how the 3D printing technology will help improve the customized design in the future.

***Keywords-design; industrial revolution; mass production; 3D printing; customized design***

## 1. Introduction

In ancient times, people had begun to make tools to help them hunting, fishing and grinding food. Stone implements are generally regarded as the earliest tools designed by ancient humans. In the modern era, after the first Industrial Revolution began in about 1860, mass production gradually replaced handicraft production with the use of steam power. There are many positive effects of it indeed, however, as every coin has two sides, we have lost something from that time. By going through the second and the third Industrial Revolutions, the production efficiency and speed have been significantly improved. However, on the other side, design, as an industry, has been gradually separated from the production process. One of the outcomes is that the creativity and ideas of the craftsmen, or designers, has been limited by many restrictions. With the standardization and serialization been used in the production process, products produced by machines all look the same. The individuality and uniqueness of the products are reduced, from this perspective, it is even a retrogress compared with the handicraft period. Even though mass production meted out large quantities of products in a small amount of time with lesser room for error as well as labor costs, it also resulted in products whose design was harder to change. As these products slowly lost their appeal, so did the value of the industry [1]. Although the manufacturing process has been updated throughout time, it seems like the capacity of the third Industrial Revolution has almost reached its limit.

## 2. Methodology

This paper firstly elaborates the limitations of the mass production and the outcomes of mass production. It conveys a fact that the mass production method can not satisfy the need of consumers nowadays. Then, by analyzing the need of consumers, it explains why customized design will be a trend of the future. And how to realize it by using the 3D printing technology. After that, by analyzing two cases of customized design using 3D printing technology, the paper elaborates the advantages of using 3D printing to improve the customized design. Finally, based on these two cases, a framework of how to do a

customized design project with the help of 3D printing has been made.

### 3. Limitations of mass production

The mass production has lasted for about 150 years, even though it has been improved throughout times, it still has some disabilities, both in the aspect of production and design.

#### From the perspective of production:

##### (1) High cost

By the mass production method, the cost is not only the materials for production but also the cost for the production lines and tons of machines. Setting up the production lines is costly. When an error appears in the design or production process, it may lead to all the before efforts in vain. Moreover, minimum run quantities tend to be extremely high, so waste is another issue [2].

##### (2) Lack of flexibility

When there is one part wrong in the production process, it may affect the whole process, like the series circuit. So its error-tolerance is low. Moreover, this issue could result in a considerable loss of money and time.

In another situation, when a product is redesigned, the existing production line may need to be redesigned or rebuilt. One or multiple changes should be made to suit the new needs. Sometimes it has to change the whole lines. So its response speed for the market is low.

##### (3) Heavy labor demand

There are many production lines, like Foxconn, has a significant dependence on labor. Moreover, the work condition is not good, sometimes even worse. The repetitive works do not make any sense of achievement for its workers. So this leads to the low motivation of the workers. Moreover, because people are easier to make some mistakes in this repetitive and high-pressure works, it increases the defect rate.

##### (4) Supervision difficulty

Most of the mass production processes are large-scale, which means there are tons of devices and lines included in the process. So it is challenging for managers or regulators to supervise it. Even though there are digital systems can be used, they still need operators.

#### From the perspective of design:

##### (1) Low individuality and uniqueness of products

Because the mass production process is standardized and systematized, the outcome of it is the same. In this way, the products have no individuality or uniqueness. Only the color, size and other few choices are provided to the customers. Goods of uniform quality are turned out irrespective of the requirements of individual customers. Individual tastes are not, therefore, satisfied.[3]

##### (2) Obstruction in design

The limitation of the production technology and the production mold may lead to many difficulties in the design process. Sometimes design has to compromise with the limitations. It is indeed damaging to the creativity.

In a word, every Industrial Revolution has its limitations. When it can not satisfy the need of people, it is time a new revolution should come with brand new technologies, which may provide an entirely different way of solutions.

### 4. The need for customized design

It is not hard to find that it is the people's need that drives the development of the design. In ancient times people use simple tools to solve the problem, it was the earliest type of design. However, in the view of modern people, we can not call a stone ax a designed product. From the need of problem-solving to the need for customization, people's need changed during the time.

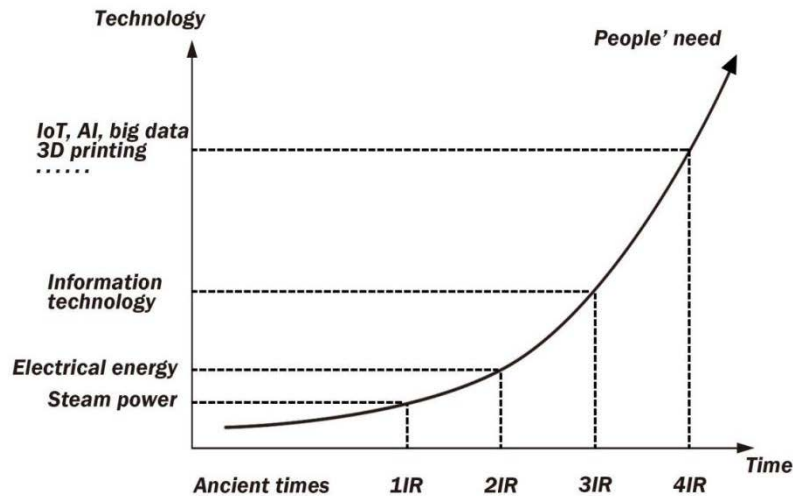


Fig 1. People's need drives design and technology

The products produced by mass production all look the same. They can not satisfy all the consumers' need nowadays. It was during the throes of the modern movement, when mass production had reached an all-time high, after which people started to come back to the roots. It was slow and steady, but gradually, the demand for customized design started to come back and eventually started an entire movement [1]. The customized design provides a good solution to this issue. In this method, design can be a service for everyone. Different consumers with different needs can get different outcomes. The only obstruction of realizing the customized design is the manufacturing process. Mass production can not make it because the outcome of production lines can not change. But with the development of 3D printing technology, the costs of time and money are reduced largely in recent years. Using 3D printing to realize customized design is feasible.

## 5. How 3D printing helps in the customized design process

3D printing, or additive manufacturing, is a technology that creates a physical object into a three-dimensional shape by printing layer upon layer from a digital 3D drawing or model [4]. From the production part, 3D printing production does not need lines of devices, and the 3D printers can print different things according to the changes in 3D models. It improved the flexibility of the production process. Moreover, with the automated method, it reduces the dependence on labor. From the perspective of design, it can fulfill more difficult tasks than the traditional one. Some complicated and hard been produced products are easily manufactured by the 3D printers. So this means there are fewer limitations for designers, in some way, increasing the freedom of design. In this method, it is the best choice to realize the customized design and makes the customized design more widespread.

Although there is a lot of customized design on the market, they are all simple designs and low-level customization, like printing a pattern onto a mug or T-shirt. But people have the need for product customization. The best news of all is that the manufacturing industry becomes increasingly customer oriented. The designs are driven by what the clients and consumers need [5]. So with the development of 3D printing, this need can be satisfied nowadays.

### CASE 1

The earnotz, a personalized wireless 3D printed earphone, was a funding project on Kickstarter. This project originated from a critical thinking about the existing earphones. The earbuds all have the same size, but everyone's ears are different. They can not fit all the people's ears. And even the AirPods may give people a feeling that they may fall out of their ears, which may reduce many potential consumers. So to solve this problem, the earnotz project aims to use 3D printing as a method to give everyone a pair of suitable and comfortable earphones. The process of getting a pair is not very difficult. First, print a provided scale and position it on the ear to get the dimensions of the ear. Then use the mobile app to capture both of the ears by video or photos. Then they can 3D print the earphone by these data. An extra

personalization service is provided, too. People can choose whether to add a picture on the shell or design their own shells by using 2D or 3D software. But this service needs the consumers themselves to make the 2D and 3D files.

The failure of this project may include many aspects. Although consumers can get the suitable size of the products, and this is indeed a good method to solve the pain point in earphone design, the appearance of the earphone is not very attractive. Though it was a customized product, a consumer was not able to join in the design part of the main body of the product. Moreover, consumers get the opportunity to design the shell of the earphone, but they need to do it themselves without the designer's help. It is not a bad thing to have more choices. But when customers are given choices they can not handle them without the designer's help. They won't bother to choose them[6]. Actually, in the earnotz's case, the customer only got the choice of size. The other choices were impracticable. By analyzing this project, a conclusion can be made: When it comes to the process of customized design, the designer must participate in every step of the design part, do the design with the client's participation and preferences.

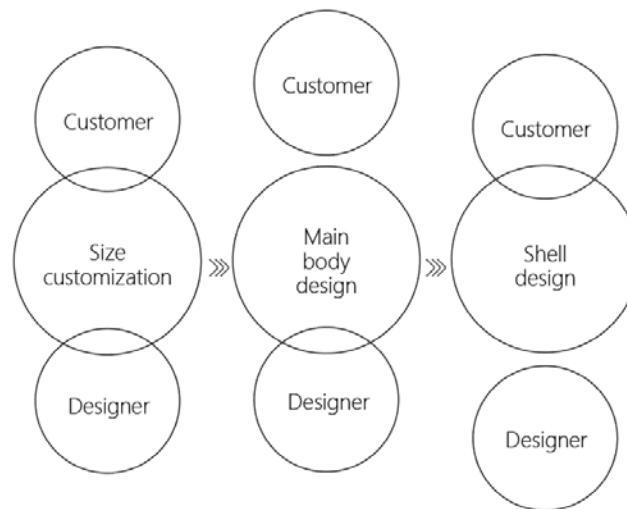


Fig2. Customer and designer's participation in earnotz's design process

Even though this Kickstarter project did not make a success in the end, it provided a good case of using 3D printing technology to realize the customized design.

## CASE 2

Another case comes from the custom jewelry design industry—the MARS fine jewelry. Different from the first case, in this situation the customer decided the direction of the design of the jewelry. The designer provides the design service to help make the idea come true. Both of the designer and the customer participate in the design process. And when the modeling process has been finished, a 3D printed wax model would be created. By using this wax model, it is easier for both the designer and the customer to communicate what changes would be made. Finally, using the lost-wax casting method, the molten metal is poured into a mold that has been created by means of a wax model. Once the mold is made, the wax model is melted and drained away [7].

Just regard the jewelry as a product. In this situation, different from the first one, it gives the customer more participation in the design process. And gives a good example of combining the 3D printing and a traditional way to produce and prototype the product. Moreover, the production process like the 3D printing process is always done by the 3D printing service providers, the jewelry customization companies do not need to own the 3D printing devices.

## 6. Prediction on customized design process using 3D printing

As mentioned above there are two cases of the existing customized design with 3D printing technology. Both of them provide some useful information:

Firstly, the 3D printing *technology* gives a total freedom of the design. Without limitations in the mass

production, design works can be more creative. This is the base support of the realization of customized design. But this does not mean all of the parts of the product need to be 3D printed. Businesses often make the mistake of considering 3D printing for the simple replacement of an existing manufacturing technology [8]. The jewelry's case elaborates that combining the appropriate methods of production is the most efficient way to manufacture.

Secondly, as it is a customized design project, the customer's preferences and proposals are very important. So both the designer and the customer should participate in the design process.

Finally, as it is predicted that "Research by consultancy firm A.T. Kearney finds that the global market for the 3D printing industry will grow to \$17.2 billion by 2020" [9], there will be more and more 3D printers and 3D printing service providers in the fourth Industrial Revolution. The competition of these 3D printing companies will accelerate the development of 3D printing and make it a more extensively used technology. This means the production of products will be easier and cheaper. The customized design providers will not need to have their own 3D printing devices. This will help promote more customized design services appear.

So with these two cases' help, a prediction of the customized design process in the fourth Industrial Revolution can be created.

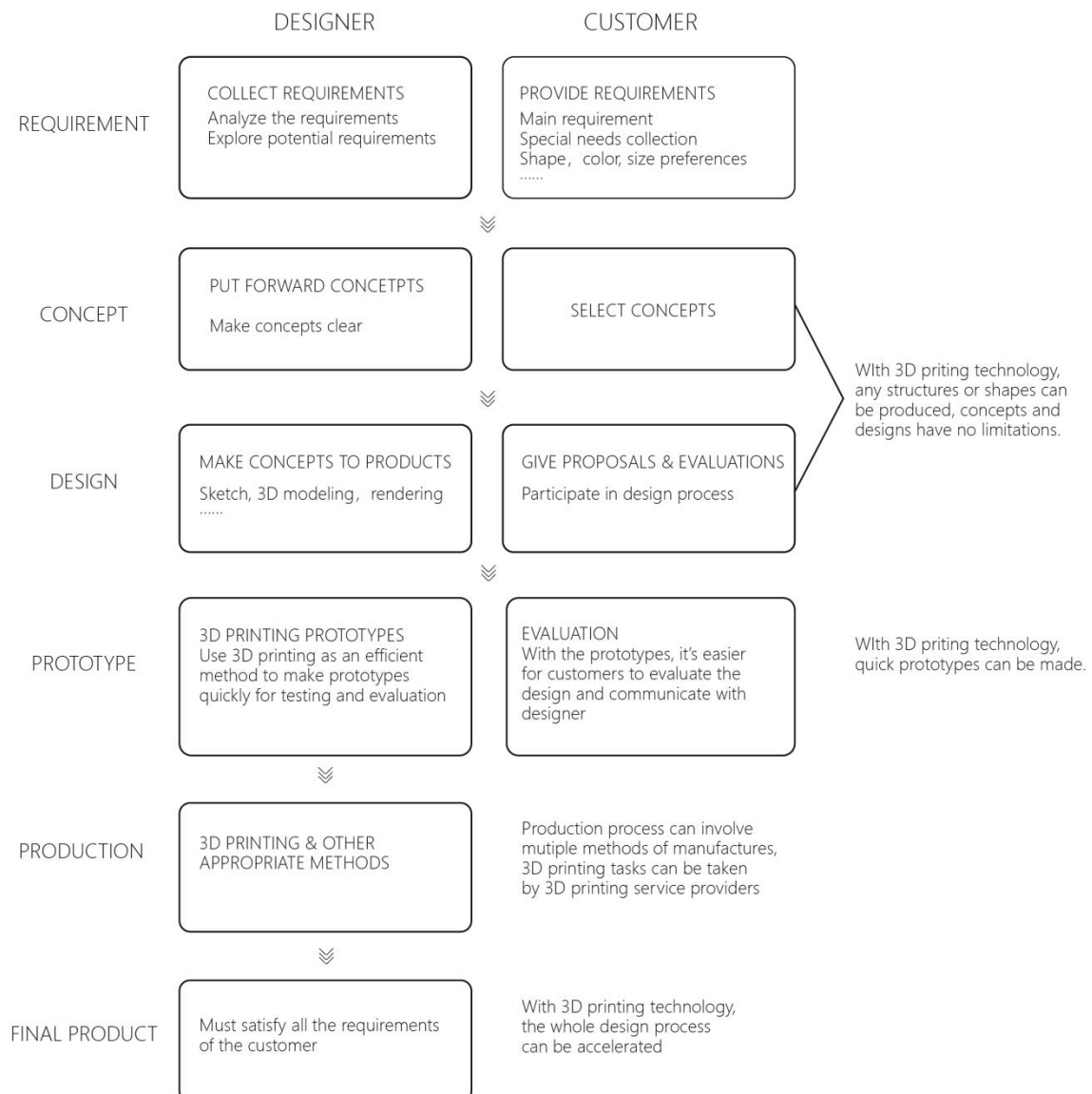


Fig 3. Customized design process with 3D printing



## 7. Conclusion

In the environment of mass production, most products look the same. Consumers do not have many choices when selecting the products. But the standards of living and consumption of people keep rising. The demand for customization and personalization is increasing. With the fourth Industrial Revolution's coming, the development of 3D printing technology will change this situation. 3D printing is not about replacing the mass production method, it is about making up the limitations of the existing manufacture methods. With the 3D printing technology, the customized design will be a new trend in the future market. The most important thing is that 3D printing makes it possible to produce different products for different customers, which gives a fundamental support for customized design. 3D printing technology not only gives the customized design more freedom but also makes it easier for the designer and customer to communicate with each other in the design process. It will help design become a service for everyone in the future.

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## Development of Virtual Reality Training System for steel mill facility

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### Abstract

Virtual work exercise using Virtual Reality (VR) technology can acquire experiences similar to actual work atmosphere, it has better learning immersion and effectiveness than existing a traditional e-learning and an ordinary video education material. This virtual reality safety education content is created for B steel, one of best steel company in China, the movement of steel equipment that is generally inaccessible and dangerous, such as cold-rolled coil packaging process. For education contents applied with virtual reality technology, it is necessary to research learner's perspective on the application of technology from is needed, such as the quality of content and the number of frames per second that can minimize VR motion sickness, in addition to quality and effectiveness of the teaching contents. In this study, we are going to describe how virtual reality educational contents are implemented for the "cold rolled coil shearing line in the steel mill."

**Keywords;** *VR;safety education;steel mill*

### 1. Introduction

Virtual Reality (VR) technology is a technology that provides a sense of reality and immersion to humans through a three-dimensional virtual environment that is sampled by computers. In other words, its effectiveness is demonstrated in a wide variety of areas, such as education/ medical/ manufacturing/ aeronautics/ military/ entertainment based on visualizations of data. [1] Simulation VR educational content that mitigates natural disasters, firefighting safety, and extreme anxiety already has a number of examples to consider qualitative levels.

Virtual work education content can produce experiences similar to actual work experience and is seen as an alternative to expensive lab equipment with no time and space limitations in education. No virtual reality (VR) based virtual work experience content has been developed yet in the field of steelmaking. The real knowledge is derived from the practitioner's own experience in the process of learning and the actual acting.[2] "The knowing is in the action. It is revealed by the skillful execution of the performance – we are characteristically unable to make it verbally explicit." [3]

The Sino-Korean School Multimedia Design has planned to develop safety education contents and operational training materials for crane facilities that are at high risk so as to result in death of accidents caused by safety insensitivity. In total, 14 experts and student's assistance have developed and produced this safety education VR material for three months with the aid of B steel, China's largest steelmaker by supporting its' basic materials.

VR-based simulation training content for natural hazards (e.g. earthquake, tidal waves, typhoons,

wildfires, etc.) is developed in the following procedure; Data analysis and scenario design → 3D modeling (props, character, and environmental modeling data) → Development of simulation technology and interactive technology → Sound effect and music → Prototype of virtual reality S/W and H/W in Head Mounted Display → Completion of educational content development.


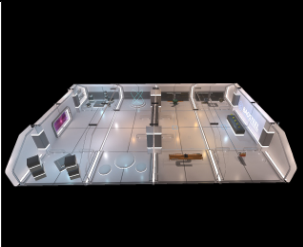

In particular, real-time visualization technology, interface technology for interaction, and integrated with simulation operational technologies that are based on a variety of engineering disciplines. This project is a safety training content for facility operation other than simulators, so the simulator interaction function was excluded in this paper. Recently, as the safety awareness of facility operation has increased, the necessity of safety education content at each site is has raised. However, it is difficult to find contents about a crane operation tutorial for the efficiency and a safety training manual for the effectiveness in the steel mill.[4] In fact, it is necessary to apply educational content that utilizes virtual reality technology at a site where high-cost crane must not be used only for education. The internal data provided by B steel shows that the movement of heavy and bulky materials on the factory often leads to employee's death in the event of an accident. Therefore, the purpose of this development is to eliminate the insensitivity to safety by actively utilizing the content developed in advance training of the operation of the crane by field staff.

## 2. Development Procedure

### 2.1. Analysis and planning

As "virtual reality (VR) based steel mill crane safety education contents" were targeted at new employees or operators at a steel mill, many jargon and abbreviations were used. Multimedia experts and B steel company collaborated to develop this scenario to let field employee train the safety education and operate equipments practically. In other words, we learn how to control equipments properly while the collision and collaboration occurs. The scope of development designate two parts; 1.Prevention of safety accidents during crane operation, 2.Cooling coil packaging process. On planning stage, we analyzed the relevant data carefully, designed for data survey on the facility (Table. 1). Thus they obtained maximum realism on the scenario considering the VR environment and the vivid and real situation to have monitored on site several times to record the actual noise and ambient sound in the steel mill.

Table. 1 Training contents Scenario

Scene	Screen	Scenario
#01 start		<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. VR interface drill</li> <li>3. Lobby enter</li> </ol>
#02 lobby		<ol style="list-style-type: none"> <li>1. Main facility and equipment Hall</li> <li>2. Safety education video</li> <li>3. Equipment operation exercise video</li> <li>4. Wear a safety helmet and enter the training site</li> </ol>
#03 factory		<ol style="list-style-type: none"> <li>1. A safety training exercise that reproduces the actual crane collisions and stenosis deaths.</li> <li>2. Practice of operating the wireless remote control for crane operation</li> <li>3. Practice on cold-rolled coil packaging process</li> </ol>

## 2.2. Modeling

We checked in advance the list of 3D objects based on photos of site facilities and cases of safety accidents provided by the B steel. Afterwards it took us about 10 weeks carrying out the modeling 3D objects by using UNITY, 3ds Max, based on actual measurement data, in the same form as the actual crane installation. When selecting objects for 3D modeling required for precision inspection training contents and carrying out 3D modeling such as indoor environment for buildings with corresponding facilities and tools for precision inspection, the results are shown in Figure. 1.



Fig. 1 3D Modeling objects and data of steel mill

## 2.3. Learning contents development

The optimization of modeling data was time consuming to convert 3ds Max data into graphic data formats in game engines, as the development target cold rolled coil shearing packaging facility had to express both exterior and interior structures. The training content was developed using the game engine Unity 3D, and the motion sensor was developed under the VIVE HMD that can express sufficient spatiality and movement by using two sensors over Oculus, which limits the range of motion with one sensor as shown in Fig. 2. The system is configured to minimize VR motion sickness by configuring HD quality above 2K and 120 frames per second.

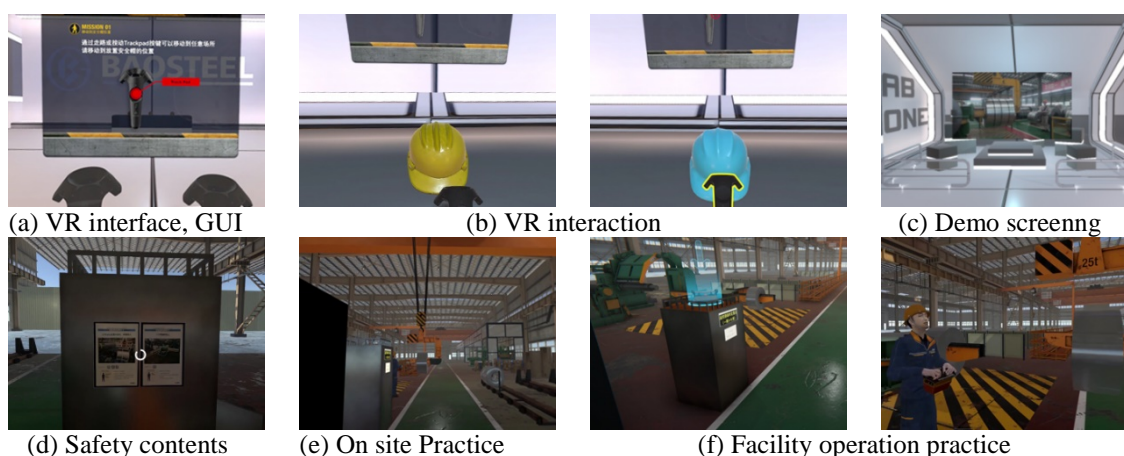


Fig. 2 3D Modeling objects and data for training contents

#### 2.4. Interaction technology development

You should left- and right-justify your columns. On the last page of your paper, try to adjust the lengths of the two columns so that they are the same. Use automatic hyphenation, if you have it. Don't forget to check the spelling.

The cold rolled coin shearing packaging process executes a precision inspection in real time for safety accidents by moving the facilities in a wide range of spaces. We considered this characteristic wide range moving the functions of the crane controller were established in the form of pulling or pushing the facility towards the center of the trainee.

Considering that most of the participants are not experienced in using virtual reality (VR) devices, we designed the learner should recognize their behavior. We divided the selection button on the controller left( tools selection/ parts selection/ valve operation/ bolt tightening) and the on/off button on the controller right (start/ stop).

#### 2.5. Safety education contents development and sound effect

You should left- and right-justify your columns. On the last page of your paper, try to adjust the lengths of the two columns so that they are the same. Use automatic hyphenation, if you have it. Don't forget to check the spelling.

"Safety training content for cold rolled coin shearing packaging process" is provided to the users on the left, and various tools to be used for inspection are displayed on the right, as the controller shown in Figure. 1.

We completed the introduction sound that can be heard in a space where cold rolled coin shearing packaging process crane facilities are installed, the sound and narration corresponding to each precision inspection phase and warning/notification/calibration are applied.

### 3. Conclusion

This paper provides the process of developing contents to enhance safety awareness in order to develop VR contents platform for safety education in the case of B steel crane operation. This platform provides a new interaction paradigm and requires users to learn how to use it efficiently. According to a recent survey of Korea's VR industry, the competitive edge of education contents compared to overseas markets was 4.13 points out of 7 point.[5] While VR education contents have already been commercialized, Medical and automotive and manufacturing sectors, the field of safety education is currently applied to the field. The newly developed product will be installed at the VR Showroom in the B-steel headquarters. In the future, it is necessary to import raw materials from which coils are generated in and to develop hardware that is actually linked to the entire process from rolling, reprocessing and packaging. Starting with this "Safety Education Content for Packaging Process", it is expected that variety of contents and VR-based educational contents will be produced.

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# What do pictures say? Secrets and Lies through Image Manipulation

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## Abstract

When creating a manipulated image, people can modify an image easily using many different image editing tools, leading to quickly create unreliable data which is the source of fake information. Furthermore, there are different degrees of dangers of a manipulation, depending on whether someone deliberately changes the image. That is, creating improper outcome is worse than making a previous picture look better without any intention. Therefore, to trust image information, image manipulation for inappropriate purposes should no longer be increased. Image manipulation techniques used for political instigation, for libel, and for demeaning certain person cause confusion in society and reduce reliability in image technology. Accordingly, in this paper, we introduce image manipulation techniques to understand such deceptions and the abuse cases for warning the use of image manipulation, leading to suggest needs for advanced techniques detecting image manipulation.

***Keywords-Image Manipulation; Abuse; Lies; Dangers; Negative Side; Instigation; Libel***

## 1. Introduction

When people read, they understand the context of the sentence rather than read it as it is, and infer the meaning behind it. Over the last few of decades, however, most people had not tried to find a hidden message in pictures, as they would read. This is because in the past, it required considerable effort and expertise to take pictures, and editing techniques had not yet been developed, people did not think there would be any hidden meaning in the pictures. They thought that pictures could only contain facts. But, there has been a growing suspicion of the meanings of photos in recent years because of the secrets and lies of the vast amount of image data available through the Internet. This phenomenon is closely related to the increase in image manipulation techniques.

In modern times, advanced image editing techniques became so widely available and this phenomenon has made it easier to edit images for non-photo professionals, and easier image editing techniques have increased the trick called image manipulation which distort facts. People are confused with real and fake information because many such manipulations are spreading quickly through the network, even though these manipulations are not 'white lies'. Hence, if you do not doubt whether pictures are true when you look at photos in modern world, you will trust fake information, your judgment will be blurred, and sometimes you will join in undermining someone's reputation. Consequently, image manipulation expedites the creation of negative sides of photography technology, thus, this manipulation can be very risky proposition.

In this vein, trusting the fascinating photography technology requires the ability to doubt manipulated pictures. This includes not only detecting image manipulation technically, but also recognizing the negative aspects of image manipulation and being wary of its dangers. In other words, image manipulation techniques are very sophisticated like any other camouflage techniques, so people must always respond to this sensitively.

In this paper, we provide the reasons why you should seriously consider these pending issues of image manipulation, and introduce an approach that helps these issues: we refer to specific types of image



manipulation techniques to understand overall image manipulation techniques, and present the inappropriate cases to illustrate risks of abuse of manipulations.

The structure of the rest of this paper is as follows. In section 2, we describe image manipulation techniques for understanding image manipulation. The descriptions of image manipulation techniques consist of editing, generating and hiding. In section 3, we introduce far reaching and long lasting abuse cases of image manipulation technology targeting politicians and celebrities. In section 4, we reiterate our findings with attesting to the value of our approach. Finally, in section 5, we discuss plans for future work.

## **2. Image Manipulation Techniques**

### **2.1. Editing**

In this section, we give a brief overview of image manipulation techniques. Image manipulation techniques are varied and abundant. In order to introduce how to manipulate images, we divided them into editing techniques, artificial intelligence techniques, and hiding techniques. The first category is editing. Various editing methods to make photos look better than the original image result in image manipulation techniques. These techniques range from very simple outline modification to graphical animation to create vividness effect. You can use the shadows in the image to give a three-dimensional effect, delete the background, insert a new background, give perspective to the image by modifying the proportion, express colorful colors through color blending, and combine and composite two or more images, or you can cut out only the specific parts you want to emphasize, create a symmetry, invert, extract a part, cut and rotate, and so on. If you use these editing techniques well, this would contribute to create an artistic work. Especially many artists use editing technology to express their personality in images. However, this technology can be unlimitedly sophisticated depending on who uses it, so when exploited, it can create fake information that is difficult to distinguish.

### **2.2. Generating and Hiding**

The second category is generating and hiding. These techniques are precisely data manipulation, the narrower range than of image manipulation. First of all, generating is a technique that uses the artificial intelligence technology to generate a desired image based on the original image. With this technology, you can create the image you want without directly manipulating the original image. The images generated by artificial intelligence are very powerful. If you have done the coding for creating the image you are implementing, because it is literally automated, to make images more versatile is only a matter of time and the performance of computer. That is, manipulating images with artificial intelligence is more dangerous when you have a malicious purpose. The speed is too fast, and sophistication has already surpassed manipulation skills that human can deal with. Second, Hiding is the sequence of actions that hides something in the raw data. It is also a technique for hiding and distributing malicious code in images. Although it is not a technique for manipulating the appearance of an image, the fact that it can hide information in raw data means it is possible to use raw data to detect image manipulation. In other words, this technology is more useful for image manipulation detection than to know the danger of image manipulation.

## **3. Abuse Cases**

The various image manipulation techniques mentioned above are not always used with good intentions. In Berlin on September 10, 2015 – Syrian refugee Anas Modamani snapped a selfie with German Chancellor Angela Merkel. However, the photo has appeared in numerous false stories on social media. He was falsely identified as one of the refugees who set fire to a sleeping homeless man in Berlin and he was also falsely identified as Najim Laachraoui, one of the terrorists behind the Brussels bombings in March 2016 [1]. The misinformation spread by his manipulated photographs led to criticism of Merkel's refugee policy, and Modamani filed a lawsuit against Facebook, which allowed to spread manipulated photographs without sanctions, but the Wuerzburg court ruled that although the posts were 'undisputable defamation', Facebook had not created the slanderous content itself, and so was not required to actively seek and delete the posts [2]. This case set a precedent for demonstrating that the purpose of a manipulated photo can cause agitation for a particular policy.



Fig. 1 Manipulated Modamani image [3].

Another issue of manipulated images comes from the act of abusing fame. Fabrication of celebrity porn pics is nothing new anymore. In late 2017, a user on Reddit named Deepfakes started applying deep learning to fabricate fake videos of celebrities [4]. Applying machine learning technique which learns patterns from the data and applies them to new data, the pornographic images began to spread on the Internet with manipulated images of celebrities such as Scarlett Johansson, Taylor Swift, and Emma Watson. The problem is that it is easy to use such techniques applied to this porn. Anybody who even has little knowledge of machine learning algorithms can easily create fake porn using free open source code. This is an ethical issue, but it is also a test of human cognitive ability [5]. Also, the emergence of these manipulations is likewise exploited by using fames of politicians. In April 2018, a fake video that former US President Barack Obama is telling US President Trump is a dipshit was released on the Internet. In these cases, artificial intelligence technique was used, and, it is clear that it still synthesizes faces of celebrities and spreads them maliciously. Celebrities make curious, and their manipulated photos spread faster than any other pictures. Just because they have a reputation, they suffer from their own fabricated pictures that wander around the Internet. When this phenomenon becomes generalized, the reliability of the real image may deteriorate later. As a result, there are concerns that manipulations could cause serious problems of the international community, within a year or two [6].



Fig. 2 Fake video of Barack Obama [7].

The last case is an incident that happened in Korea. In Korea, cybercrime that degrades a specific person is a very serious problem, and this is usually done by defaming his or her reputation with manipulated images. The most famous case is image manipulation done by a website called Ilbe. Members of the website Ilgan Best Jeojangso (Ilbe, storage space for the daily best) have strong anti-North Korean views and are at the center of controversial remarks snubbing former Korean President Roh Moo-hyun and the May 18 pro-democracy movement in Gwangju [8]. They have been constantly manipulating and distributing images with wrong purposes. In Korea on May 18, 2018 – KBS (Korean Broadcasting System), the Korean public service broadcasters, mistakenly broadcasted Ilbe image which is manipulated by that website. Most viewers were angry at the manipulated image used to ridicule the former president. As the controversy continued, the production team of the program apologized to viewers on 19<sup>th</sup> that it was an obvious mistake [9].



Fig. 3 Differences between the original logo image and the manipulated logo image [10].

Unfortunately, there is not enough technology or legal resource to directly manage all these issues. In any part of the world, even if someone is suffered by image manipulation, they cannot severely punish or receive suitable prevention. For this reason, we must face the negative sides of image manipulation. We need more powerful techniques to detect image manipulation and more specific legal resources. In addition, if the development of image technology will be encouraged for good purposes and the wrong intentions are broken, we could be able to experience better technological progress.

#### 4. Conclusion

In this paper, we introduced how images tell the false and how the aftermath of the lies of image manipulation can have a major impact on society. In some ways, techniques of manipulating images have an attractive artistic value and people can use the techniques for good goals. However, the risk of image manipulation is so large and powerful that it cannot justify this enticing temptation. The information on the modern society is ‘sharing’, and it always expects basic honesty. That is, good information requires reliable data. While you may think that the above-mentioned deceptions are not relevant to you because these are confined to political issues and celebrities, the abusing modern computing technology is at any time and from anywhere, targeting everyone.

In conclusion, we urge the urgent development of technology of detecting image manipulation. We are living in an age where we are exposed to a remarkable array of visual imagery [11]. While you hesitate to doubt, unreliable data is being created with great effort even at this moment. That is why you should always be vigilant about image manipulation. Which means, there is a concomitant need for developing techniques to distinguish the original images from the altered ones [12]. When developing techniques to detect image manipulation, it must be more sophisticated and more accurate than existing technology. This is because, that image manipulation detection is different from traditional semantic object detection because it pays more attention to tampering artifacts than to image content [13].

#### 5. Future work

Future work concerns new proposals to detect image manipulation. There are some ideas about the detection. Obviously, these ideas will answer the question: Can human brain truly detect manipulated images? Firstly, it could be interesting to consider the use of artificial intelligence technology. There are already too many manipulated images on the Internet, and this has been beyond the human processing speed. The problem of speed due to changes in modern technology can always be addressed only by technology, and AI could be an alternative. Secondly, we could achieve detection by analyzing the binary code. By analyzing the binary code, we can observe information that is not visible from the exterior. We will get detailed information about image manipulation, including whether it is manipulated, the process, the date, etc. This will definitely help detection. To sum up, we will use these ideas to develop detection techniques that can eliminate the risk of image manipulation and to overcome human limitations.

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## Imagining the Future of Foods Through Speculative Design

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### Abstract

Food futures are relevant to the Sustainable Development Goals 2 of zero hunger, 3 of good health and well-being, and 12 on responsible consumption and production. Other than conventional food production, trends in food track the rise in synthetic food development. However, the consideration of future food should go beyond its production – one should consider as well, how and why of consumption. This paper presents a study that aims to apply speculative design to create future food using digital technology. A web-based Future Foods Creator app has been developed to test the use of digital technology to implement speculative design. The app was launched and tested by 15 participants at an exhibition as a proof-of-concept demonstration.

**Keywords-***speculative design, art-science, future of foods, SDGs,*

### 1. Introduction

The project was developed as a result of an idea that was formulated during a participatory-speculative design workshop in April 25, 2018 that involved the participation of 15 stakeholders in all areas of ageing-related research and services. Food and nutrition were among the provocative issues that were discussed during the workshop, and the decision to create the app was the result of that inspiration. The app was launched during a Making and Doing Exhibition as part of the Society for the Social Studies of Science (4S) Meeting in Sydney on August 28, 2018.

The future of food is important because of its relevance to the Sustainable Development Goals 2 of zero hunger, 3 of good health and well-being, and 12 on responsible consumption and production. The future of food is no longer about the development of GMO or lab-grown synthetic meats (Kleeman 2018), or even about latest food trends (raw foods, slow foods, etc) – rather, it is as much about how and why we consume, and what draws us to consume the foods, as in the food product itself. The consideration of future food here also includes a consideration into the forms and presentation of foods, from those with long-term impact and to those that will fade as the fad dissipates.

This paper will consider speculative design as an approach that culminated in the development of the Future Foods Creator. The second section will provide the conceptual background on speculative design append its applied philosophy. The third section will briefly discuss the process underlying the Future Foods Creator design from the storyboarding to the coding. Section four will report on the results and outcomes of launching the Future Foods Creator, with section five briefly discussing future possibilities for the app.

## 2. Speculative Design as Art-Science Approach to Designing the Future

Design is a process of fabrication and invention, one that could translate different concepts coming from different knowledge fields into a coherent narrative with material outcomes; such outcomes range from problem identification to solutions prototyping. These material outcomes also include making space for what one may not have anticipated or known and including preparing for the possibility that the outcome of the design may not always translate into the intended and envisioned.

Design is a methodology, a practice of form, that could marshal together logic, precision, lateral-thinking, philosophical provocations, and narrative construction. The understanding of design process involves understanding the logic of how different parts, even if they don't belong to the same systems or ontology, connect. Developing an understanding of more general strategies and characteristics underlying a design process allows one to circumvent the unknown or hidden (also known as the blackbox) to reverse engineer the present to backcast between a projected future and the present, before extrapolating towards possible/plausible futures. Circumventing the unknown does not dismiss what is not knowable or not-yet-knowable. Rather, it is about using what we could know to speculate or predict on what is outside present knowledge capacity by projecting from the logic of the known. In the case of engineering design that is derived from technology that had been successfully implemented as the result of the successful operationalization of an underlying science, extant knowledge can prevail.

However, when it comes to projecting from extant scientific epistemology, there lies a possibility for a knowledge structure to be completely disrupted and falsified. Therefore, it is important for designers, regardless of which knowledge fields they are operating from, to look beyond their present problem to conjecture how external changes could produce not-yet-existing issues. Reeves et. al (2016) talks about the typification that emerges from the categorization of existing knowledge stocks where the expectations of the future are usually formed, although they acknowledge that the future is open and unstable, and that more data must be collected to improve forecasting. On the other hand, pragmatic projections underlie the determination of the designable.

Speculative design incorporates interdisciplinary forms of speculative practices in a design narrative; the practices range from designing not yet available scenarios to experimenting with new techniques, either through the design process or from bringing together different knowledge practices that create the foundation to a new knowledge or technology. There is novelty in speculative design; nevertheless, that novelty is constituted less by the approach being new or unprecedented, and more by the unexpected outcomes such an approach could produce. Incorporating speculation into the creative process goes from reconstituting what we thought we knew or understand about the status quo, to imagining a condition, technology, and interaction that could have been inspired out of reconsidering present impossibilities. In considering these impossibilities, it is crucial to consider whether such possibilities/impossibilities are due to ontological or epistemological obstacles, or inviolable constraints imposed by the laws of nature.

As speculative design is a transdisciplinary research methodology that contain within them, direct and indirect counterparts in the form of creative prototyping (Graham et al 2014), studio laboratory (Salter et al 2017), critical design (Neeley and Montgomery 2016, de Oliveira 2016), adversarial design (DiSalvo 2012), it is much more than creating a solution or even a range of solutions – it is also about predicting possibilities that could arise from these solutions, including outcomes that are not intended by presumed solutions. Unintended outcomes are not necessarily caused by poor design methodologies – rather, it is the consequence of having a design interact with a very complex environment or ecosystem. When a participatory component is added into the mix, the design brings together co-designers with different backgrounds, expertise, lived experiences, and belief systems to collaborate on designing problems and accompanying solutions to the problems.

Some of these co-designers are citizen designers with no professional training in design. This lack of training does not impede but could add to imagining possibilities that are not encumbered by minor technicalities. That undergirds the thought and intent behind the Future Foods Creator we have developed, which begun as an idea conceived from a participatory design workshop that is part of a series of workshops aimed at provoking participants to venture into unfamiliar territories. Facilitators of these



workshops are fully aware that that each participant has varying degrees of knowledge when it comes to latest technological trends. Moreover, what an individual conceived of as a preferable future for one may not translate into being preferable, or even sensible, for all. In addition, the aspiration to novelty in speculative design is not about competing to come up with an unconsidered idea— rather, the point of speculation in advancing novelty is to create a space for destabilizing and displacing existing biases and expectations so that no further constraints are imposed by the individual limitations or extant expertise.

Designing for a plausible future scenario is not merely about developing solutions; rather, it starts from problem creation through an iterative process of formulating a problem statement. Problem creation starts from identifying what constitutes the nature of a problem, and the narrative as well as characteristics of the problem. Given that design-solutions involved the targeting of socio-technical problems, one will have to differentiate the social from the science/technological while setting out how each side is bound to the other. Problem creation is a process of scenario construction to negotiate how the problem may transform over time, and how its relevance could take on a different dimension due to interactions internal and external to the problem's ecosystem. It is also a process of building priorities so that the development of solutions could be concentrated on core concern of the problem.

When speculative design is deployed to the Future Foods Creator design, it has the dual role of influencing the construction as well as content of the app – both construction and content could be open to co-designing input from non-primary designers, as well as possess the possibility of being turned into a toolkit for churning out new and not previously considered possibilities. There are speculative characteristics to the digital platform as interactions that take place on them could produce emergent situations whereby human behavior could never be constrained, especially since hacks and exploits could be uncovered along the way. Therefore, the inclusion of speculative design allows apps to engage in the act of prototyping on the go.

## **2.1 Designing the Future Form of Food**

Speculative design has been used to construct narratives on food cultures, such as in the development of new forms and practices of agriculture through the deployment of interaction design. According to DiSalvo (2012), food cultures represent a lively site of invention and reproduction of culture through design.

The case of the Future Foods Creator presented here, at its current developmental phase, is focused on soliciting input on the aesthetics of foods that had little to do with the nutritional content of the food. Even at this stage, the planning stage of the app development requires an accounting for known food types and forms, the manner of food preparation and packaging, dietary preferences, and eating habits. A more sophisticated version of the app would require an understanding of the fluidity of these categories and the subjective actions of the users despite the constraints imposed by the rudimentary form of that app.

The food app uses the format of a visual multiple-choice format to get users to experiment with various combinations although the designers of the app are aware that the choices may as much represent the curiosities of the users as their preferences – both choices are opened to further studies by psychologists and behavioural economists. At this point in time, there is not much data to go by in term of what the present app has collected, and we hope to spread its use further. But data collection is not the point of this paper.

## **2.2. Web-app based Speculative Design Approach**

To the best of our knowledge, there is current no similar food app in the market that allows participative food creation, let alone creation of future food. Web is a good platform to allow potential participants to give their input based on the multiple-choice questions without the limitation of time and space. The Web can also provide presentation of future food with visuals and audio. Participants will be able to imagine what kind of food they are about to create by looking at the incrementally designed food prototype.



Figure 1: From problem creation to initial prototype

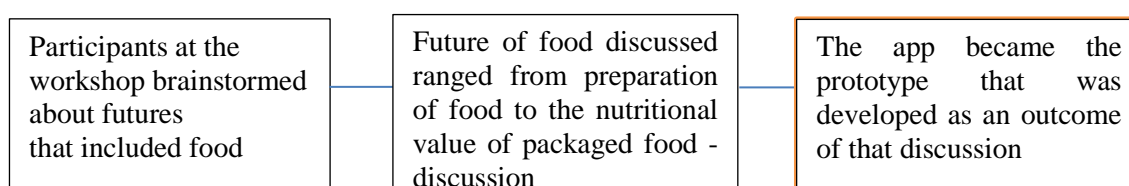


Figure 2 Process underlying participatory-speculative design in the app design

### 3. Storyboarding the app

This section will provide a critical description on the scripting of the app, starting from consideration of the intention for the app right to the coding. The app aims to understand consumer eating habits and preferences through a series of structured questions that had been designed to appeal to the visual of the users. But to get to the final version of the app, a process of building a storyline for delineating the intention of the app is involved. The endgame: to present a case of future food that is co-designed with those who will consume them, and whose lived experiences as consumers could potentially change the manner in which food are prepared to be more appealing to consumers while encouraging the consumption of better-quality foods. Of course, there is still some way to go to get to that point.

#### 3.1 Developing the narrative of the app

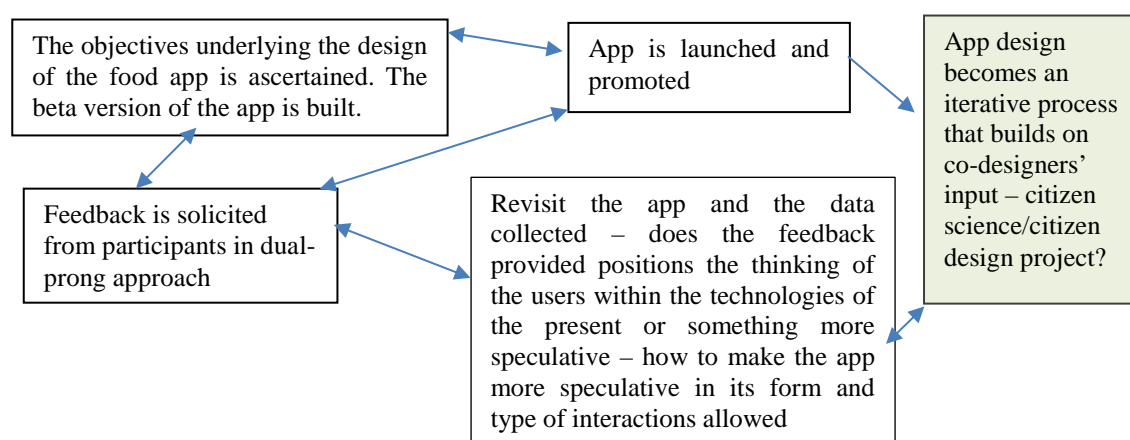


Figure 3 Iterative Design Solution-Building

From its inception in a brainstorm to its initial prototyping phase, the app was developed with the intention of investigating food cultures that are tied as much to the personal as to the communal. The narrative script is designed to allow the gradual creation of food, which begins with ascertaining the dietary habits of the user, before building towards how the users could choose to consume the food of choice. The script was designed with feedback from a psychologist and with the assistance of a digital visual designer. The structured questions produce outcomes that build on the outcomes of the previous questions – the user is then shown the result of the choices made. The app also has a function that allows the user to evaluate the creations of other users as part of the process of consolidating data on how individual users in situated locations experiment with their dietary and food habits.

### 3.2 Building the app's structure

For the purpose of allowing participants to create a future food based on pre-selected criteria, a web-based Future Foods Creator app is developed as a proof-of-concept. The Future Foods Creator provides 7 questions that leads to a final future food “prototype”. The Future Foods Creator is developed using PHP, HTML, with Javascript and Cascading Style Sheet (CSS) deployed for interactive effects that aims to provide the participant with a more intuitive approach towards the type of future food they could create. The questions are designed to be simple and straight forward. The use of visual and audio queues aims to assist the participant to picture given possibilities of a criteria as he/she moves through the questions. After answering the final question, the participant is presented a final product of all the answers provided – this is when we present the final future food prototype.

The Future Foods Creator not only allows the creation of possible future food. There is also a “Rate a Future Food Prototype” option. A participant is encouraged to continue with the rating of his/her own new creation after it is presented. He/she is also able to rate a future food creation from other participants. The app does not only serve as a prototyping tool but also a rating tool.

## 4. Results and Outcome

The Future Foods Creator app has been introduced during the Making and Doing session organized by the Society of Social Studies of Science in 2018. During the session, 15 participants used the app to create their future food. Only 5 out of all took part in the rating part of the app. Due to the small number of participants, the trend of future food cannot be determined at this moment. From the rating, however, we observed that most of the participants described their food creation as “fresh”, “alive” and “smooth”. At this point, it is not yet possible to confirm whether the choices are made as a matter of curious experimentation or do they represent the real preferences of the app users. Nevertheless, the implementation has served its purpose and can be used for further tests with new participants.

## 5. Going Forward

We hope to collaborate with dieticians, nutritionists and culinary experts to move into the next phase of the project so as to develop deeper layers of structured choices, then build the project into the next phase, which could include the launching of mobile app versions. This would of course require a larger proof of concept testing, involving more participants from multiple backgrounds, including the designers themselves. To make the app self-explanatory, we also intend to include a guidance video to go with it, although this would probably be after the app has attained sufficient level of sophistication.

The current design and presentation of the questions, including the visuals and audio, can be further improved. More importantly, an analytic function is in store in the next phase of the app to provide the users with a display as well as analysis of food creations.

## 6. Conclusion

Finally, speculative design has the potential not merely for designing to present problems but also for anticipating new problems that could arise through the process of co-designing outcomes that are iterative

and never conclusive. The process of building scenario narratives is important to putting the creation of problem on equal ground with the design of solutions. The use of digital technology may bring advantages to the process of co-designing. Putting the process as an online web app may allow users to design via visuals and audio shown to the users. This paper presented the ideas to explore using web app to enable speculative design of future food creation. An app was developed to demonstrate the concepts and ideas in the Making and Doing Exhibition in Sydney as a proof of concept.

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# Understanding Thai Sentence Structure Using the X-Bar Theory of Phrase Structure

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## Abstract

The ambiguity of Thai language structure is important and needs to be addressed since it is a bottleneck for further analysis processes. In this research, we describe the design of phrase structure grammar and development of grammar parser that assigns grammatical structure to annotate input text with label brackets. Natural language parser is a language processing tool that recognizes the structure of the sentence according to the specified grammar rules. The rules for parser usually are defined in lexicalized and context-free. In this study, the words with multiple syntactic categories are disambiguated with part-of-speech tagger that reduces ambiguities of the sentence structure. The head word appears at the beginning of each context that plays important role in deciding category of the phrase. The results of the parser will be displayed as a tree structure called *syntax tree*. The information source is in the form of unstructured natural language of Thai text. The approach to the problem is divided into two parts. First, the Thai written language is processed with morphological analysis and each word is assigned a part-of-speech tag. Second, the phrase structure grammar (PSG) rules for the Thai language are defined in a form of Extended Backus–Naur Form (EBNF) with the principles of phrase structure and the X-bar theory that aims at the common properties of different types of syntactic constituents.

**Keywords:** *Information Extraction (IE), Thai Language Processing, Thai NLP*

## 1. Introduction

In-depth NLP analysis requires large amount of knowledge and computational resources, nevertheless, it provides the system with an ability to enhance its level of language understanding. In computational linguistics, syntactic information is used to identify the role words play within the sentence and their semantic meaning. In recent years, there are number of researches related to Thai language processing. The ORCHID project was focusing on building large part-of-speech corpora and that is part of the research at National Electronics and Computer Technology Center (NECTEC), the research institute in Thailand. Many researches for Thai Treebank has been proposed such that Ruangrajitpakorn presented Thai CG Treebank a language resource where the tree can be divided into three grammatical types [9] and the corpora tool kit is also developed in [7]. A dependency parser for Thai is also described with the composition of three components [11]. First is the process of root identification followed by the dependency analysis and finally, the proposed algorithm based on the beam search. Nevertheless these research still requires tremendous amount of works from linguists in order to derived large annotated corpus. Thus sentence parsing tools are very important to analyze grammatical structure research and development increases analysis of the structure of language. For the sentence parsing tools that perform structural analysis of the language such as CMU Link Grammar. Thai character cluster (TCC) [10] used a set of few simple rules to character clustering to reduce the ambiguity of word boundary in Thai documents and to improve the search efficiency. A Thai LFG tree [5] is transformed into the corresponding English LFG tree by pattern matching and node transformation. An equivalent English sentence is created using structural information prescribed by the English LFG tree. This paper is

organized as followings. Section 2 explains the characteristics of Thai sentence and the challenges when dealing with its ambiguity. Section 3 describes the experiments of our implementation. Finally, the conclusion of this paper is presented in Section 4.

## 2. The Characteristic of Thai Sentence

The structure of Thai text often contains highly ambiguous structure. The sentences usually are written consecutively without a boundary between words or sentences. Usually, the spaces will be used to separate the contexts; but they cannot be used as an indicator for beginning or ending of the sentences. There are many different ways that Thai words can be created such as compounding, reduplicating, deleting and loaning. Thai has no word inflection for different case, sex or gender; therefore, the word form will not be changed. There is only one form of words for different syntactic categories. For instance, a word *go* will be in the same form for all tenses and gender. Thai sentence formation usually relies on the semantic meaning rather than the grammar structure. In this research, the input sentences are segmented and tagged with part-of-speech tags using SWATH, a language processing tool [4]. Part-of-Speech (POS) tagging is one of the common techniques used in the syntactic analysis of sentences. The common Thai part-of-speech tagging usually contains 12 general syntactic categories<sup>1</sup>. The syntactical categories used are generic syntactic categories, which are not specific enough to describe the role of the words. This is important because Thai has no word inflection and in particular, it allows words with the same syntactic category to appear in serial such as serial nouns, verbs, auxiliaries and determiners. In addition, this general classification does not include all syntactic categories such as punctuation marks and prefixes which can be inserted in front of the verb to nominate it. For these reasons, we need the assistance of the syntactic categories designed by the Orchid project [14]. In the Orchid tagset, there are 14 general categories that have been further classified into 47 categories. For instance, the noun is divided into six different nouns: NCMN, NPRP, NCMN, NTTL, NLBL and NONM.

### 2.1 Thai Phrase Structure Grammar

In Thai, a phrase is a higher level grouping of words, which may be noun phrase (NP), verb phrase (VP) or prepositional phrase (PP). The phrase is usually composed of one or more elements, where each element can be a specifier or complement of other words. In Thai, any single word that has a role in the sentence can also be considered as a phrase. Phrases can be linked together to form larger phrase and eventually, the hierarchical structure for the entire sentence is formed. In this research, the X-bar theory is used to describe the phrase structure grammar of the Thai language. This means that the structure will be represented as layers in a hierarchical representation. The phrasal categories containing a group of words are organized into noun phrase (NP), verb phrase (VP) and prepositional phrase (PP) and they must contain at least one lexical element head.

### 2.2. Proposed Context Free Grammar

In this study, we organize the Thai phrase into five main phrasal categories (NP, VP, PP, ADVP, ADJP) and six lexical nodes (LBL, CONJ, END, INT, PUNC) in the grammar. The difference between the phrasal category and the lexical node is that the phrasal constituent may contain hierarchically structure that takes other constituents as the complement whereas the lexical node may appear by itself as a single tree node. The action codes in the grammar are omitted for an ease of presentation in this paper. Using ANTLR [7], the grammar rules are deterministically parsed in a top down manner with a fixed amount of look-ahead. Rules are first defined and procedure is given for determining if a context free grammar is LL(k) [9]. It also uses bottom-up parsing in a new Grammatical Transformation into LL(k) form [6]. Although, some theorems of LL(k) had iteration [2], parsing LL(k) techniques are still widely used. For example, Extended LL(k) grammars and parsers [8]. Adding semantic and syntactic predicates

<sup>1</sup> The Thai general syntactic categories are Noun, Verb, Adverb, Pronoun, Preposition, Conjunction, Auxiliary, Determiner, Interjection, Unit Classifier, Ending and Negator.



to LL(k): pred-LL(k) cannot resolve syntactic ambiguities and parsing conflicts due to the limitations of finite look ahead.

The context-free grammar rule contain the rule elements of the left hand-side that can be rewritten by the rules on the right hand-side. The elements that can be decomposed further to smaller elements are called “non-terminal”, whereas the others that cannot be decomposed are called “terminal elements”. For this case, the terminal rules are the part-of-speech tags that are assigned to the segmented words. The CFG rules for Thai are defined in the EBNF (Extended Backus–Naur Form). The symbols ‘\*’, ‘+’, ‘?’ are the regular expressions notation for the quantifier that indicate ‘zero or more’, ‘one or more’ and ‘zero or one’ (optional) respectively. Although, the notion of the sentence in Thai is not clear but in the phrase structure rule will start the highest node as the sentence. The basic structure of Thai sentence is in the following order: Subject-Verb-Object, but sometimes some constituents such as subject or object can be missing. In PS(3) the rule allows different phrasal constituents to appear in the sentence.

### 3. Experiments

We have developed a Thai parser a software application with ANTLR (ANother Tool for Language Recognition) is a language tool that provides a framework for constructing recognizers, interpreters, compilers, and translators from grammatical descriptions (<http://www.antlr.org>) [9] The notation of the Orchid tagset consisting of 47 POS tags was also exploited. The rules consist of non-terminal nodes where part-of-speech tags appear as the leaves. The parser development is based on the phrase structure grammar rules with the focus on optimizing the pre-processing of linguistic analysis. The parsing technique used in this study is based on top-down parsing that looking for syntax tree starting from the root node and works down to leaves at the bottom of a tree. The grammar rules use an extended Backus-Naur Form (EBNF) notation, which describes the non-LL(k)/LR(k) context-free languages. The top-down parsing strategy with syntactic predicates augmented solve non-LL(1) designed to provide selective backtracking and semantic predicates to any context sensitive tree pattern. Basically, the parser is divided into two modules. First, the scanner, or the lexical analyser, scans the input stream from left to right to recognize the valid strings called tokens, the scanner works on the basis of deterministic finite automata (DFA), which uses regular expressions. Second, the parser recognizes the phrase structure of a group of words according to the predefined grammar rules. The followings are results from the parser based on input sentence that is segmented and tagged with part-of-speech.

[S [NP ประธาน] [VP [VP ได้รับ] [NP ข้อความ แจ้งว่า หมายเลข [PP ของ [NP คุณ [PP ที่ [VP ใช้]] [PP ใน [NP ระบบ คลื่น ความถี่ 900 [CL'MHZ] โกลี]]]]]] [VP [VP หมด] [NP อายุ 2558]]]]  
 e  
 ople receives message to notify that the number operating 900 Mhz band will be expired in the year 2558”

The result from the parser is in the format of labeled brackets, and represented in a tree structure with the visualize tool (Fig 1).

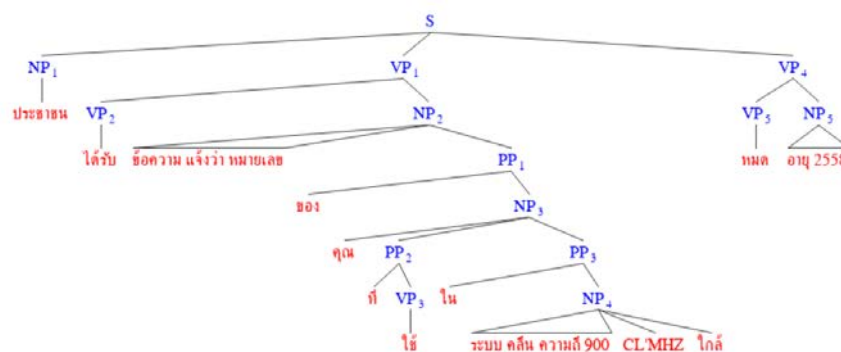


Fig 1: Parsed results from the parser in tree structure

The evaluation is performed based on the Grammatical Relations (GRs) based on parser views of the sentences with a form of head and dependency schemes as described in the followings:

### **Modifier: mod (type, head, dependent)**

The relationship between the head and its modifier can be examined using this scheme. In CFG, the modifier such as adverb phrase, adjective phrase and classifier node are presented as a separate node from the lexical head.

### **Subject: subj (head, dependent, initial\_gr)**

The subject argument can normally be found from the lexical head of the noun phrase node. However, since Thai language does not require an overt subject or a pronoun to appear in the sentence, the subject information can be omitted from the subj slot-filler's scheme. It is important to note that the phrase structure can begin with any phrasal constituents. Therefore, the subject information can be located in a different sentence or as a separate tree node. For this case, the subject scheme will not be considered. Another important issue that should be addressed here is that the grammar rules allow the nouns and verbs series to be presented as N' and V' nodes.

### **Complement: comp (head, dependent)**

A relation between the head and the complement can be captured using the comp scheme. This scheme is designed to capture the complement information in general. Within the complement, the information such as direct and indirect objects can be further identified.

### **Direct object: dobj (head, dependent, initial)**

Direct object information usually resides within the noun phrase node that may be a complement of the verb phrase. Usually, a direct object is a result that receives directly from the action of verb. According to Orchid's syntactic categories, the action verb has a form an active verb (VACT).

### **Indirect object: iobj (type, head, dependent)**

An indirect object contains information which is an indirect result received from the direct object. An indirect object in Thai usually follows the direct object and normally is introduced by the preposition.

In this experiment, 266 sentences are selected from the import/export domain, which have also been divided into 3 test sets. The performance of the parser according to the four schemes: mod, subject, direct object and indirect object, will be evaluated based on the precision of the results [3].

$$\text{GR Precision} = \frac{\text{No. of slot produced by the parser}}{\text{No. of expected slots}}$$

Test Set	T1	T2	T3	Average
Mod-Head	93.86	95.45	87.52	92.28
Sub-Verb	78.32	83.63	79.86	80.60
Direct-Obj	88.35	97.31	98.34	94.67
Indirect-Obj	97.35	97.39	96.44	97.06

Table 1: The experiment results of the GR schemes

Table 1 illustrates the experiment results of GR precision that are produced by four different schemes. This result shows that the verb-subject relationship has the lowest percentage of 80.60%. One of the reasons is that the VP node is not attached to the correct noun phrase node in the syntactic tree. Based on this experiment, the problem of the Subject-Verb relation in Thai is difficult to deal with due to three main reasons. First, there is no subject-verb agreement such as gender and plural. Any noun phrase node that appears before the main verb is eligible to become a subject. Secondly, there are many help words

used in the sentence as to clarify the meaning. Sometimes, these additional words that appear between the actual subject and verbs cause the confusion to the parser. Finally, since Thai has no sentence boundary and there are no specific punctuation marks used within a sentence, the parser can only rely on the space that is used as the context separation. In this experiment, the parser has no problem in identifying the direct or indirect object. This is because an object usually immediately follows the verb in the Thai word order. However, the results of action may appear more than once which can be scattered in different places or conjoined with another events using the conjunction. In this situation, the object that usually resides within a noun phrase node may be incorrectly attached to the verb phrase node.

#### 4. Conclusion

This paper describes the Phrase Structure Grammar (PSG) that have been developed the Thai grammar rules using the Orchid tagsets. We emphasized on using X-Bar theory for constructing the Thai phrases and context-free grammars including noun phrase, verb phrase and prepositional phrase and the additional phrasal nodes (e.g. classifier, labeling, ending and punctuation) are introduced into the phrase structure. Since the development of the parse is beyond the scope of this research, we therefore used ANTLR language translator tool to provide the syntactic predicates to parse the sentences via arbitrary expressions using semantic and syntactic context. With this approach we could be able to automatically create the annotated sentences in bracket labelling which is the preliminary important steps for building large Thai Treebank corpus.

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# Future User Behavior Prediction in the Case of Network Crash under Mobile Internet Environment

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## Abstract

With the development of science and technology, human beings have entered a whole new era. The lifestyle of modern people has undergone qualitative changes, and mobile web has become an inseparable part of daily life. Communication between people, the interaction between people and objects, information transfer between objects, all these may rely on the internet. However please make the following assumption, one day in the future, the mobile web collapses unexpectedly. The way humans depend on it will be completely disintegrated, and what actions users will take and what design can we make to reduce the influence of mobile internet crash. This paper discusses this possible situation, through case study and data analysis, find evidence of different panic behaviors based on what happened in the past and at present, explore what types of user behavior we might see and how to minimize the impact.

***Keywords-*** Mobile internet; panic; user behavior; prediction

## 1. Introduction

As human society enters the information era, human dependence on the internet has gradually increased, and networks have become an indispensable part of life. Every day we use the internet to connect with our surroundings, for example, based on smartphones people easily achieve communication from a very long distance; browsing news and checking emails during a trip; shopping online or playing games no matter when and where; mobile navigation avoids the embarrassment of getting lost, users can go to any place they want to go. Mobile web has had a specific impact on the behavioral habits and life of a new generation of users. With all these benefits, mobile web offers a great opportunity, it improves the efficiency and convenience of many processes in our life.

However, obstructions are coming along. The convenience of the network has led to human dependence on the Internet. For one thing, over-reliance on the Internet makes young people's attention challenging to concentrate, which would cause the reduction of efficiency in studying and working process. For another thing, indulging on the internet causes the reduction in communication between people, which is likely to lead to an emotional loss.

In this paper, first I give a brief overview of the definition, characteristics and development of mobile Internet, and then analyze the problems brought by the development of mobile networks, and how it affects user behavior and life. Based on the above analysis, through the establishment of the user models of different age groups, given the specific prediction analyzes different effects that to users of different age groups when the network crashes, find relationship between the impact of mobile network crash on users and the level of using mobile networks. At last, draw a conclusion of what kind of design would be better used in the future.

## 2. Review of mobile Internet

The mobile Internet does not currently have a clear and uniform definition. One of the views is that WAP (Wireless Application Protocol) is the mobile web; another view is that mobile data is used on mobile terminals; the other view is that "mobile" is just an access method, mobile Internet. It is the Internet.

Mobile web is a new technology in recent years. Compared with the original Internet technology, mobile web has made further breakthroughs regarding time, space and other factors based on the original technology. At the same time, mobile Internet technology integrates the sharing and openness of the original Internet technology.

### 2.1. Characteristics of mobile Web

One of the most prominent features of the mobile Internet is that users are no longer limited by time and place. They only need to have a mobile device to connect to the network for operation. Compared to the traditional desktop Internet, the mobile Internet breaks the existing space-time boundary. It has the following characteristics.

#### 1. Portability

Mobile Internet terminals are daily items including smartphones, tablets, smart watches and even smart glasses, and mobile terminals have the characteristics of small, lightweight, and easy to carry around. It is very popular and users can use the Internet anytime, anywhere.

#### 2. Convenience

The mobile web has changed the connection mode of the traditional Internet. As long as it is connected to the Internet through a mobile terminal in an area with network coverage, the mobile web is more convenient than the traditional Internet connection through a fixed port.

#### 3. Dependence

In Maslow's hierarchy of needs, it pointed out that after people meet the needs of survival and security, the next need is social communication, which means the communication between people. Mobile Internet just caters to this demand. Smart mobile devices are easy to use, fast to get started, and the price is not untouchable. For these reasons, the mobile internet has become the primary means of communication between people. The appearance of "Phubbing" is the best embodiment of mobile Internet dependence.

#### 4. Time-efficiency

In this era of information explosion, how to receive information for the first time becomes one of the primary needs of users. The mobile Internet allows users to "online" 24 hours a day, and can view and process network messages at any time, breaking the time and space restrictions received by the traditional Internet, filling up all the leisure and trivial time of users.

#### 5. Localizability

One of the advantages of the mobile Internet is localizability. No matter where the user is, just use the mobile terminal to connect to the Internet to enjoy the location service, which is not possible with the traditional Internet. This feature also enables the mobile Internet to be applied to service areas such as route navigation and location sharing.

### 2.2. Development of mobile web

With the popularity of mobile devices and the development of information technology, the mobile Internet has been fully integrated into people's daily lives. We cannot leave the smartphone one day, which means we cannot have one day to leave the mobile internet. Communication, video calls, entertainment videos, finding information, watching news, online shopping, mobile Internet has affected all aspects of our lives.

### 1. Network business is gradually moving towards mobilization

In the past, services on the PC port began to provide its use on the mobile side, such as chat communication, mail, video playback, network payment, etc., to ensure the continuity of its services.

### 2. Entertainment applications become a mainstream business

The most used mobile Internet terminals are smart phones, while the users are mostly concentrated in the youth group. The users have a significant dependence on the mobile network, and most of them use smartphones to kill the time and have specific requirements for the entertainment of the application. The demand of the market and the entertainment industry have outstanding technical support, and there are more entertainment apps in the app store.

### 3. Business transaction applications are growing rapidly

The development of electronic payment and mobile Internet has made mobile payment come into being. The generation of mobile payment has enabled significant e-commerce companies to develop their applications on the smartphone vigorously. Business transaction applications such as shopping, taxiing, takeaway service and travel booking have been rapidly developed. Online travel bookings include train tickets, airfare, hotels, and vacation products. Global leading information and measurement company Nielsen has released a white paper, which reveals how connected devices and digital platforms have led to a consumption boom in China. It shows that 84% of consumers used their mobile phone to shop in 2017 – up from 71% in 2015<sup>[1]</sup>.

### 4. Mobile Internet has serious regional development problems

There are many types of mobile Internet services, and most of them are mainly distributed in economically developed cities. Relatively speaking, the business in remote areas appears to be less. Due to the economic development level, people's living conditions, knowledge development, technological advancement and other factors of different regions, the distribution of mobile Internet has become severely regionalized. The regionalization of mobile Internet distribution directly leads to the difference in inter-regional communication levels, which may further lead to the gap in economic development level, and at the same time affect the regional distribution of mobile Internet.

## 3. Problems analyzing and user behavior research

This section depicts two parts. 1) The user's reliance on mobile networks has gradually increased and caused some bad influences; 2) An analysis of real cases shows that users' dependence on the network increases rapidly when an emergency occurs, and discusses how current designs respond to that situation.

### 3.1. Problems analyzing

Usually when humans start to adopt or rely on something, once they are lost, they will be extremely insecure and uncertain. When a baby is out of the mother's arms, the baby will be crying because of panic. When a child grows up, there is often a specific item that a child depends on it. It may cause the child to be unable to fall asleep when the item is not around. While adults suddenly lose something relying on, it may cause anxiety mood like OCD. In this era, almost everyone has a technology fever, technology is undoubtedly a beautiful and tempting one, because it makes up for the fragile part of human nature. We have an unimaginable dependence on it and it is difficult to get rid of.

Taking the life of modern people as an example, it seems that suddenly our life is inseparable from electronic devices. In addition to the necessary work and study time in a day, everyday life revolves around various electronic devices, open the phone to see social networks, watch the news, check emails, and listen to music. On the subway, on the bus, you can see that almost everyone is playing with their mobile phones. According to the survey, we will check the mobile phone one or two times a day; the last thing that some young people have before going to bed, the first thing to get up is to open the phone, even if it is not set and turn off the alarm.

Most people spend too much time on electronic devices, unable to concentrate, even affecting sleep, affecting regular communication with family and friends, and losing the ability to thinking alone. For most people in this modern society, once they lose their mobile phone, it is more like they lose the way to communicate with the outside world. They would always worry about they might missed the boss's phone



call, missed friends' information, and missed world news happened today. At this time, most people will start to panic.

Thus, many modern problems have born. For instance, Mobile phone overuse (smartphone addiction), is a dependence syndrome seen among mobile phone users. Some mobile phone users exhibit problematic behaviors related to substance use disorders. These behaviors can include preoccupation with mobile communication, excessive money or time spent on mobile phones, use of mobile phones in socially or physically inappropriate situations such as driving an automobile <sup>[2]</sup>.

Technology and media are not only taking up our time, but also changing our behavioral habits, affecting some of our abilities, and even changing our brains from a physiological level, making it harder and harder to focus and unable to think deeply. It is precise because our brains are more attuned to and conditioned to the state of security that comes with relying on electronic devices, once we lose it, we are more likely to experience psychological panic and anxiety, and even physical insecurities.

### 3.2. User behavior research

When an emergency occurs, the individual's psychological behavioral response will have a process of change. It is a reaction that occurs when the external stimulus is caused by the environmental change and users' coping ability. It is a result of interaction between the individual and the environment.

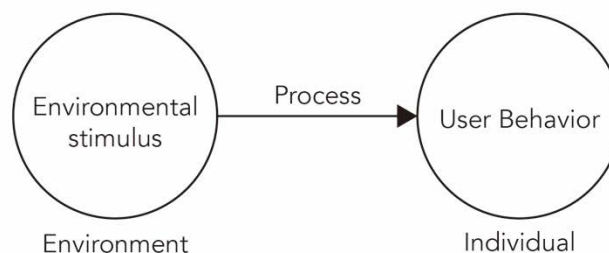


Fig. 1 Relationship between environment and individual

Studies have shown that after an accident, if the network system is still available, the number of online users will increase significantly. The US Geological Survey (USGS) has found that when an earthquake is felt by a population that uses Twitter, tweets reporting the incidence of an earthquake are published online sooner than the 2 to 20 minutes, it takes the USGS to publicly distribute instrumentally derived estimates of location and magnitude <sup>[3]</sup>. In an evaluation implemented by Paul et al, the authors found that tweets referencing earthquakes may be useful information for detecting earthquakes in poorly instrumented regions <sup>[4]</sup>. Instant change of user activities and appearance of event-related keywords have been seen in a variety of adverse events such as earthquakes, cross-border attacks, and wildfires <sup>[5]</sup>. For example, in the MW 4.3 earthquake in Morgan Hill, CA, 2009, the tweet frequency in the epicenter region quickly rose to about 150 per minute, in comparison to the background level of less than one per hour before the earthquake. Information regarding the location and specific details of events was reported on Twitter within seconds following the first explosion of the April 15th, 2013 bombing at the Boston Marathon <sup>[6]</sup>.

Modern environmental science points out that people's response and judgment to the environment is based on the what they are acquiring from it. The above data analysis shows that people no longer regard the mobile Internet as a simple way of communication, but a necessity for survival. With the development of technology, users' dependence on the mobile Internet will only increase. So, in the future, when the mobile Internet crashes, even a brief crash or a network failure will have a massive impact on users.

### 4. Predictions based on user behavior researches

In 2017, China's largest communication app (active users 963 million) WeChat briefly crashed for an hour, promptly heated up in China and jumped to the top of the popular search. To avoid or minimize the

impact of the mobile Internet crash on user psychology and life, the user model should be analyzed and then thinking about what design should make in the future.

#### 4.1. User behavior prediction

In predicting the behavior of future mobile Internet users, we should establish a user model to outline the persona first. It is based on user-centered design ideas, including the user's necessary information, living environment description, usage scenarios, and product usage behavior. In personas created by Microsoft designers Pruitt and Grudin, a template for the persona of the mobile Internet application for smartphones were designed<sup>[7]</sup>. In this template, the designer can select the elements according to the specific design project to combine and piece together.

Among all users of the mobile internet, a different generation has a different dependence of the internet. The new generation born in an era of remarkably developed networks, so they are more dependence on the network. However, the old generation experienced the process of the network emerging to well-developed, and the dependence was relatively reduced. The oldest generation has gone through the entire development process of the network, and the familiarity and dependence on the mobile network are relatively low. Therefore, based on the template, user classification is performed according to different age groups, and a user model is established.

Table 1. User Model 1

User overview	16-25 years old
Product related information	Proficient in smartphones and mobile internet The extremely high frequency of using mobile internet Check mobile phones more than 50 times a day Habitual behavior Almost all problems can be solved with mobile internet
Scene script	Mobile internet crash
Problems	Seriously affect normal life
Solutions	Reduce the dependence of young people on mobile phones

Table 1. User Model 2

User overview	26-40 years old
Product related information	Familiar with smartphones and mobile internet Use mobile internet frequency Have certain dependence Can solve some problems with mobile internet
Scene script	Mobile internet crash
Problems	May have some impacts but can adapt
Solutions	Reduce the dependence of mobile phones

Table 1. User Model 3

User overview	41-55 years old
Product related information	Can use smartphones and mobile internet Using mobile internet but not in high frequency Have no dependence Using functions is mainly limited to chatting, browsing news, etc.
Scene script	Mobile internet crash
Problems	No impact
Solutions	Remain unchanged

According to the user models of different age groups, the following conclusions can be drawn: the impact of mobile network crash on users is related to the level of using mobile networks. The horizontal axis of the Fig. 2 below represents the level of user independence when network breaks down, and the vertical axis represents the extent to which users use the mobile network. The three colors of ABC represent different age groups, and the degree of tilt of the diagonal line represents the panic behavior of users. The more frequently users use mobile networks, the less independent they are in network crash down, and shows higher level of panic.

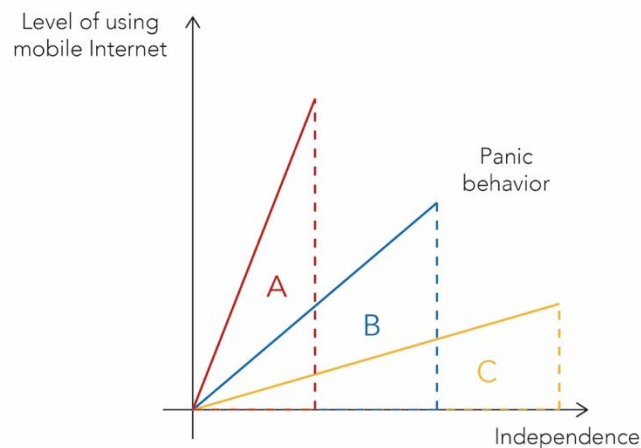


Fig. 2 Impact of mobile network crash on different users

#### 4.2. Innovation design

One day in the future, when an emergency or network failure causes the mobile world to linger, the world may fall into a silence, so at this moment, it is particularly important to plan. The CNN web design undoubtedly provides us with some inspiration (<http://lite.cnn.com/en>). This is a special version of the news page. When the mobile network connection is not smooth, the user can choose to enter this version of the webpage directly. It will only display the text version of the website homepage, but will not load any images, videos and animations. However, users can still browse real-time news. Moreover, after clicking on the news link to enter the secondary page, it is still presented in plain text. Imagine that when an emergency occurs, countless people are using the mobile network to try to contact the outside world. The congestion of the network can be imagined. The design of CNN ensures that users can still receive messages when the mobile network signal is inferior, which can bring great psychological comfort to users.

The development of responsive web design also provides another solution, which is an important technology developed to cope with the growing demand for mobile devices. The responsive web allows web pages to automatically adjust to the screen size of smartphones, tablets, etc., ensuring the smoothness of the website display. In some areas where 3G or 4G mobile networks are not widely available, people still rely on slow Edge for network systems. Therefore, the design of the responsive web design can shorten the loading time of the website, and the users would not be limited to the mobile network with poor connection when browsing the webpage.

How to design to reduce the user's panic when the network crashes? As shown in the Fig.3, the horizontal axis represents the different stages of design from tradition to innovation. When the mobile network collapses, the traditional design will reduce the user's panic. Conversely, the technological design will increase the user's panic. Therefore, finding the balance between traditional design and innovative design is the key. Among the four types of ABCD design, B and C are within the scope of good design. They consider both tradition and innovation, which is also a possible development stage in future design.

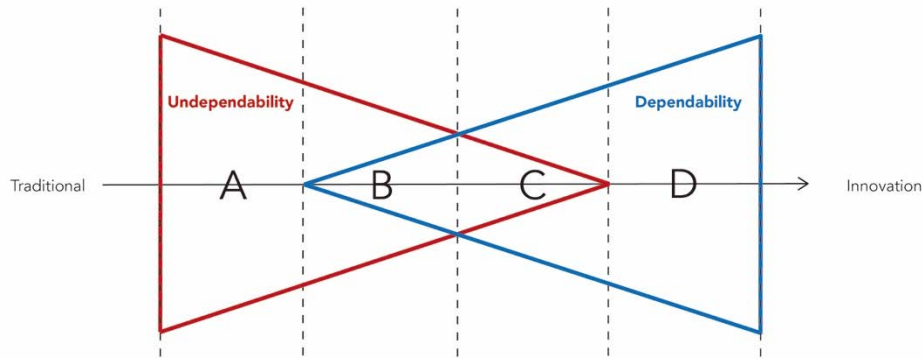


Fig. 3

## 5. Conclusion

We live in the age of intelligence, smart phones, smart homes, artificial intelligence, etc. The convenience that these products bring us is unimaginable more than a decade ago, but does intelligence mean everything? It is undeniable that intelligence is indeed an inevitable trend of development of time, but progress also means that it is almost impossible for human beings to re-adapt to lives without mobile networks. For instance, a building using an elevator must have a staircase as a fire exit to ensure safety when an accident happens. From a design perspective, always consider the backup plan is the key to deal with possible mobile internet crashes in advance, and to minimize the impact on people's life.

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## What do students expect from us?

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### Abstract

This paper discusses what students expect from their teachers during their course work based on their feedback in Student Course Evaluation conducted at the end of the semester before they receive their final grades from their teachers. The study involved Chinese undergraduate students completing their one year course in the dual degree program in the fields of Animation and Visual Effects at Dongseo University, Busan, Korea. Based on the students' feedback, the effectiveness of students' course evaluation will also be discussed along with the students' characteristics reflected in their feedback on lectures.

**Keyword:** *motivation, student ratings, teaching*

### 1. Introduction

For the higher education institutions to prepare the 4th Industrial Revolution Era, the relevant skills and knowledge which the 21st Century students must possess are continuously discussed in learning and teaching environment. The administrators in higher education institutions, national education departments, and/or university educators have(has) been determining course contents and teaching methods to help students build competencies required for the 4th Industrial Revolution, the cyber physical systems. However, students' feedback on their teachers or educators must be considered in learning and teaching as they are another active agent in education.

Education actors are both teachers and students. Learning and teaching environment is a living organism that changes and develops through the interactions of both actors. This study involves 270 Chinese undergraduate animation and visual effect major students who are completing their one year course at Dongseo University under the dual degree program between Zongnam University of Economics and Law, China and Dongseo University, South Korea. Based on the students' written qualitative feedback, the study will discuss what students expect from their teachers along with their reflected characteristics. Also, the study will discuss whether the quantitative course evaluation questionnaire in 5 point Likert scale fully extracts students' straightforward views on their lectures.

### 2. Student Course Evaluation Questionnaire

Dongseo University conducts student course evaluation questionnaire at the end of the semesters before students receive their final grades from their teachers. Student course evaluation questionnaire examines six factors in 5 point Likert scale: Organization and Sincerity of the lecture, the lecturer's role as a facilitator, the lecturer's teaching skills and communication ability, the lecturer's use of educational materials, assignments and appropriateness of tests, and overall evaluation. Students are also asked to write freely about the lectures. Table 1 shows the student course evaluation questionnaire in Dongseo University.

Table 1. Student Course Evaluation Questionnaire in Dongseo University

Factors	Questions	Types
Organization& Sincerity of the lecture	The lecturer led the lessons according to the syllabus. The lecturer was punctual and never missed the classes. The lecturer managed the lessons with passion.	Quantitative
The lecturer's role as a facilitator	The lecturer provided Q&A and discussion opportunities. The lecturer provided clear and specific answers to students' questions. The lecturer allowed the time for questions or counselling after classes.	Quantitative
The lecturer's teaching skills and communication ability	The lecturer explained the lectures clearly so that the students were able to understand the lectures easily. The lecturer provided clear examples for the students to understand the lectures with ease. The textbook and the references helped the students understand the lectures easily.	Quantitative
The lecturer's use of educational materials	The lecturer employed various teaching skills according to the lectures: discussion, presentations, video clips or presentation files. The lecturer employed e-class, e-learning, personal website to communicate with the students.	Quantitative
Assignments and appropriateness of tests	The lectures gave clear instructions on evaluations. The lecturer evaluated students' skills and knowledge relevant with lectures. The lecturer provided feedback on assignments.	Quantitative
Overall evaluation	Overall, I am satisfied with the lectures.	Quantitative
Free Writing	Write freely to the lecturer about the lectures. Suggest any improvement on the lectures if any.	Qualitative

### 3. Findings and Discussion

The students' responses to quantitative questions are categorized into six factors: orientation, structuring, application, interactive classroom, teaching skills, and assignments.

#### *Orientation*

The students wanted their teachers to provide the clear objectives for their lessons. Students expect the orientation process to have their lessons meaningful. They want to know the reasons of their lesson designed by their teachers. This expectation indicates that students are no longer passive followers. They want to have interactive communication with their teachers in learning process in in class.

#### *Structuring*

These students suggested that they need to have lesson parts to structured: overview, review, and preview. They wanted their lessons to be uploaded online ahead for both the preview and review. Students' expectation on structuring shows that the difficulty level of their lessons be delivered gradually and implies again that they want to have interactions in class with the lecturers.

#### *Application*

The students required practice and application opportunities in class. They commented that they did not just want to follow teacher-centered lectures. Students' expectation on application implies that students are more eager for the industry-related activities in class. They want active participation in class.



#### *Interactive Classroom*

The students indicated that the difficulty level of lessons should be controlled by asking students lesson-relevant questions to check the students' understanding of the lessons.

#### *Teaching skills*

The students requested various teaching skills depending on lesson types. Students' request show that the students have capabilities of assessing teachers' teaching skills and dependence of their motivation to learn. They are no longer passive learners.

#### *Assignments*

The students indicated the amount of assignments to be controlled and the assignment dates be scheduled evenly during the whole semester. They also commented that the complexity of assignments are not linked with the lessons.

### **4. Conclusion**

The findings from the student course evaluation questionnaire clearly shows what students expect from their teachers in six different categories. Their expectations in six different categories indicate that they basically want clear and active communication or interactions with their teachers in class. For higher Education institutions to understand student needs, data analysis is essential. Education is increasingly becoming “just in time” rather than “just in case”; it is more about what you need to know for a certain time than compiling knowledge that may never be needed[2]. Therefore, data regarding student performance, behavior, development, and interaction inside classrooms must be gathered from student course evaluations or ratings. Data analysis would help the lectures design their courses that would reinforce students' motivation in the classroom and thus enhances students' active engagement in class.

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# Smartphone Addiction Among University Students: Problems and Possible Solutions

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## Abstract

It is already accepted that smartphones have been adopted in almost every sphere of our lives: personal, professional, educational. This technological innovation provides access to the internet, documents in various formats at all times, allowing us to process data faster, learn new things easier, improve our working performance, effectiveness, productivity, etc. A lot of mobile applications have been developed for educational purposes targeting to help students with their studies. Universities develop their own mobile applications in order to help students control their curriculum, check schedules, assignments, participate in projects and other activities. And with such an increase of smartphones usage, we now face quite a prevalent issue – smartphone addiction. The purpose of this paper is to study how university students use their smartphones, what level of smartphone addiction they have and what impact it has on their educational performance.

***Keywords-smartphones; smartphone addiction; education; university students***

## 1. Introduction

Rapid development of mobile technologies brings a lot of comfort to every sphere of our lives: we use mobile devices at universities, working places, homes, while travelling, doing sports exercises, etc. Smartphones are one of the most popular mobile devices we employ in our everyday routines. If we look at some statistics in smartphones ownership by age groups (e.g., in [11]), we can see that the majority of smartphone users are in the age groups 18-29 and 30-49. The first age group includes a lot of college/university students who supposedly use smartphones in their educational life as well.

A number of studies has been done in order to evaluate to what extent university students use their smartphones for educational purposes, investigate which cognitive factors influence the continued use of smartphones and how smartphones can be used in classrooms for measuring students' attentiveness in lectures. Along with the latter studies, some research papers suggest effective methods of using smartphones in classroom environments and outside.

Our research is devoted to a study of smartphone addiction level among university students and what relation does it have to their use of smartphones in personal/social and educational life. For the purpose of this study we performed a survey among undergraduate university students, with quantitative analysis of its results.

The structure of this article is organized as follows: Section 2 briefly describes previous studies on use of smartphones among students; in Section 3, we describe our research method with its results; Section 4 concludes the paper.

## 2. Previous Studies on Use of Smartphones in Higher Education

A number of research papers introduce results on studies about students' preferences in use of smartphones. For instance, Feng et al. [1] in their research about students' preferences and intention on

using smartphone education applications found that educational performance expectancy has the strongest predictor of behavioral intention. Therefore, people who expect higher on their own performance by utilizing technology are more likely to adopt smartphone learning apps. It is also shown that most learners prefer visual learning style, where diagrams and graphs can help learners to gain information and memorize things, which in turn suggests to utilize more pictures and diagrams in order to enhance the educating functions of smartphone apps. Research results of Morphetou [4] show that an increasing number of students do use their smartphones for educational purposes and in many situations replacing the use of laptops. This study discovered that 41% of the respondents said they have downloaded apps to help them with their studies and education whereas the most popular choice was instant messaging apps (51.4%).

The cognitive factors that influence the continued use of smartphones by college students had been investigated by Idemudia et al. [3]. Their model indicates that both familiarity and cognitive trust in the integrity of a smartphone have a positive and significant effect and explains 79% of smartphone continuance usage, which, in turn, made authors to suggest the following investigation of factors relating to Visual Perception Theories that directly influence smartphone continuance usage. It is also shown that accessibility of smartphone and smartphone satisfaction explains 52% of cognitive trust in integrity for a smartphone.

Other studies suggest how to use smartphones in the classroom in order to improve students' attentiveness, increase their motivation to study harder and improve students learning concentration. Höver and Mühlhäuser [2] developed a system called "Classquake" that uses students' smartphones as decentralized sensors to measure their activity and attentiveness during lectures. The system aims at supporting lecturers to recognize a decline of students' attentiveness in order to start appropriate countermeasures like short breaks, which can recover the level of attention. Rothe [6] and Yamamoto [9, 10] suggest to employ special smartphone applications in order to better handle classrooms and improve students learning motivation and self-learning: Pingo app and the software configuration for lecture record, respectively. Both application suggest real-time interaction between students and lecturers at specific stages of the lectures. Another learning motivation improvement with use of smartphones is suggested by Shirali-Shahreza et al. [7] where computer science students should be involved in real-world problems. Example problem introduced in their paper is to ask students implement the FFT (Fast Fourier Transform) algorithm on a PC and then port the program to a smartphone using J2ME (Java 2 Micro Edition) programming language. It is supposed that by doing this project, the undergraduate computer science students will become familiar with the limitations of small devices such as smartphones.

There are a few studies on smartphone addiction which are focused more on general groups of users and either analyze factors that contribute to smartphone addiction or suggest some intelligent systems to reduce and/or prevent smartphone syndrome. For instance, Rapeepisarn et al. [5] aimed to develop an Android application, namely iRelief, which could keep track and collect information about smartphone usage, measure percentage and level of smartphone addiction as well as provide basic knowledge about smartphone addiction, smartphone syndrome, and yoga. In addition, the application offered a yoga treatment solution to prevent and relieve symptoms caused by smartphone addiction syndrome.

As can be seen from the above research papers review, no specific study had been performed on the detailed purposes of use of smartphones by students along with the study on their smartphone addiction level. Following we introduce our investigation on this issue and analyze its results.

### 3. Research Method

For the purpose of this research paper it was decided to perform a descriptive quantitative analysis for more conclusive results. 51 undergraduate international students (from freshmen to seniors) of Dongseo University from Computer Engineering (CE) and Business Administration (BA) departments participated in a personal survey in September 2018. The participants' characteristics in our study are shown in Table 1.

#### 3.1. Survey Preparation

A personal questionnaire has been developed for a survey. It consists of three parts: the first part includes questions about students' preferences in use of smartphone (e.g., phone calls, chatting through instant messengers, checking SNS, reading/watching news online, studying/doing homework, playing

games, etc.) where students have to select an answer in the range from 1 (never use) to 7 (most of the time) and statements related to the students' attitude in smartphone usage, with indications ranging from 1 (strongly disagree) to 7 (strongly agree); in the second part students are requested to visit online test on adult Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD) [13]; the third part requires students to go through the nomophobia test [12] in order to evaluate their level of smartphone addiction.

Table 1. Characteristics of the Survey Participants

no. of Male/ Female students	Students' age	Departments	Students' year of study	Years of using smartphone
Male – 51 (100%)	18y.o. – 4 (7.84%)	CE – 36 (70.59%)	Freshman:	1yr – 2 (3.92%)
	19y.o. – 8 (15.69%)	BA – 15 (29.41%)	18 (35.29%)	2yrs – 1 (1.96%)
Female – 0 (0.0%)	20y.o. – 10 (19.61%)		Sophomore:	3yrs – 6 (11.76%)
	21y.o. – 20 (39.22%)		7 (13.73%)	4yrs – 6 (11.76%)
	22y.o. – 5 (9.80%)		Junior:	5yrs – 10 (19.61%)
	23y.o. – 3 (5.88%)		20 (39.22%)	6yrs and more – 26
	24y.o. – 1 (1.96%)		Senior:	(50.98%)
			6 (11.76%)	

### 3.2. Survey results

For the purpose of better understanding of smartphone addiction situation among university students, let us start with analysis of the first part of the survey. The questions about use of smartphones are duplicated for two categories: use during lectures and use outside of lectures. Fig.1 and Fig.2 show the results respectively. It is evident from these Figures 1 and 2 that majority of students do not use smartphones during lectures for such purposes as listening to music, watching videos, playing games, and phone calls. However, there are some peaks in the histogram of respondents' answers distributions indicating that more than half of students "sometimes" (4) and "often" (5) use smartphones during lectures for studying – 16 (31.37%) and 12 (23.53%) students respectively. According to the additional comments in the questionnaire, computer engineering students sometimes use their smartphones in classes while learning and developing Arduino projects with use of smartphones or access online E-class system to open study materials for the lecture.

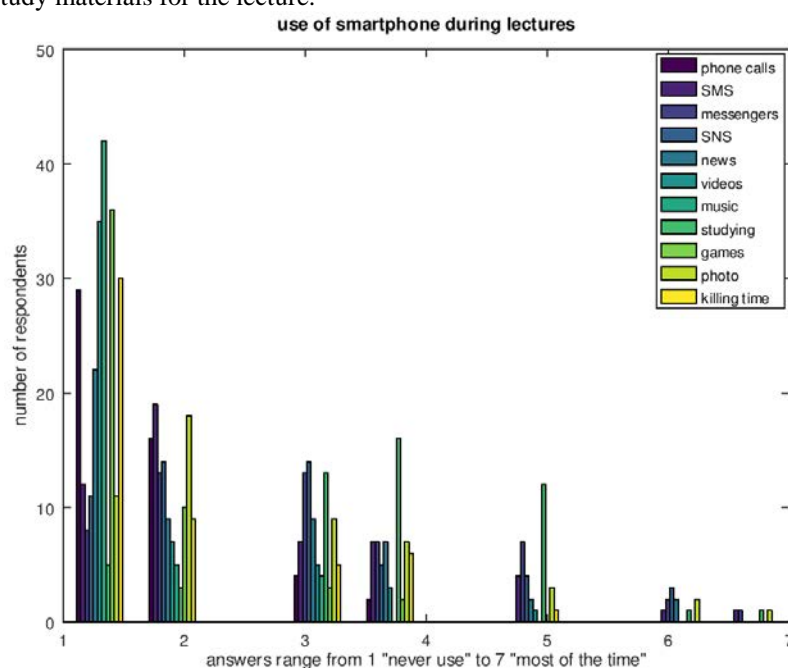


Fig. 1 Respondents' answers on use of smartphone during lectures.

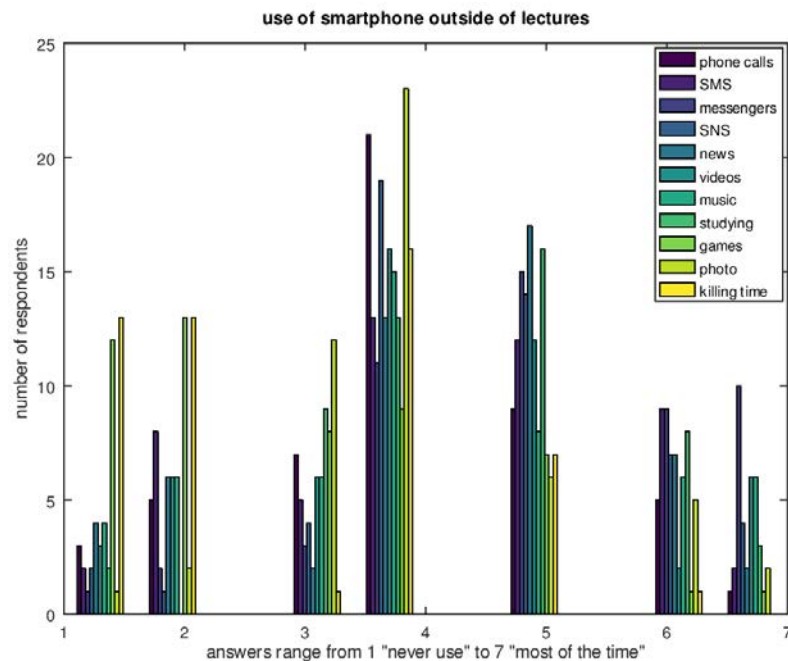


Fig. 2 Respondents' answers on use of smartphone outside of lectures.

As for use of smartphones outside of lectures, Fig.2 shows that most popular answers belong to such purposes as: taking photos, phone calls, checking SNS – “sometimes”; to check news, to study/do homework, to chat through instant messengers – “often”; to send SMS and chat through instant messengers both have high peaks in “very often” and “most of the time” responds.

Next, we show results on the amount of hours students spend in average per day using their smartphones (separate on weekdays and weekends). According to Fig.3 majority of students spend more time with their smartphones on weekends: 7 hours and more – 15 respondents (29.41%), up to 6 hours – 8 respondents (15.69%), up to 5 hours – 10 respondents (19.61%); whereas high peaks on use of smartphones on weekdays are distributed as follows: up to 3 hours and 7 hours and more – equally, 8 respondents (15.69%), up to 4 hours – 12 respondents (23.53%), up to 5 hours – 13 respondents (25.49%).

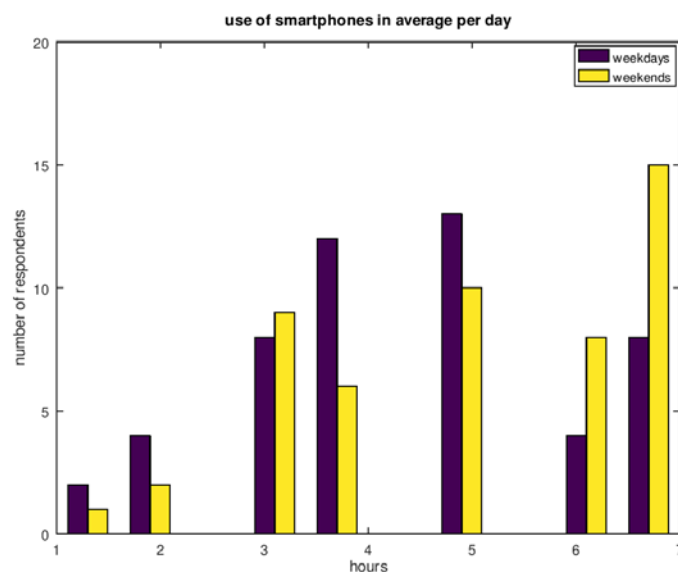


Fig. 3 Average hours spent on using smartphones per day.

Fig.4 illustrates results of students' responds to rate: (a) how often they use smartphones to find (search online, ask friends, etc.) answers/solutions/ hints for their homework assignments; (b) to study, learn some new, additional theories related to their courses. It is evident from the graph that majority of students rated these two statements as "sometimes" (27.45% (a) and 21.57% (b)), "often" (27.45% (a) and 31.37% (b)), "very often" (21.57% (a) and 31.37% (b)), and "most of the time" (9.80% (a) and 7.84% (b)).

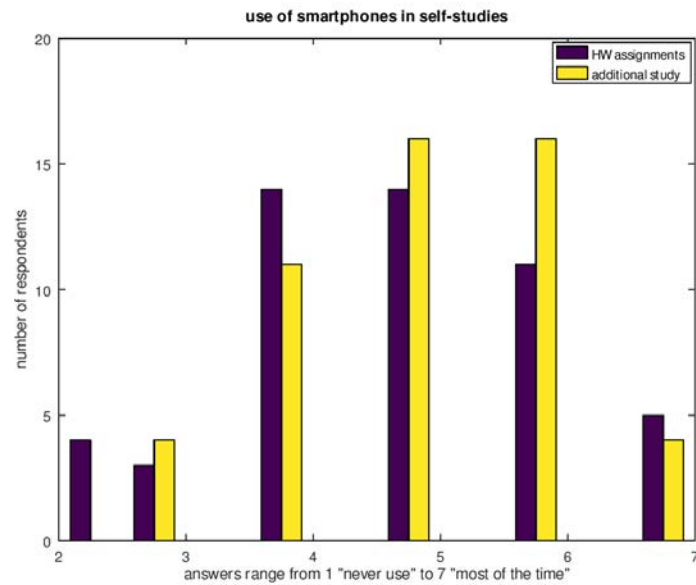


Fig. 4 Use of smartphones for homework assignments and self-studies.

An interesting fact can be observed from Fig. 5 – it shows results of students' perception on their skills to (a) learn an understand new materials easily and (b) to easily memorize and remember for a long time new theories related to students' studies. Statements (a) and (b) on evaluation of these skills are suggested to be rated from 1 (strongly disagree) to 7 (strongly agree). Both skills get higher responses with ranges 4,5, and 6 (i.e., students agree with the statements at different levels), however the highest peak on distribution of learning skills evaluation has rate 5 (24 respondents - 47.06%), whereas the highest peak on distribution of memorization skills has rate 4 (22 respondents – 43.14%).

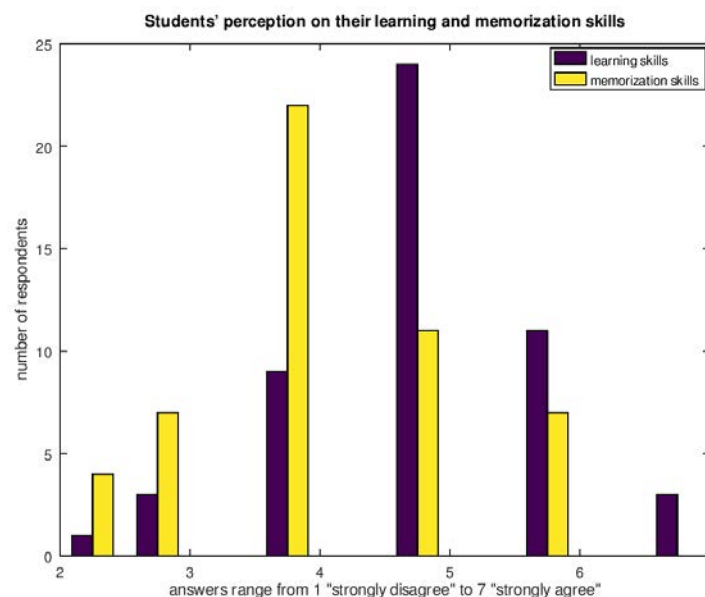


Fig. 5 Students' perception on their learning and memorization skills.



Finally, we approach to the results of part 2 and 3 of our survey. In part 2 students used a scientific test [13] to help determine if they have some symptoms of ADD or ADHD which include difficulty concentrating, keeping organized, impulsivity, and for some, hyperactivity. Developers of this test claim that this is not meant as a diagnosis tool but rather its results to be interpreted as recommendation to possibly seek further diagnosis from a trained mental health professional in order to rule out a possible attention deficit disorder. Therefore, we use results of this test for the purpose of measuring potential symptoms of ADD/ADHD. After completing the test, a person gets instant results in three numbers: total score, inattention subscale, and hyperactivity/impulsivity subscale. The results of two subscales together add to the total score. Fig. 6 illustrates results of the test with three scores.

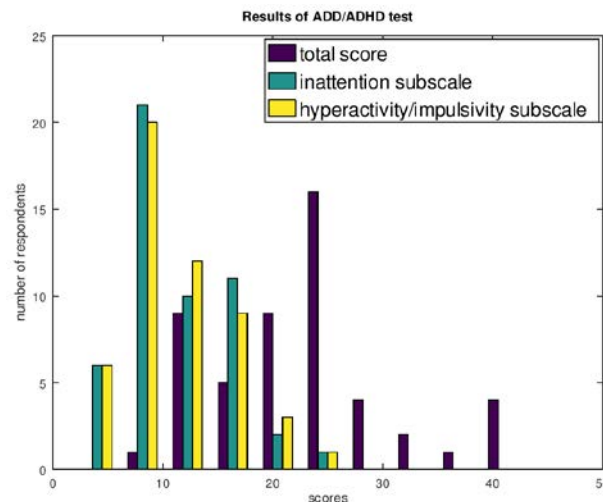


Fig. 6 Results of ADD/ADHD test.

The scoring key along with score results of the test is given in Table 2. According to these scores, majority of students have “ADHD possible” (37.25%), “ADHD symptoms” (25.50%), and “Moderate ADHD” (23.53%) results, whereas in subscale scores most of the students have low (60.79%) and moderate (33.33%) values.

Table 2. Scoring key and results for ADD/ADHD test

Total score	Number of respondents	Scores in subscales	Number of respondents
34 & up – Adult ADHD	5 (9.80%)	20 & up - - High	3 (5.88%)
26-33 – Moderate ADHD	12 (23.53%)	13-19 – Moderate	17 (33.33%)
19-25 – ADHD Possible	19 (37.25%)	0-12 - Low	31 (60.79%)
12-18 – ADHD symptoms	13 (25.50%)		
0-11 – No ADHD symptoms	2 (3.92%)		

In the last part of our survey we employ nomophobia test [12] in order to measure level of smartphone addiction among students. Fig. 7 illustrates results of this test among the survey participants. Three horizontal lines on the stem graph are to separate four levels of smartphone addiction from Absent (with scores 0~20) to Severe (with scores 100~140). According to this test, more than half of students (27 respondents - 52.94%) have moderate level which (according to [12]) refers to the fear of not being able to access information; 13 students (25.49%) have mild dimension of nomophobia which refers to fear of losing connectedness; and 11 students (21.57%) are indicated as having severe level of smartphone addiction which in nomophobia dimension refers to “giving up convenience”.

In order to conclude results of our survey we measured correlations between pairs of various responses' samples and found moderate positive correlations between the following samples:

- $q7\_3$  and  $NFT$  ( $r = 0.53316$ ),
- $q7\_3$  and  $TOT$  ( $r = 0.53248$ ),
- $TOT$  and  $NFT$  ( $r = 0.52304$ ),

where  $q7\_3$  is the statement for students to rate from 1 (“never use”) to 7 (“most of the time”) – “How often do you use your smartphone during the classes for chatting through instant messengers”,  $NFT$  is nomophobia test result, and  $TOT$  is total score from ADD/ADHD test. Example visualization of one of the correlations (between  $TOT$  and  $NFT$ ) is introduced in scatter plot in Fig. 8. Correlation coefficients  $r$  were calculated with a general Pearson’s correlation coefficient formula (1):

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}} \quad (1)$$

where  $x$  and  $y$  are the individual sample points.

Additionally, mild positive correlations have been found among the following samples:

- $q7\_4$  and  $NFT$  ( $r = 0.40737$ ),
- $q7\_11$  and  $TOT$  ( $r = 0.46658$ ),
- $q13$  and  $NFT$  ( $r = 0.44564$ ),

where  $q7\_4$  is the statement for students to rate from 1 (“never use”) to 7 (“most of the time”) – “How often do you use your smartphone during the classes for checking SNS”,  $q7\_11$  is the statement “How often do you use your smartphone during the classes for just killing time”, and  $q13$  is the statement to rate from 1 (“strongly disagree”) to 7 (“strongly agree”) – “I am happy to have my smartphone always with me”.

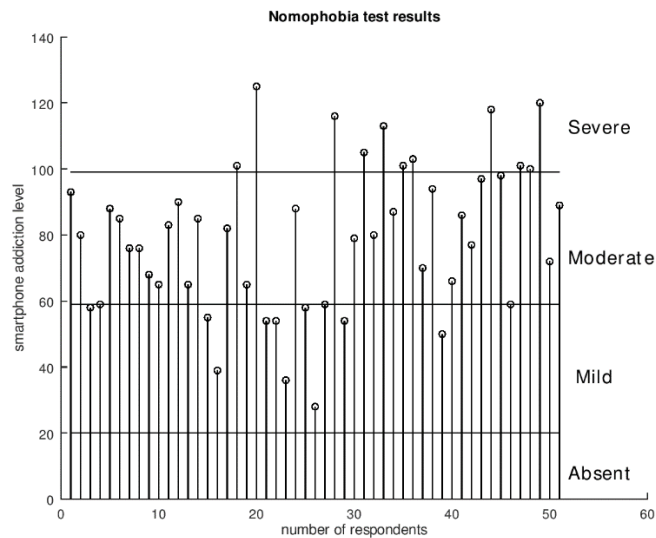


Fig. 7 Results of ADD/ADHD test.

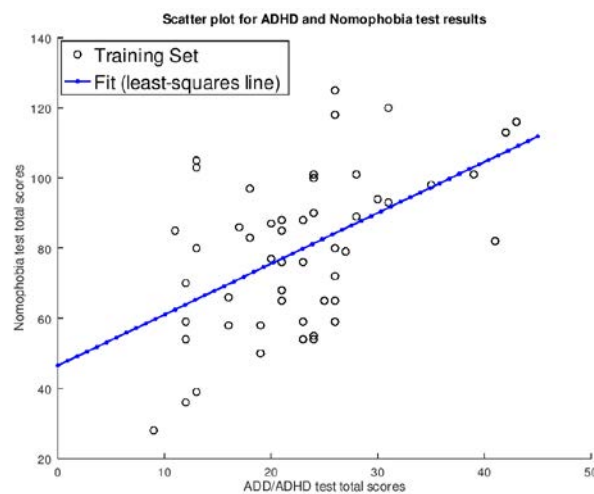


Fig. 8 Results of ADD/ADHD test.

## 4. Discussion and Conclusion

According to our survey results we found that students have mild (25.49%), moderate (52.94%) and severe (21.57%) levels of smartphone addiction. Referring to the first part of the questionnaire and taking into consideration correlation coefficients, it infers that the major fear students encompass is related to their possibility to communicate through instant messengers and SNS. In additional comments they mention the reason of being happy to always have smartphone with them as necessity to be always available to be reached by family members, friends, and/or to get important messages/calls on time. Somewhat meaningful correlation of nomophobia and ADD/ADHD tests with students' use of smartphones during the classes (to chat through messengers and check SNS) can be explained as a result of behavioral culture in lectures environment – students are supposed to listen to professors, participate in study activities for some consecutive hours without watching their smartphones frequently at any time. This anxiety somehow distracts students from lectures at different moments and may influence on their study performance.

Our survey has also shown no relation of smartphone addiction to students' learning and memorization skills, though recent studies [8] mention about “Google Effect” and “digital amnesia” due to individuals to believe they can access stored/necessary information at any time through computers/smartphones.

To conclude this paper, we acknowledge that sample size (51 participants) in our survey is limited to one university and two departments, along with all students being males, and may not represent its effect to the general population of students. Therefore, we plan to conduct additional research with expanding sample size and studying more thoroughly use of smartphones among students and professors involving smartphones in their courses.

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# ACHIEVING GRADUATE ATTRIBUTES THROUGH AN INTEGRATED ONLINE PLATFORM FOR INTERNATIONAL COLLABORATION: A NEED BASED STUDY

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## Abstract

The present study aims to explore on possibilities of developing an integrated online platform for international collaboration and relate the proposed platform with the graduate attributes of CHRIST (Deemed to be University). Three important aspects of the platform were identified. They include advantages, challenges and suggestions. When the advantages of the platform were linked with the graduate attributes, a significant relation was observed between them. The study implies that collaborating with different foreign universities through the integrated online platform can well nurture the graduate attributes among university students.

**Keywords-** *international collaboration; graduate attributes; integrated online platform; semi-structured interview; content analysis*

## 1. Introduction

International collaboration is encouraged by most of the universities and research institutions [1]. Goal of such collaboration is to generate research projects, share knowledge, and solve each other's research problems and cementing international relationships [2]. Collaboration between countries can bring other gains such as developing trust among countries and engagement of researchers [3].

In recent years, the internet and other information technology resources have supported long-distance communication among researchers. But most of the collaboration begins only after the collaborators have established personal contact [4]. A few important elements to be taken care for an international collaboration to be fruitful include detailed planning, knowing the context of different country, building relationship continuously, being flexible, using technology to enhance communication, ensuring that both parties get benefit out of collaborations, creating a common ground and thinking for long term [5]. Universities across the world are offering different programs for international collaboration to cultivate graduate attributes of students [6].

Graduate attributes have been defined as "the qualities, skills and understandings a university community agrees its students will desirably develop during their time at the institution and, consequently, shape the contribution they are able to make to their profession and as a citizen" [7] [8]. But it is not feasible for everyone to go for offline collaborations. There are numerous online platforms with communication tools, design tools, documentation tools, file sharing tools and project management tools. These tools are fragmented and serve limited purposes. One of the fundamental purposes of university is to nurture graduate attributes among students. Hence through this present study, investigators explore on the need to have an integrated online platform which can be utilized to nurture graduate attributes among university students.

## **2. Objectives**

The first objective is to explore on the understanding of students and faculty members on integrated online platform for international collaboration. The second objective is to relate integrated online platform for international collaboration with graduate attributes of CHRIST (Deemed to be University), Bengaluru, India.

## **3. Method**

### **3.1. Research Design**

For in-depth exploration investigators utilized a qualitative phase.

### **3.2. Participants**

Participants included five students and five faculty members (males=3, females=7) who are currently associated with CHRIST. Participants were selected using purposive sampling technique.

## **4. Measures**

### **4.1. Semi-Structured Interviewing Technique**

Investigators prepared open ended questions related to the research area and conducted semi-structured interview with participants. Interview sessions were planned for duration of half an hour to one hour.

### **4.2. Procedure**

Five students and five faculty members were identified to take part in the research study. Rapport was established prior to the interview. The process of data collection was mainly through semi-structured interviewing techniques. With the consent of participants, their responses were audio recorded. Data collected were later content analyzed using the support of Dedoose software. Here researchers looked for patterns that evolved from the descriptions to identify the understanding of students and faculty about the integrated online platform for international collaboration. All the ethical issues were taken care throughout the research processes.

## **5. Results and Discussion**

Results and discussions were done in two phases. Phase-I dealt with the understanding of students and faculty members about the proposed Integrated Online Platform for International Collaboration (U-GATEWAY). Phase-II talks about the relation between advantages of U-GATEWAY and the graduate attributes of CHRIST.

### **5.1. Phase-I**

Three major categories were identified. Categories discussed include 1) Collaboration Advantages of U-GATEWAY, 2) Collaboration Challenges of U-GATEWAY and 3) Suggestions for U-GATEWAY. Details of categories and sub-categories are given in below sections.

#### **5.1.1. Collaboration Advantages of U-GATEWAY**

Ten different advantages of having U-GATEWAY identified from discussions. Using Dedoose software, a qualitative chart was plotted. Identified advantages, count values, mean scores and sum scores are



presented in table 1.

Table 1. Advantages of U-GATEWAY

Advantages	Count	Mean	Sum
Research/Project Collaboration	29	6.2	181
Idea Development and Resource Sharing	20	6	120
International Exposure (Online and leading to Offline)	13	6	78
Discussion Forums	10	5.7	57
Online Seminars/Conferences/Workshops	8	5.9	47
Convergence of Ideas	6	6	36
Cultural Bonding	3	6	18
Online Internship	3	6	18
Collaborative Report Generation	2	5.5	11
Proposal Preparation for International Funding	1	6	6

Above table has been arranged in the order of importance, from most responded to the least mentioned sub-categories. Advantages in top five list include research collaboration, idea development & resource sharing, international exposure, discussion forums and online seminars/conferences/workshops.

### 5.1.2. Collaboration Challenges of U-GATEWAY

Second category evolved from discussion was termed as collaboration challenges of U-GATEWAY. Nine different challenges were identified. Identified challenges, count values, mean scores and sum scores are presented in table 2.

Table 2. Collaboration Challenges of U-GATEWAY

Challenges	Count	Mean	Sum
Lack of Face-to-Face Interaction	10	6.1	61
Server Issue	5	6.2	31
Misuse of Platform	4	6	24
Privacy Issues	4	5	20
Cultural Clash	3	6	18
Withdrawal	3	5.7	17
Inability to Use the System	2	6	12
Time Zone Differences	2	6	12
Closed Mindedness in Information Sharing & Receiving	2	6	12

Challenges which are in top five among the list are lack of face-to-face interaction, server issue, misuse of platform, privacy issues and cultural clash.

### 5.1.3. Suggestions for U-GATEWAY

Participants also shared their suggestions which can be included while developing U-GATEWAY. Suggestions evolved from discussions are categorized under four different sub-categories. Details are given in table 3.

Table 3. Suggestions for U-GATEWAY

Suggestions	Count	Mean	Sum
Structured System	7	6.1	37
Continuous Trouble Shooting of Platform	4	5.8	23
Facilitators and Volunteers	3	7.7	23
User Friendliness	2	6	12

Suggestions are presented in the order of importance: structured system, continuous trouble shooting of platform, facilitators and volunteers and user friendliness.

## 5.2. Phase-II

In this phase investigators studied the relation between the advantages of U-GATEWAY and the graduate attributes of CHRIST. Details are given in table 4.

Table 4. Concurrency between the Advantages of U-GATEWAY and the Graduate Attributes

Advantages of U-GATEWAY	Concurrency Percentage	Graduate Attributes					
		Academic		Personal	Interpersonal		Societal
		Academic Excellence (4)	Professional Excellence (9)	Personality (12)	Leadership (9)	Communication (6)	Social Sensitivity (7)
Research/Project Collaboration	64%	4	7	6	4	3	6
Idea Development and Resource Sharing	66%	3	7	9	4	5	3
International Exposure	68%	3	8	5	5	4	7
Discussion Forums	49%	1	3	5	5	6	3
Online Seminars/Conferences/Workshops	34%	1	2	1	4	4	4
Convergence of Ideas	68%	1	6	6	8	5	6
Cultural Bonding	45%	0	0	7	5	5	4
Online Internship	62%	4	8	5	4	5	3
Collaborative Report Generation	64%	4	7	4	7	5	3
Proposal Preparation for International Funding	66%	3	8	3	7	5	5
		61%		43%	69%		63%

Table 4 presents ten different advantages of having U-GATEWAY and its relation to four graduate attributes. Maximum concurrency score for each attribute is mentioned in the header of table. Elements of graduate attributes include academic attribute, personal attribute, interpersonal attribute and societal attribute. Academic attribute comprises of academic and professional excellence. Personal attribute includes personality. Interpersonal attribute includes leadership skills as well as communication skills. Societal attribute comprises of social sensitivity. Upon linking these ten possible categories of advantages it was found to have 61% of concurrency with the academic attribute. Similarly it was found to have 43%

of concurrency with the personal attribute. The result also revealed that maximum concurrency can be expected for the interpersonal attribute with 69%. From the obtained results it could be inferred as that among all four attributes, U-GATEWAY can most effectively used to develop interpersonal attribute (leadership skills and communication skills). Engaging in different activities using the proposed platform was also found to have 63% concurrency with the societal attribute.

Seven out of ten advantages shared over 60% of concurrency with overall graduate attributes. From obtained results it could be inferred as that engaging in different international collaborations with different foreign universities through an integrated online platform will result in overall development of graduate attributes in terms of academic excellence, professional excellence, personality, leadership, communication and social sensitivity.

## 6. Conclusion

The study finds the need to develop an integrated online platform for international collaboration. The study implies that collaborating with different foreign universities through integrated online platform can nurture graduate attributes among university students. As a future implication, the study proposes to evaluate the effectiveness of platform in building graduate attributes for students.

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## A Transformative Next-Generation Student Connect and Pedagogy: A Holistic Change Driven Environment. “Engineering-Service Assisted Integrated Learning [E-SAIL]”

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### Abstract

E-SAIL–Engineering Service Assisted Integrated Learning; was founded in CHRIST University’s Faculty of Engineering during the academic year 2017-18. CHRIST University, dedicated to its vision “Excellence and Service” binds its academic fraternity through the core values such as Faith in God, Moral Uprightness, Love of Fellow Beings, Social Responsibility and Pursuit of Excellence. University’s mission, of providing a nurturing ground for individual’s holistic development, drives E-SAIL. It aims at capitalizing university’s flagship program on ‘Holistic Education’ upon instilling these values and letting young minds innovate over the basic needs of the society. E-SAIL also taps the research outcome of the ongoing work in the departments into a product worth deployable for the communities in the neighborhood and reach out to all those in need [1]. In doing so, they also get academic credits by integrating into the engineering curriculum. On the other hand, it gives an opportunity for the community service organizations to access the innovative talent pool. This is achieved through a perfect blend of synergy in finding the long-term, low-cost and enthusiastic technical assistance, by and large benefitting the society. On a broader note, E-SAIL intends to bring about a holistic transformation among these young individuals in entrusting their purpose of life and reinstalling the need to live in close proximity with nature.

**Keywords**-E-SAIL, Societal, Multi disciplinary, community service, diversity.

### 1. Introduction

In the modern digital era where the focus is completely on developing next-generation innovators and global citizens, It is a big challenge posed in front of the world-class universities/colleges to cater quality higher education. This calls for the transformative initiatives which result from holistic planning and design of curriculum, evaluation, teaching-learning, Research, Policy framework and more. The term quality is often misunderstood in the education sector. With the rise in population and advent of several mushrooming colleges, some meet the purpose, but most of which gets the title of 'profit making ventures'. Are they sufficiently equipped to meet the challenges of the 21<sup>st</sup> century? Even if they did, most often it is to develop only the professional side of an individual. Are universities responsible just for their professional growth? Isn't it the duty of these educational institutions to teach the values/ ethics and life-saving skills in the young individuals, not just to foster in their professional carrier but also to strike a right balance between professional and personal life? In the midst of these ideologies, students are often confused with regards to their choices and choices imposed by the peers and parental pressure. E-SAIL focus on disruptive measures to foster into some of these issues projected above in understanding their current stature and providing an innovative model to self-explore and sustain their thirst for a satisfying professional career. The realistic picture of being a successful engineer is always a big challenge posed in front of each individual. Statistics show the need for imparting real-life, hands-on projects [6], much more than just being theoretical. It is not enough to learn the skills set of knowledge of Engineering, Maths, Science, Problem-solving and System design alone, but should also be exposed to the joy of working with

multidisciplinary teams and should communicate effectively. An experimental research conducted at CHRIST gave significant impetus on the effect of Holistic education on the social competence and related skills [13]. It was really a moment of pride for the team E-SAIL to be recognized with its first project funded by 'United Board' in experimenting the innovative pedagogy amongst the young talented individuals. It is our desire to ensure the program endures to take the challenge of the long-term, for credit project, in providing this innovative pedagogy in the desired time frame. CHRIST University has the legacy of sensitising students on the societal front through the Centre for Social Action (CSA). E-SAIL reflects on one such model, which integrates the concept of community service through service learning. Once the concepts are thoroughly discerned, the Joy of designing Engineering project gets effectively implemented through the multi-disciplinary approach in Service Assisted Integrated Learning (SAIL).

### 1.1 E-SAIL Attributes

- A unifying approach to innovate
- Provides inter and multidisciplinary exposure
- End to End design: A Journey from Design to prototype and finally a product
- A testimonial to the engineering discipline
- The joy of developing a product beneficial to the underprivileged community.

These executions would inherit the joy of contentment in giving back to the society, which is the need of the hour. We believe this 'Unity in diversity' would bring about a profound change, and, if integrated into the context of curriculum would lead to further innovations, most desired for the 'Next Generation Pedagogy.'

## 2. Overview of E-SAIL

### 2.1 Motivation

E-SAIL was evolved as a long-standing outcome of the holistic education proposed by the present Vice-Chancellor and visionary in his book [12] through his vision of bringing about synergy amongst the youth by holding them through the strings that can bind them tightly. The ethics, life-saving skills, may it be through their professional, personal, interpersonal or societal skills, were kept as the key graduate-attributes of any graduating student from CHRIST University. The consensus was that students to be ready for future, would need:

- Professional ethics and skills, being loyal to oneself and the profession, ability to perform in a team, manage finance, establish good communication and delivery on time.
- Convert research outcomes (published/patented work) into the product, Sensitize on socio-economic issues affecting engineering projects, raising concerns for environmental issues and addressing the needs of the nation.
- To instil the dignity of labor and overcome the ego of strata in working with communities which are widely looked down upon.

Often these are pressing issues, which are seldom overlooked, in conventional professional institutions. A new curriculum of integrating this awareness is vital for the present generation, to generate a sense of belongingness and hold accountable for being responsible citizens. This would also instill in them the need for nation-building and work towards uplifting the underprivileged communities in restoring their rights and privileges for a better living. Simultaneously the community service organizations should get benefited out of these innovative approaches being directly made beneficial, as they require [2-4].

E-SAIL was conceived in creating a perfect blend, providing a direct product based outcome, resulting from the ongoing research and bringing about a long-term association between the university and community service partners, which should eventually benefit each other. We hope to bring a lot of value addition in mutually exploring and tapping the potential to deliver the best for common men.

## 2.2 Curriculum

E-SAIL functions on the basis of projects envisaged, either through the outcomes of the ongoing research or through identifying and analyzing the needs of the beneficiaries around us. The university professionals, industry professionals, community partners, and bureaucrats closely monitor this progress. Table 1. below showcases some of the E-SAIL areas, teams, and projects selected for the current academic year. The projects are broadly classified under four different areas as Water management, Agriculture, Healthcare and Disaster management.

E-SAIL is deployed as different courses in the curriculum. Presently they are integrated into four years of Engineering curriculum as two credit, three credit and twelve credit courses which range from a set of core subjects, elective subjects, internships, and capstone projects. Each team is of size 7-10 students. These are students who range from the first year to final year and across multi-disciplines of the university, present pilot run engages students across different disciplines of engineering. However moving forward, it intends to have students cutting across the university from Management, sociology, social work, humanities, Law, Psychology, professional studies, and sciences. While the final year students graduate, new students are added to the team each year. Selection of E-SAIL students involved, inviting application from across the departments and thereby conducting a written test and personal interview. Since the numbers are restricted to a batch size of 7-10 students in a project, often the scrutiny goes tough, and good no of them get waitlisted. Upon induction, the team undergoes an orientation program, where the teams are formally introduced to the systems and assigned a formal mentor along with a student buddy mentor. Generally, a senior student is entrusted from the respective groups. While they get accustomed to the project group, they also learn to shift and take different roles from trainee to design engineer, to project or team leader, etc.

## 2.3 Status

The E-SAIL program at CHRIST University currently has four teams and a total enrollment of 25 students per year. In a typical semester, about seven disciplines are represented. E-SAIL witnessed its first international connect in its first year of inception where a team from MIAMI University represented the international conference on “A transformative next-generation pedagogy” conducted at CHRIST University during March 2018. This conference witnessed 15 speakers and a panel discussion for over two days creating general awareness amongst the students and other regional universities and colleges in the nation and overseas. As an outcome E-SAIL has established its first inter-continental cohort and for the first time during the academic year 2018-19, E-SAIL will host a group of 15 students and one mentor from Miami University on a joint collaborative project to be deployed at a small village, Byramangala, at Ramanagaram taluk, near CHRIST University Faculty of Engineering. We are in the process of inviting several regional, national and international universities to partner with the project E-SAIL giving it a multi-dimensional facet.

## 3. Theme

While we proposed E-SAIL to the students of CHRIST University, we thought about the theme of “Unity in Diversity “

### 3.1 Unity in Diversity:

CHRIST University presently houses 21 thousand students, which cuts across all the states of India, union territories and close to 68 countries. A country which is highly diverse in language, culture, caste, and creed, yet respects each others space in bringing about a perfect synergy. A conglomeration of several disciplines and departments has brought about a unifying approach amongst the students, which has actually helped them widen their horizon and think beyond boundaries. While several states have their own societal issues and problems, These challenges are encouraged to be cited through the E-SAIL forum and brings a synergetic approach in positively impacting several communities.



Table 1. Projects: Water Management, Health Care, Agriculture and Disaster Management

<p><b>I. Area: Water Management:</b></p> <p><b>Title:</b> “The Development of cavitation based disinfection technique for heavy metal contents and other effluents in the industry contaminant river water”. The project is under execution in the Christ University Faculty of Engineering campus.</p> <p><b>Location :</b> Vrushabhavathi river, Kubalagodu, Bangalore.</p> <p><b>Description:</b> The E-SAIL team visited the villages near by and came with the proposal based on extensive literature survey and analysis. The river caters to the living of almost 45 villages across its bank , carries impurities including dissolved solids, microorganisms, toxic heavy metals and suspended particles. An effective cavitation technique involving generation, growth and violent collapse of vapor filled bubbles in water was proposed. The process involves the break up, expansion and collapse phases with sudden release of accumulated energy resulting in disinfection of impure water. The process is a replication of natural phenomenon with an intention to harness positive effects of cavitation. This purified water would initially be used to water some select plants/fruit bearing trees in the university farmland and the results thereon will be analyzed for expanding its area of implementation.</p> <p><b>Outcome:</b> The major outcome expected from the project will be the conversion of polluted river water to several levels of disinfection and propose its utility. The effectiveness of cavitation on the river water can be ascertained by the vegetation growth, which will form the basis for further study and research.</p> <p><b>II. Area: Health Care:</b></p> <p><b>Title:</b> “Real-time Non-Invasive sensor based Blood Glucose Detection System”. The project is under execution in the Christ University Faculty of Engineering campus.</p> <p><b>Location:</b> Bayramangala, Ramanagaram, Bidadi, Bangalore.</p> <p><b>Description:</b> This project evolved out of the research findings of a faculty at Dept. of Electronics and Communication, has resulted into direct application for those living in the villages, in the near by vicinity of the university. This project will support the primary health care centers in the villages to identify the blood glucose variations and detect the type II diabetics, one of the most reported diseases, through a purely non-invasive method. We believe this would result into an invention upon proving the efficacy of the project.</p> <p><b>Outcome:</b> A sensor based low cost device, will assist non-invasive testing for screening blood glucose level and aims at benefiting a large population of the nearby villages.</p>
<p><b>III. Area: Agriculture:</b></p> <p><b>Title:</b> “Drone based precision agriculture”. The project is under execution in the Christ University Faculty of Engineering campus.</p> <p><b>Location:</b> St. Mary’s Farm Land, Kengeri, Bangalore.</p> <p><b>Description:</b> Good number of crops in several farm lands in the vicinity gets infected through unusual fungal diseases, which are on a rise year after year. This has primarily resulted out of Poor irrigation facility and contaminated river water, particularly those polluted through untreated domestic and industrial sewages. This has a major affect on the quality, growth rate, annual yield of crop, by and large the economy of the farmers living across this region. This project aims at developing a low cost pattern recognition algorithm with a camera mounted drone which would identify and deploy the regulated insecticide and pesticide through an aerial payload carrying drone.</p> <p><b>Outcome:</b> This project aims at providing on site assistance for farmers with cost-effective remedial actions. It also intends to bring out the real time challenges of agriculture and farming in polluted environmental conditions.</p>
<p><b>IV. Area: Disaster Management</b></p> <p><b>Title:</b> “The waste to growth story: Low cost construction for flood ravaged villages”. The project is under execution in the Christ University Faculty of Engineering campus.</p> <p><b>Location:</b> Waynad, Kerala.</p> <p><b>Description:</b> The recent floods in Kerala and Karnataka have caused devastation to human life and property. The damage to infrastructure in particular has been estimated as mammoth and this has resulted in monumental challenges to relief and rehabilitation operations by the authorities. Dept. Of Civil Engineering developed a low cost brick from industrial wastes. This technology transfer would augment the efforts of such floor and cloud burst areas of the states to rehabilitate the affected people on a quick transition. University in liaison with the Kerala state administration has planned to utilize the construction materials manufactured using industrial wastes in low cost constructions in flood affected villages.</p> <p><b>Outcome:</b> The major outcome of the project will be to provide relief and succor to flood affected people in coordination with the state government. The project also will help to validate the low cost construction concept based on industrial wastes.</p>

#### 4. Engineering Education-A Roadmap

A program like E-SAIL would address quite a lot of challenges as faced by the common man. The spark of learning by doing would bring about a great transformation in believing one's capabilities. It would On the other hand, it will also attract researchers identify problems, which has social relevance and travel an extra mile going beyond mere publications in the journal. This should promote a product-based culture in the country and should thrive for more patents from the academic community. The need to explore and provide these niche, among the graduates in on a constant rise. Several accrediting authorities have started integrating these requirements through their assessment criteria. University Grant Commission/All India Council for Technical Education has recently enforced the requirement of rural internship/projects for the holistic development of the villages. The Engineer of 2020[6,9] has deliberated

on creativity, entrepreneurship, agility, resilience and flexibility. While the needs assessment for such program is surfacing in the country, we are happy to take this lead in pioneering this well defined E-SAIL structure, integrating the growing set of skills –analytical, problem-solving, design, professional skills into the curriculum.

## 5. Conclusion

We strongly believe that programs like E-SAIL can bring about a profound change in performance-based differentiating factors for the formation of NextGen responsible individuals. As quoted by a student who underwent a course in community service at Purdue [8], “No longer is engineering just a bunch of equations, now I see it as a means to help mankind” should be the ultimo, for being part of this transformation and capitalizing these case studies in the classroom, for bringing about a transformative next-generation pedagogy.

## Acknowledgements

E-SAIL program has been supported by grants from the United Board for Christian higher education in Asia, headquartered at New York, CSR donations, through a recent MoU signed between Safran engineering services (France based company), IEEE (World’s largest technical professional organization for the advancement of technology) and CHRIST University, on E-Mobility. CHRIST University management for the wholehearted support, all the project team members, Faculty and student cohort from various disciplines, community service partners and various industry representatives.

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# Design Thinking: Cross-Disciplinary Disintegration Paradox

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## Abstract

Design Thinking is a growing topic of interest in academia, particularly in Management, Engineering and Design schools. Although the term “Design Thinking” has gained immense popularity, still many finds it hard to practice economic cooperation among cross-disciplinary condition, choosing to expand mainly in its own specializations. This direction and framework pose cross-disciplinary disintegration concerns. In this fragmented landscape, this study is aimed to analyze the disparity and discrepancy among specialized fields of knowledge and discusses the core cause of cross-disciplinary disintegration.

**Keywords:** *design thinking, innovation, academia’s cross-disciplinary disintegration.*

## 1. Introduction

Early glimpses of Design Thinking in context of academia shows how it emerged in the specialisations and formed as a means of integrating these highly specialised fields of knowledge, so that they can be jointly applied to the new problems as discussed in the article: Wicked Problems in Design Thinking [1]. No doubt, the integration of specialized fields of knowledge are essential for significant innovation, still many finds it hard to practice economic cooperation among cross-disciplinary condition, choosing to expand mainly in its own specialisations. Noting such disintegration among specialised fields of knowledge, this study begins by reviewing the origin of Design Thinking to understand the essence of original intentions and the evolution of its present definition. Following, the paper by analyzing of both Engineering and Management school’s Design Thinking framework. Particularly, the disparity and discrepancy among disciplines. The study further discusses its learning and the core cause of disintegration.

## 2. Methodology

This study uses comparisons analysis between framework interpretation and its own projection and reflection in both Engineering and Business academia and uses its learning to contrasts along fundamental design process to find similarity or disparities. There are 2 areas this article focuses to understand: first, the definition and the perception of both cross-disciplinary perspective.

## 3. Design Thinking

### 3.1 Origins

Design research provide diverse origin of design thinking tracing back to early 1950s and 1960s within the context of architecture and engineering fields. In the 60s, science made efforts to “scientise” Design, and bring the field within the objective of rational sciences as Nigel Cross, in his paper Designerly ways of knowing: design discipline versus design science [2], describes. He further asserts “[Fuller] called for a

'design science revolution', based on science, technology and rationalism, to overcome the human and environmental problems that he believed could not be solved by politics and economics".

Horst Rittel, who coined the term "Wicked Problems" (i.e., extremely complex/multi-dimensional problems) in the mid 1960s becomes core of design thinking in design circle and academia. Following the book "Systematic Method for Designers" was published in 1965 by L. Bruce Archer

In the 70s, the notion of design as a "way of thinking" in the sciences can be traced to Herbert A. Simon's 1969 book *The Sciences of the Artificial*. In Robert McKim's 1973 book, *Experiences in Visual Thinking* also expresses the notion design as a "way of thinking".

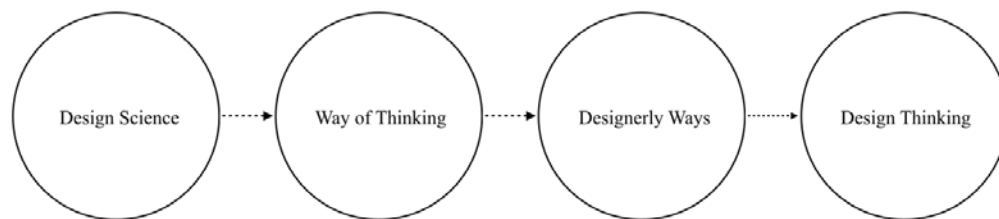
By 80s, design thinking made it relevant in general education and thus for wider audiences. Peter Rowe, then Director of Urban Design Programs at Harvard, published his book *Design Thinking* in 1987, which focuses the approaches used by architects, was a notable in the design research.

In the 90s design consultancy IDEO was formed by combining three industrial design companies. They are one of the first design companies to showcase their design process, which draws heavily on the Stanford University curriculum. Richard Buchanan's article "Wicked Problems in Design Thinking" is published in 1992 [3] [4].

In recent years, interest in design thinking has grown as the term became popularized in the business press.

In short, Design Thinking emerged and developed over time from early design science to way of thinking and designedly ways followed by design thinking (Fig.1) as means of solving new and broader problems of our time.

Fig 1. Design Thinking Overview (Source Interaction Design Foundation)



### 3.2 Original Intention

The rapid societal change and its complexity after WWII, required many disciplines to converge in collaboration to collectively solve broader problems. Richard Buchanan's article "Wicked Problems in Design Thinking" discusses how Design Thinking emerged in the specialisations and developed as a means of integrating these highly specialised fields of knowledge, so that they can be collectively applied to the new problems. Thus design circle and across various discipline expanded its outlook by perceiving the more holistic view of the broader problem.

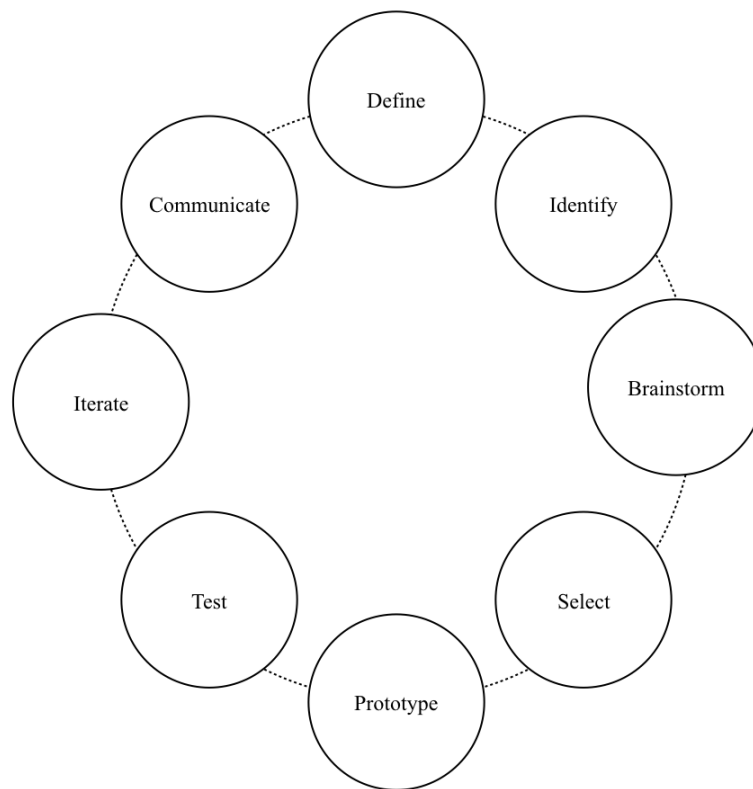
### 3.3 In Engineering Academia

Design is expressed as central part of activity in Engineering. In recent years, Engineering university programs have transformed towards encouraging students to develop deeper levels of contextual understanding; this is meant to not only challenge students to critically reflect on the broader impacts of their work, but to develop real-world skills such as persistence, flexibility, and adaptiveness that are necessary for their professional success [5]. Paired with incorporation of project-based learning (PBL) [6] and human-centered design (HCD) thinking [7]. This thinking has been in the cross-disciplinary field of development engineering, which aims to design and implement appropriate technologies to spur economic and social development in areas with limited resources [8]. It focuses on (i) incorporating international development goals, (ii) scaling for impact, and (iii) integrating novel yet lean technologies [9].

The main forte of engineering curricula seems the efficacy of conveying with reason with mathematics and sciences. Engineers believe design is itself as thinking process dependent on the systematic

generation of concepts. And designing a system, in most cases, requires reliance other than empirical data. It is the “Conducting experiments” that engineers have adopted from design process to analyze and understand the results better. Engineering reflect themselves as a Driving Force Behind the Design as mentioned by Bob Sutton, Stanford University.

Fig. 2. Engineering Design Thinking Process; Source Stanford University



### 3.4 In Management Academia

Management school’s education has been reliant on analytical thinking in the past, but with integration of design thinking education, it complements learning to be open to other’ perspective as noted in review [10]. Herbert Simon projected upon launching a knowledge platform on how design processes can assist in management already in 1996 [11], and Kirby indicated that creative entrepreneurial skills could be taught at business schools and universities.“ Roger Martin, dean of the Rotman School of Management asserts, “design thinking”—approaching managerial problems as designers approach design problems—and its potential impact on management education. Given constant socio-economic and environmental changes globally, professionals whose education will enable them to envisage and innovate and will continue to be highly valued [12]. Dunne and Martin [13] asserts that design thinking would encourage students to think broadly about issues, develop a thorough understanding of users, and recognize the value in cooperating with others.

Entrepreneurs are those who innovate and deliver new solutions [14]. And in business academia, they cast Design Thinking as a catalyst for “growth” and “creative skill” as value and the process that provides practical implementation in the real world challenges.

Base on Stanford’s Hasso Plattner Institute of Design these are the five steps of Design Thinking process:

Empathize – meaning to get a broad understanding of the experiences of users that you are designing through the techniques such as observation, interaction and immersion.

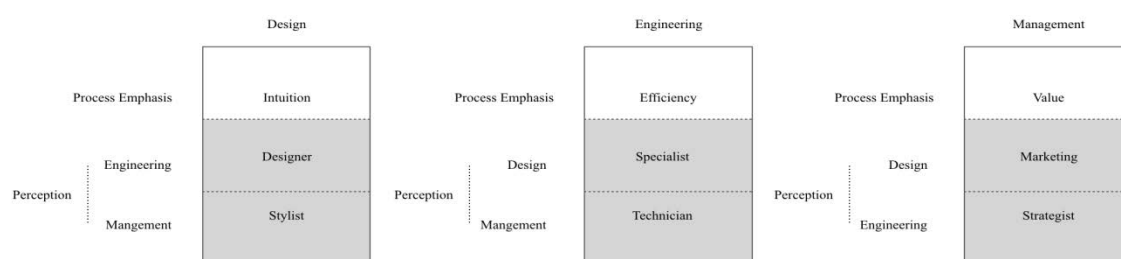
- Define – identify users' point of view based on the processed and synthesised findings of the empathy work.
- Ideate – investigate as wide as possible variety of potential solutions enabling a step further from the obvious to ideas.
- Prototype – turn the ideas into a physical form that would allow further exploration and learning experiences.
- Test – at this step the high-end products are being tested and refined based on the feedback received further advancing the knowledge of users and refining the original viewpoint.

## 5. Suggestions

In comparison, despite of differences in knowledge, it's apparent that all use common Design framework with various emphasis that suite its own specialization. It is evident that various disciplines practice an common framework with some degree of variation in wording. An examination of both literature work and practices among different Academic knowledge, it reveals shared understanding in value in all of them. In other words, each discipline recognize the value in cooperating with others, yet when it comes to large program of practice, 'disintegration' continue to be stumbling block to progress.

This study identifies that the cause of disintegration problem is not due to the lack procedural process but, rather individual perception disparity (Fig. 3). Perception refers to a general tendency to form impressions of other people [15]. The disparity occurs when out of sync with the way you're seen by others. The perceptions of one another affect the collaboration they form. Stereotyping and generalizations about a group based on inaccurate assumptions is what people do all the time. This kinds of 'people' perception is full of errors and it occurs in high frequency.

Fig. 3. Perception Disparity



## 6. Conclusion

The results of the analysis of both Engineering and Business school's Design Thinking framework showed that there are more commonality between specialized disciplines, however findings also showed that among cross-disciplinary practices lacked integration with each other and causing fragmentation. This study also identifies that the cause of disintegration problem is not due to the lack procedural process but, rather individual perception disparity.

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# Poster Presentation (Session ST-P1 ~ ST-P5)

17th November 2018

## Session ST-P1 - Digital Contents

17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College

Session Chair: Prof. Weeraphan Chanhom (Chiang Mai University, Thailand)

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| #783 | "Comparison of Various CNN Models in Railway Accident Prevention System," Ziyu Fang and Pyeoungkee Kim (Silla University, Korea)   | 301 |
| #557 | "A Study on Storytelling Directing Method Using Motion Clip of Digital Actor," Gu Jie and Chulyoung Choi (Dongseo University, Korea)   | 304 |
| #536 | "Aesthetics of Film Images in Oil Painting Animation-Focus on Loving Vincent," Yijun Cao and Hyunseok Lee (Dongseo University, Korea)  | 307 |
| #782 | "A Study on the Story of Gamification to Prevent Equalization of Personal Satisfaction and Self-esteem," Haein Kim, Sojung Lee and Hyeyoung Ko (Seoul Women's University, Korea) | 312 |
| #558 | "Analysis of Influence Factors on VR Animation Viewing Behavior of Chinese Viewers," Hou Zheng Dong and Chulyoung Choi (Dongseo University, Korea)                               | 315 |
| #460 | "Research on Ethnic Style of Animation Performance Based on Drama Performance," Dong Jiajia and Chulyoung Choi (Dongseo University, Korea)                                       | 319 |

## Session ST-P2 - Digital Contents

17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College

Session Chair: Prof. Hongsik Park (Dongseo University, Korea)

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| #561 | "A Study on the Development of One IP(intellectual property) Animation & Game in Chinese Market," Pan Yang and Chulyoung Choi (Dongseo University, Korea)                              | 326 |
| #521 | "The Proposal of Pipeline for Photorealistic 3D Object Modeling," Qi Zhang, Haitao Jiang, Yun Ji, Linwei Fu and Taesoo Yun (Dongseo University, Korea)                                 | 331 |
| #507 | "Realization of Realistic Wave Effect in Houdini under the Overlooking Angle," Jiani Zhou and Taesoo Yun (Dongseo University, Korea)   | 335 |
| #531 | "National Narrative of Chinese Animation: Monkey King vs. Little Door Gods," Ting Wu and Mijin Kim (Dongseo University, Korea)   | 339 |
| #566 | "Analysis On The Development Direction Of Chinese Animation In The Animation Market Under The New Animation Industry Chain," Ji Hui Yan and Chulyoung Choi (Dongseo University, Korea) | 342 |

**Session ST-P3 - Foundation & Source / Culture Service****17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College****Session Chair: Prof. Eunyi Kim (Konkuk University, Korea)**

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| #617 "Sunlight Radiation Analysis in Urban Scenario using Layered Accumulative Shadow Map,"<br>Woosuk Shin and Nakhoon Baek (Kyungpook National University, Korea)   | 346 |
| #781 "Analysis of Success Factors of Korean Web Entertainments and Development Direction," Kiri Kim<br>and Hyeyoung Ko (Seoul Women's University, Korea)   | 350 |
| #593 "Location Estimation Algorithm of Docent Robot in Art Gallery Using Object Detection," Mihyeon<br>Cheon and Donghwa Lee (Daegu University, Korea)   | 354 |
| #604 "Introduction to Coding Education Using an Interactive ALIINO Robot," Jaeson Pyeon (Taejon<br>Christian International School, Korea), Sukbum Kang, Jinhyun Kim and Seyoung Jeong (Saeon<br>Co., Inc., Korea)        | 357 |
| #774 "Initiating Global Service Learning Movement: A Best Practice of Petra Christian University,"<br>Rolly Intan (Petra Christian University, Indonesia)  | 362 |
| #932 "Research on the Problems and Measures of the Construction of "Double-Qualified" Faculty in<br>Independent Colleges," Luo Wenhui and Zheng Yaping (Zhijiang College of Zhejiang University<br>of Technology, China) | 368 |

**Session ST-P4 - Advanced Technology****17th 09:10~10:30, @International Culture Exchange Center(Floor 2), Yuanpei College****Session Chair: Prof. Somchoke Rueng-itiinun (Kasetsart University, Thailand)**

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| #607 "A Virtualization Approach for Accessing IoT Resources and Appliances Control in<br>Smart Home," Muhammad Ali Jibrán, Shabir Ahmad, Wangcheol Song and Dohyeun<br>Kim (Jeju National University, Korea)  | 380 |
| #452 "CNN-based Single Object Tracking Framework for Autonomous Target Tracking<br>Systems," Donghyun Lee (Kumoh National Institute of Technology, Korea)   | 382 |
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| #773 "Analysis of Artificial Intelligence Speech Recognition Technology," Yena Lee, Uijeng<br>Kang and Eunjung Choi (Seoul Women's University, Korea)   | 391 |
| #890 "IoT-based Space Security Solution," Suji kim, Hwayon Park and Minseok Oh (Seoul<br>Women's University, Korea)   | 393 |
| #886 "Labs and Classes : An IoT Design and Implementation," Mohammed Abdulhakim<br>Al-Absi, Kamolov Ahmadhon, KiHwan Kim, Ahmed Abdulhakim Al-Absi, Mangal Sain,<br>Hoon Jae Lee, (Dongseo University, Korea) | 400 |
| #887 "General Study of Secure E-commerce Logistics Distribution," Rui FU, Mohammed<br>Abdulhakim Al-Absi, Mangal Sain, Hoon Jae Lee (Dongseo University, Korea)   | 404 |
| #888 "Survey on Digital Signature Algorithm," Azamjon Abdullaeva, Mohammed Abdulhakim<br>Al-Absia, Mangal Saib, Hoon Jae Lee (Dongseo University, Korea)  | 408 |
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# Comparison of Various CNN Models in Railway Accident Prevention System

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## Abstract

In this paper, we are trying to determine which of the latest CNN models and algorithms are more suitable for railway accident prevention systems. We use MobileNet v2 using Single Shot Detector algorithm, MobileNet v1 using Feature Pyramid Network algorithm and MobileNet v1 using Single Shot Detector algorithm as a reference. After training and evaluation, MobileNet v1 using Feature Pyramid Network algorithm is the most suitable model for Railway Accident Prevention System. And this model is particularly good at small target recognition.

**Keywords-component; railway accident, image recognition, deep-learning**

## 1. Introduction

As well as everybody knows, the overpressure in the air when a train passes with high-speed will cause a serious damage to people near the rails. According to previous research, MobileNet version 1 model has a good recognition effect on the Railway Accident Prevention System. Now the new model named MobileNet version 2 has been designed and tested. Not only that but the Single Shot Detector algorithm (SSD) was used before. Now we have added a new algorithm named Feature Pyramid Network (FPN). In order to determine which algorithm is the most suitable for the system, the experiment was re-executed.

## 2. The CNN Models in Railway Accident Prevention System

We used the previous design to capture image near the rails in the air over the 30 meters by the drone. And let the computer identify the target if someone was near the rails. MobileNet v1 reduced the size of the model and improved the recognition efficiency by using depthwise separable convolution instead of standard convolution [1]. MobileNet v2 use a 1\*1 pw to increase the number of channels and get more features. At last use linear bottlenecks instead of ReLU to prevent the features damage as shown in Fig.1 [2].

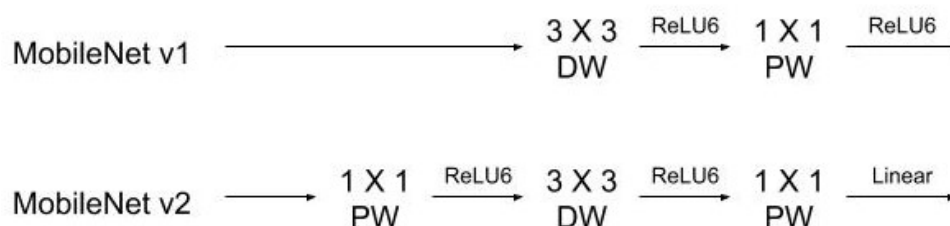


Fig. 1 Differences between MobileNet v1 & v2

SSD algorithm does not perform upsampling and only extracts features of different sizes at different layers for prediction without adding extra calculations as shown in Fig.2 [3]. But, there are different sized targets in the image, while different targets have different features. Simple features can be distinguished by using the features of shallow layers. And the features of deep layers can be used to distinguish complex targets. FPN is characterized by the simultaneous use of shallow and deep features to better identify targets [4].

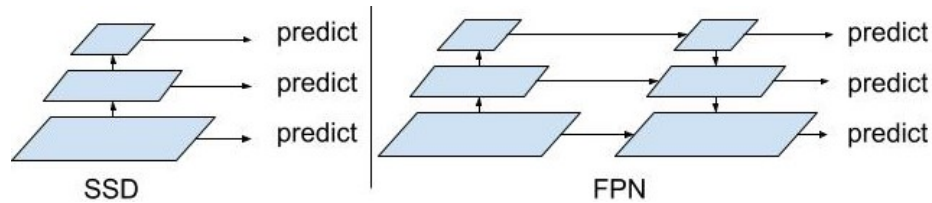


Fig. 2 Single Shot Detector & Feature Pyramid Network

There are 1123 images in the experiment dataset with the PASCAL VOC format. There are 919 training images, and 204 evaluation images. As shown in Fig.3, the dataset does not only collect the images with various drone flight states, but also various background and environment. We use the human body in different positions near the rail as the target of recognition. The dataset includes images of different genders, as well as images of different poses. We record the input rectangle's corner pixel value (xmin, ymin, xmax and ymax) and save them into tfrecord file.



Fig. 3 Image Example

### 3. Experiment Result



Fig. 4 mAP & mAP with different IOU



As shown in the Fig.4, when the IOU is 0.5, the mAP of the SSD MobileNet v2 model is close to 1. And the mAP of SSD MobileNet v2 is better than the other two models. When the IOU is 0.75, the mAP of SSD MobileNet v2 is not as good as the mAP of the FPN MobileNet v1 model. The performance of the FPN MobileNet v1 model is best considering the different IOU situations.

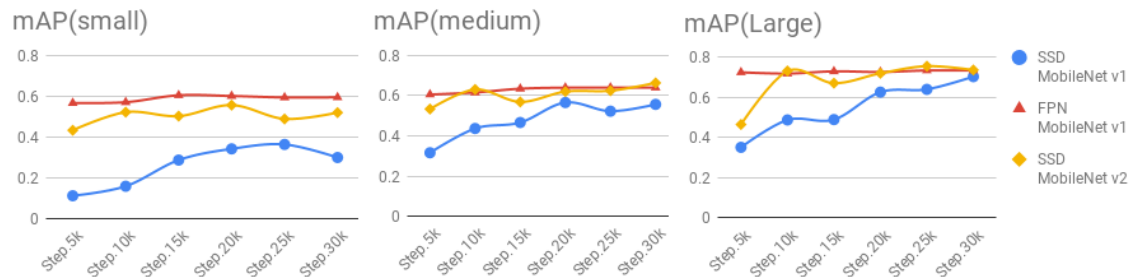


Fig. 5 mAP with Different Target Sizes

As shown in Fig.5, the FPN MobileNet v1 model also performs well for targets of different sizes. Although the mAP difference between the FPN MobileNet v1 model and the SSD MobileNet v2 model is not significant, it is significantly better than the SSD MobileNet v1 model. However, the small target recognition performance of the FPN MobileNet v1 model is better than the performance of SSD MobileNet v2.

#### 4. Conclusion

This article uses some new CNN models. By comparing several sets of experimental data, the FPN MobileNet v1 model is the most suitable model for Railway Accident Prevention systems. The model's target accuracy is high, especially for small targets. In the future, we will continue to develop systems for railway safety.

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## A Study on Storytelling Directing Method Using Motion Clip of Digital Actor

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### Abstract

Compared with the movie, the quality between animation works varies greatly depending on the different times and expense of productions, meanwhile the action of the created character is the most important reason among them. The animation method and related techniques for making the key pose of the production of actions and then generating the in-between develop slowly. There is a quick way to overcome the difficulty of low-cost TV series animation and improve the quality. Before animating with motion capture, we can get a reference image by performing as a movie with a real person imitating an animated character and shooting and editing according to the script. By segmenting the clips of the actions of the digital characters, this passage compares the images taken by the existing scripts and finds out their advantages and disadvantages based on the narrative method of the actions and clips suited to the scenarios.

**Keywords-***reference clip; CG Animation; clip data base*

### 1. Introduction

The biggest difference between the main characters in movies and animations is whether the characters exist in the real world if we compare them. This will make a significant difference in the contents of the productions. The situation of the movie is that the actor takes many shots in real time and the director then chooses the action to make the editing. On the contrary, in the animations, the director needs to animate the characters according to the script, create the key pose and add the in-between, and then give the characters and details to the characters. Therefore, the process of making animation is from scratch, and through the stage that from continuous production to completion, so the deficiencies in the times and budgets of production will directly lead to the declines of the perfections of the animations. High-finished Disney early animations, as shown in Figure [1], use the actions and timings that were used in the past, just like the image reference used to make the animation, with the added personality of the action, which reduces production time and expense.

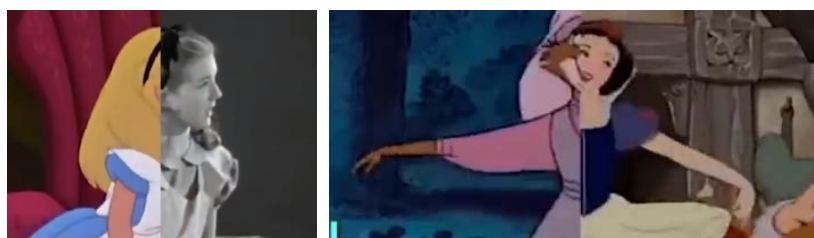


Fig. 1. An example of the same action (Left: Alice in the animation and Alice in the movie, Right: The Jungle Book and The snow White)

If we observe the example of Figure [1] from a different point of view, without affecting the direction of the new script, the data of many previous actions can provide the best action reference. In the case of similar characters of the characters, if the action is similar, the data of many previous actions can be the best action reference without departing from the direction of the script.

## 2. The Animation Clip Comparison

As a result, we can compare the motions of the animation and the changes of feeling by selecting and combining the clips which can be referenced and used in animations according to scripts and making animations by referencing that combined clips.

Analyzing scenarios of Miyam's Hell Training, the episode of Dogogi Paradise, 2010, which is an TV series animation, we collected and arranged video clips suitable for each sentence according to the script, and finally we try to compare with existing clips.

Table 1. Animation clip comparison

Scenario fourth: Epilogue	Basic clip	Recommended clip	content
A cat that glared at the door and had a high morale			Show changes in movement after a change in emotions
Personification; instructors supervise the movement of practice			Show threats to other people's action, poss and timing
A cat with a rope and a drag on its waist.			Show the timing of a weary walking foot
Whining cats lying on the ground			Timing and poss that respond with wide eyes
The dog sleeping on the tyre opened his eyes because of the motion.			Show the timing and posture of the weary and falling movements

The reference clips seen in table [1] are mostly poss and timing of emotional changes that could not be expressed in the original image. Increasing expression of emotional changes means that it can show character's personality well, which also means that it can reflect the script better. As a result, the situation in table 1 reflects that characters' actions and animations with different timings can also improve quality in this way in different situations.

Okon, Korea's leading animation maker, based on the success of Pororo, in 2012, has released the TV series Dinosaur Dvor. But this animation has not achieved a great succession because that the actions of characters and the speed of the development of the script are too fast for the audience to understand. The additional action like this can be very good to convey the meaning of script, but it will also make the animation complex which will raise the question that the probability of rejection by the audience will be very high. So the actions should be choose according to the ability of understanding of the audiences.

### 3. Conclusion

Unlike movies, animations need a production process from scratch in order to show actors' movements. With the shortening of budget and production time, the expressive force of shorter actions becomes weaker, which makes it difficult to make full use of characters to convey the purpose of the script. Especially in TV series animation, this phenomenon is increasing. To overcome this phenomenon, it is possible to shorten the production time by creating the clip data base of the action or by using the re-use method of the action data. In conclusion, the character will become vivid by using the appropriate reference clips to show the script, meanwhile the quality of the subdivided action will also be improved. In future, I will compare the entire reference clips of a script and carry out a further detailed analysis with the questionnaire of the target group.

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## **Aesthetics of Film Images in Oil Painting Animation - Focus on <Loving Vincent, 2017>**

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### **Abstract**

In order to explore more possibilities of the combination of oil painting animation and to promote its better development, this thesis is based on Andre Bazin's Aesthetics of Film Images and Wassily Kandinsky's Theory of Artistic Painting, analyzing how to use Van Gogh's original works and painting style to embody the aesthetics of film images in the production of the oil painting animation film <Loving Vincent, 2017>. From the sociological and artistic point of view, <Loving Vincent, 2017> highly integrates pure art and images, changes the pattern of the Vatican, breaks through the limitations of the frame, and naturally neutralizes the contradiction between the pursuit of realism and the limitations of painting techniques in the mid-19th century.

***Keywords-Oil Painting Animation; Aesthetics of Film Images; Pure Art; Painting Theory***

## **1. Introduction**

### **1.1. Research Background**

Bazin established three pillars of the theoretical system of film realism: ontology of photographic images, psychology of film origin and the evolutionary view of film language. Artists such as Kandinsky, Itten, Albers and others, studied how the presence of colors, affects the viewer emotionally, and applied these studies to their artworks: "Discovery of relationships, mediated by the eye and brain, between color agents and color effects in man, is a major concern of the artist." [1]. Kandinsky believes that browsing through a group of colors at random can achieve two kinds of experience, pure physical impression and psychological effect of color. The analysis comes from the perspective of the depth of field and mummy complex in Bazin's aesthetics theory of film on the basis of Kandinsky's inner necessity and the theory of people's visual perception of color. Depth of field is very important in scene scheduling, which makes the relationship between audience and image closer to reality. Perspective gives the viewer a three-dimensional visual effect, and artists often use halo method to express the perspective structure.

### **1.2. Research Theories and Methods**

Bazin believes that the use of psychoanalysis to trace the origin of painting and sculpture will reveal the mummy plot. Ancient Egypt and religion advocated the fight against death by living, believing that if the body was immortal, life would last forever. Artificially preserving the human body's shape meant holding the life forever and making it immortal [2]. With the development of art and civilization, plastic arts have been able to get rid of the function of witchcraft. As far as art forms are concerned, there is an external similarity based on the inner necessity, which is simply emotional communication and emotional resonance between the audience and the author. Kandinsky sums up the whole process of art appreciation as follows: emotion (artist) - feeling - artwork - feeling - emotion (audience). Kandinsky's theoretical analysis of the psychological effects of color suggests that when a group of colors makes another color

block move horizontally by contrast, the color group will also be affected by this color block, and it produces another strong separation movement. This kind of color movement is the first antithesis of color because of the difference between cold and warm colors [3]. This paper, centered on <Loving Vincent, 2017>, elaborates the visual effects in the film pictures with Kandinsky's color theory about the psychological effects of blue and yellow on people.

## **2. The Mummy Complex and Inner Necessity in the Oil Painting Animation Film <Loving Vincent, 2017>**

Ancient Egypt placed several pottery statues near the sarcophagus as spare mummies, and when the bodies of the deceased were destroyed, they acted as stand-ins. From the religious origin of sculpture art, we can reveal its original function: copying the shape to preserve life. As the times progresses, plastic arts gradually get rid of witchcraft functions. <Loving Vincent, 2017>, produced in Van Gogh's style, has a recording function in the form of hand-painted oil animations to help people remember Van Gogh, so that he won't be forgotten. Art works have internal and external elements, with the internal elements being the artist's inner feelings, which can arouse the audience's inner resonance. The senses are influenced by the media, which can arouse and stimulate emotions. It is the creation of art for feeling to build a bridge between immaterial (artist's emotion) and matter. On the other hand, it is the appreciation of art for feeling to bridge from the material (artist and his works) to the immaterial (audience's inner feelings). Art forms are determined by irresistible inner forces, the only unchangeable law of art, which is called the "inner law" [4]. Van Gogh's more than 2,000 paintings over the past 10 years have incorporated his own emotions and thoughts, while the director and production team of <Loving Vincent, 2017> have inspected about 400 Van Gogh paintings, and interviewed experts at the Van Gogh Museum to learn about Van Gogh. Eventually, Van Gogh's life was narrated in the form of oil animation, showing the world his feelings and salutations, and the audience was moved and sympathized with the film, which is the essence of the film.

## **3. The Relationship between Screen and Painting**

### **3.1 Theory of the Relationship between Screen and Picture Frame in Bazin's Film Aesthetics**

Bazin thinks that the screen completely breaks the space of painting. In fact, painting is opposed to reality itself through its surrounding frames, especially the reality it represents [2]. That is to say, although the frame stands in nature, the fundamental function of the frame is to emphasize the heterogeneity of the micro-world and the macro-world of the painting, which is a caring space that only opens to the inside of the painting. The frame causes the inward direction of the space. On the contrary, the scene that the screen shows for us seems to extend to the external world [2].

### **3.2 Coordinated Processing of Screen and Painting in <Loving Vincent, 2017>**

<Loving Vincent, 2017> broke the delicate contradiction between frame and screen. The high degree of fluidity of the oil painting materials and Van Gogh's unique Arabesque strokes with a large number of curved Arabic patterns make the painting itself filled with a sense of movement. Not only does it not lose other painting modeling characteristics, but also influenced by the spatial characteristics of the film, the painting has the potential to spread around the world of painting characteristics. Marguerite Gachet at the piano is one meter wide and 50 centimeters long. The proportion is rarely seen in painting. For better visualization, the director imagines Van Gogh looking out of the house at Marguerite painting for her, with the doorframe as the foreground. As is shown in Figure 1:



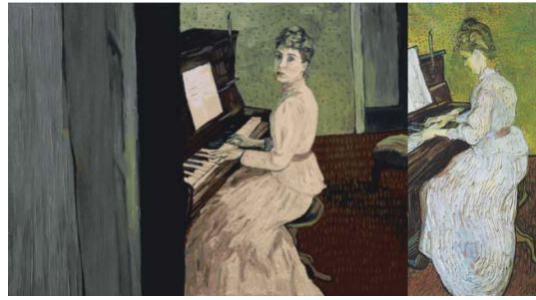


Fig. 1 The movie screen and the paint

### 3.3 The Relationship between Depth of Field Lens and Perspective Painting Embodied in <Loving Vincent, 2017>

A decisive event is the invention of perspective painting, which is the first scientific system, a system of preliminary mechanical properties (Da Vinci's box is the precursor to Niepce's box) [2]. The box can produce an image that conforms to the principle of monocular perspective without the use of "optical components." Perspective allows the painter's painting to give the viewer a three-dimensional visual effect, and the spatial structure of the image can appear to have a direct sense with us. Van Gogh likes to move in observing things when he paints, so the perspective of painting often has its own characteristics. In order to illustrate that some of the features of the clear area are defined by depth of field, the film has to change the perspective structure of Van Gogh's works to make it conform to the realistic perspective. First, the actor enters the green screen and then turns it into CG animation, and finally draws it. <Loving Vincent, 2017>, as is shown in Figure 2, uses rotoscope and PAWS system to match the less accurate perspective of Van Gogh's paintings with the depth-of-field effect in the film, and to move photography in certain scenes, to reproduce Van Gogh's scenes horizontally or vertically. While maintaining a high degree of consistency with Van Gogh's style of painting and painting scene contents, the audience can feel personally in the scene, as if they entered into the real world of Van Gogh. The vertical swing motion of Cafe Terrace at Night in the movie is shown in Figure 3:

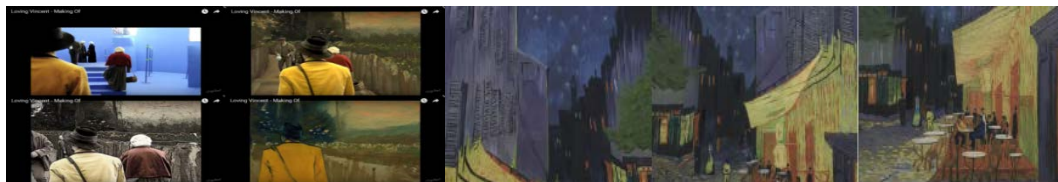


Fig. 2 The process of green screen turn into CG animation, Fig. 3 The movie capture

## 4. The Psychological Impact of the Use of Blue and Yellow in <Loving Vincent, 2017> on Audiences

### 4.1. Kandinsky's Analysis of Yellow and Blue

Yellow and blue also produce centrifugal and centripetal motions that affect the horizontal motions mentioned above. Two circles in the landscape include a yellow one and a blue one. The yellow circle creates a centrifugal movement that slowly diffuses and approaches the audience visibly, while the blue circle shrinks inward and avoids the audience slowly. When you look at the yellow circle, your eyes will feel a sting. When you look at the blue circle, you will have a feeling of cotton sucking [3]. Yellow is outgoing and difficult to understand, and blue is restrained and resistant to expand.

### 4.2. The Use of Blue and Yellow in Movies

As is shown in Figure 4, the film draws on 34 Van Gogh's original works, which contain obvious blue and yellow, such as Starry Night, The Bedroom, Wheat Field with Crows, Starry Night Over the Rhone,

Self-Portrait, and so on. The two colors collocate and cancel each other out to calm down. Based on the achieved results we can imagine going further and defining higher-level content characterizations by associating the color content to the human perception [5]. The film picture brings tension to the audience without losing the visual sense of peace, especially the final selection of Van Gogh's self-portrait showing the retrospective plot, from grey to color progressively. Yellow beard, hair color, blue clothing and calm, soft and lonely atmosphere needed by film plot created by background are shown in Figure 5:



Fig. 4 The movie capture, Fig. 5 The final capture of movie

## 5. The Process and Result of Case Studies

Table 1. The Process and Result of Case Studies

<b>Bazin's Film Aesthetics</b> 1. mummy complex 2. depth of field 3. screen and picture frame	+	<b>Kandinsky's Color Theory</b> 1. inner necessity 2. colors' psychological effects	+	<b>&lt;Loving Vincent, 2017&gt;</b> 1. rotoscope, PAWS 2. Van Gogh's painting
↓				
<b>Oil Painting Animation</b>				
1. coordinate screen and painting, pure art and film image 2. integrate depth of field lens and perspective of halo method 3. add a new form of existence for painting				
↓				
<b>&lt;Loving Vincent, 2017&gt;'s Aesthetics</b>				
1. recording function 2. balance the conflict between film images and pure art 3. inner law (intrinsic driving force) 4. break the frame limitation 5. the yellow and blue's psychological effects with film plot 6. neutralized the contradiction between the pursuit of realism and the limitations of painting techniques				

## 6. Conclusion

This thesis is based on Andre Bazin's aesthetics of film images and Wassily Kandinsky's theory of artistic Painting, analyzing the aesthetics of film images of the oil painting animation film <Loving Vincent, 2017>. Oil painting animation film is not to "affect" or abandon painting, but to add a new form of existence for painting. The existence of oil painting animation film balances the hidden conflict between film images and pure art. This film which is produced in Van Gogh's style is based on aesthetically processed works, and it has a recording function in the form of hand-painted oil animations to help people remember Van Gogh. It finished creation and appreciation of art for feeling to bridge between immaterial (Van Gogh's emotion) and matter (Van Gogh's paintings) for two times, and from the material (Van Gogh and his works) to the immaterial (Directors' inner feelings), then from the material (<Loving Vincent, 2017>) to the immaterial (audience's inner feelings). The film uses rotoscope and PAWS system and units the halo method of oil painting and depth of field lens to change the perspective of Van Gogh's painting by using vertical swing motion etc. to maintain a high degree of consistency with Van Gogh's style of scene. According to Kandinsky's analysis of the use of blue and yellow's psychological impact, we can find that these 34 film pictures bring tension to the audience without losing the visual sense of peace, especially when the final selection shows the calm and lonely atmosphere needed by film plot created by the change of colors.

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# **A Study on the Story of Gamification to Prevent Equalization of Personal Satisfaction and Self-esteem**

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## **Abstract**

This study suggests a story of SIIMI, which is mobile Gamification content to prevent identification of self-esteem that is created by the satisfaction of appearance by combining the theory of Gamification with factors of psychotherapy game

***Keyword: self-esteem, gamification, serious Game, and lookism***

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## **1. Introduction**

The concept of self-esteem has received lots of attention in this society. According to the point of psychology, this concept has affected behaviors of human and adaptation. Therefore the importance of self-esteem has been emphasized. Self-esteem is the concept of judgment regarding their values and the meaning of estimation[1]. Especially, Freud insisted that the ego of the human body is the critical factor of character formation, and also the relation between appearance and self-esteem affects a character[2]. On the other hand, in Korean society, there is a strong tendency that the appearance satisfaction is becoming self-satisfaction. Like this, when someone builds self-esteem by judging appearance beauty for the standard of value, it can be very unstable and controlled by others easily[3]. This thesis suggests the story composition of Gamification which can help improve this social phenomenon and build the right self-self-esteem of individuals.

## **2. Theoretical background**

### **2.1. self-esteem**

Crocker (2003) suggests that self-esteem is associated with specific areas and that success and failure in self-esteem areas determine self-worth[4]. Based on these theories, Cocker and Park (2003) defined that an environment is needed to satisfy these two conditions for high self-esteem. It must be accompanied by a sense of self-esteem in a particular area and must be placed in an environment where we can experience success in that area[5].

If we apply the lookism problem of present society to the theory associated with self-esteem, It can be said that a significant number of Koreans involve self-esteem in the appearance area. In practice, the result of research in the effect of appearance satisfaction on the female college student's satisfaction shows that two factors are highly correlated[6]. Self - esteem in the appearance area is unstable in that the factor that can experience success in the area is limited and the judgment of others is influential.

### **2.2. Gamification**

Gamification is that applying mechanism of a game in non-game things so that it can induce fun to various actions and help to convey effectively what you meant. Gartner, a market research company, has presented four factors in a way that enables users to immerse themselves by using Gamification. These are a plausible story, a definite goal and the rules of a game, moderately difficult tasks, quick feedback cycles[7].

### 2.3. Serious Game for Therapy

The area of Gamification presented above is gradually spreading into the field of education and marketing, and is becoming a core theory. In this project, we would like to suggest a theoretical study of therapeutic Gamification. Sunjung Yoon has applied psychotherapy to the games and selected necessary factors for therapy serious games. These factors have required the consistency with character, the stability of the game material, realistic factuality, self-determinism of whole game and interaction with reality[8].

## 3. Body

### 3.1. Story based on elements of a Serious game

For the story elements which can lead to improving self-esteem, we have deduced the elements of therapy serious game and applied them to the story.

Table 1. Story based on Elements of a Serious game

Elements of Serous Game	The characteristics of a story
Consistency with character	Selection of the main character as the one who is pressured by the aesthetic standards of society in the lookism society. Being an outcast because of the mistreatment of decoration as a real tree, unlike other Mii tribespeople who decorate like a real tree.
Stability of game material	For healing, atmosphere to be stable, use the soft tone of colors for the central background desert and characters, maintain a relaxed mood with calm music.
Realistic factuality	The appearance of a character who denies itself due to low self-esteem and realistic characters that judge and bully others due to their high self-esteem of appearance. Deliver the topic clearly with the main character's actions of deviating from social, aesthetic standards.
Self-determinism of the whole game	Overall the whole game, users move their main characters to solve the problem.
Interaction with reality	There is no link between therapy and counseling concerning the story in the game.

### 3.2. The characteristic of Gamification

Table 2. Story based on Elements of Gamification

Conditions of Gamification	The characteristics of a story
A plausible story	Increase immersion with the story in an imaginary world that liken to reality

A definite goal and the rules of a game	Present one's obsession with appearance beauty in the form of visible 'leaf', and take all the leaves off that were attached to the main character's body.
Moderately difficult tasks	In the form of drag & drop puzzles, find clues for deducing the story and take the leaves off with unexpected ways.
Quick feedback cycles	Consistent feedback on game elements

Finally, the users have a chance to think about areas that involved self-esteem for themselves while playing the content. Ultimately, we can look forward to relieving this phenomenon.

#### 4. Conclusion

The appearance beauty has become one of the important factors of success as living in modern society. As demonstrated in previous studies, the connection of one's appearance, ego and self-esteem is a natural process, but increasing this phenomenon can be a social problem. It would be difficult for an individual to establish a sense of self-esteem that is independent of appearance in this society that is continually emphasizing beautiful female images and easy to find plastic surgery advertisements in anywhere like in the subway. For relieving this phenomenon and prevent to establish so-called, 'Fake self-esteem' which is based on variable and instability, we suggest a scenario of Gamification content which applied with psychotherapy techniques. In the future, it is necessary to verify whether the application will affect the actual game.

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# Analysis of Influence Factors on VR Animation Viewing Behavior of Chinese Viewers

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## Abstract

Virtual reality technology has been receiving attention as an emerging technology that started in 2016. In the early stages of dissemination of VR animation works with new technologies such as virtual reality, the number of viewers and the process of use must be observed and predictive analysis must be performed. Based on the Hwasang of the expanded Unified Technology Acceptance Model (UTAUT2), the main body aims to analyze factors that affect viewers' willingness to watch VR animation.

**Keywords-component; Virtual reality; style; styling; Unified Technology Acceptance Model**

## 1. Introduction

Since 2016, the advent of HTC Vive, Oculus Rift, and SONY PSVR cameras means that virtual reality manufacturing thresholds have already been lowered. In China, the virtual reality market (the user's direct shopping, advertising, and enterprise software applications) will reach 386.4 billion RMB in 2021, and the company's market will reach 87.8 billion RMB. As the mix of VR technology and animation has increased, VR animation has given viewers a unique experience, especially in areas such as advertising, movies, and education. Based on this backdrop, the research is carried out using the expanded Unified Movie of Acceptance and Use of Technology 2 to focus on the evolution of VR animation. In order to achieve stable development and expand the distribution category, the new images must be analyzed and studied the intent of consumption behaviors of viewers, starting from the early stages of acceptance and distribution. From this point of view, the significance of the study can be found.

## 2. Theoretical background

Benkatesh and others have established an expanded integrated technology acceptance model based on the UTAUT model. Empirical studies show that the distribution of behavior in extended integrated UTAUT2 compared to UTAUT models increased from 56% to 74% in terms of analysis and from 40% to 52% in terms of technology acceptance. The expanded integrated technology acceptance model 2 is the introduction of the new relationship between the introduction of the UTAUT model and the new generation, the existing benefit value, and the habit. VR animation is produced through virtual reality (VR) technology. Currently, there are three types of VR animation experience. Animated work is mainly performed in educational, entertainment, social and entertainment experiences. According to Super Data report, Samsung Gear VR sold 4.51.3 million units in 2017 with 169.3 million units of PlayStation, 3.0.6 million of Oculus Rift and HTC Vive. By August of 2018, VR Animation had provided three platforms, each with a slightly overlap in video content.

## 3. Model development and hypothesis

This study model preserves five variables, including Performance expectancy, effort expectations,

promotion conditions, pleasure motivations, and habits of UTAUT2 model, thus setting the variables as factors that affect consumers' viewing and viewing behavior.

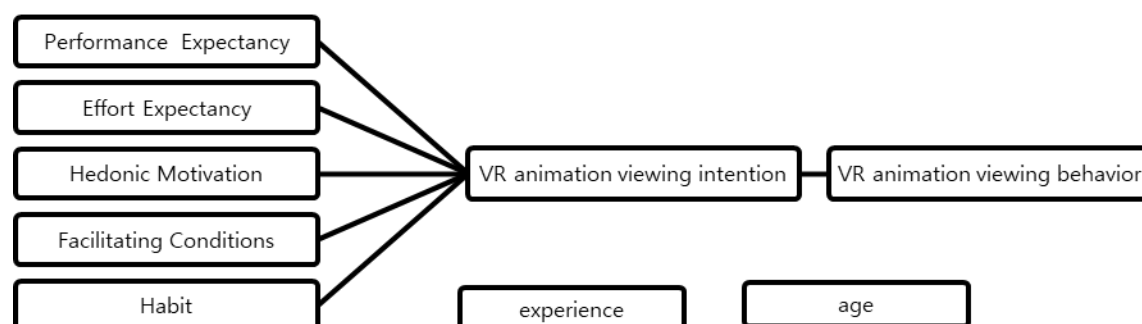


Fig. 1 VR animation study model.

First, performance expectations in this research environment represent the degree of benefit consumers can gain from watching VR animation. Animation art is a culture and a kind of comprehensive art. In other words, no matter what function is used in which field; animation inevitably creates a certain cultural effect in which it is used. Let's look at an educational use case. Oh Sang-mi (2017) said that animation could improve elementary school students' reading skills and increase their interest and interest in English. For users, future use may be reduced if the technology they use is difficult to use, even if it helps them achieve their goals. Davis et al. (1992) combined pleasure and technology acceptance models to claim that pleasure is influenced by the external factors of the technology acceptance model. On the entertainment side, animation works have an entertainment function, and the entertainment content included in the animation gives the audience a sense of spiritual pleasure and satisfaction. Ajzen and Fisherberein (2000) argued that habits act as driving forces to sustain the intent of use. Ochslein et al. (2014), Venkatesh et al. (2012) suggested that habit affects the willingness to use new technology. While research and development of software and hardware used to view VR animations is making some progress, what is more important to consumers is how easy it is to use the programs and devices. According to retail research data released by GfK (GfK China), China's VR technology for 2017 showed an increase of 11% compared to last year's sales of 8.3 billion won. The market began to grow again after the basic restructuring was completed in 2018. Advances in markets have had some influence on both convenience of buying devices that are needed to watch VR videos, level of use and convenience after purchase, and consumption of contents. Benkatesh et al (2012) also suggested in his study that the more appropriate the promotion conditions, the less antipathy and resistance to new technologies can be made. this study formulates the following hypotheses:

- H1.** Performance expectancy will positively influence VR animation viewing intention
- H2.** Effort expectancy will increase VR animation viewing intention
- H3.** Hedonic motivation will positively influence VR animation viewing intention
- H4.** Habit will positively influence VR animation viewing intention
- H5.** Habit will positively influence VR animation viewing behavior
- H6.** Facilitating Conditions will positively influence VR animation viewing intention
- H7.** Facilitating Conditions will positively influence VR animation viewing behavior

#### 4. Methodology

This study is one of the study of variable impact relationships. The study adopted a survey approach to collect data and conducted a data analysis using the most appropriate tool, SPSS. First, basic parametric analysis was carried out on the collected data, and statistical work was carried out on what gender, age, and distribution situations were like. In the study of impact relationships on data measured in scores, the reliability and validity of the data were analyzed. Finally, the basic attitude of the sample group was studied in relation to descriptive analyses, survey items measured with scores, etc. At this time, with correlation analysis methods, the basic work for regression analysis was carried out by studying the relationships. In addition, under the assumption that data are relevant, the regression impact relationship

was studied and the regression analysis method was used to verify the hypothesis.

## 5. Results

### 5.1. Respondents' profile and characteristics

Frequency analyses were conducted to identify the general characteristics of respondents based on the 171 questionnaires collected. According to the analysis, 60 men and women (35.09 percent) and 111 (64.91 percent) respectively were found to be female. Age distribution by age range from 18 to 25, 54 (31.57 percent), 26 to 30 years old (25.15 percent), and 48 people (28.07 percent) aged 31 to 40 years old. From the age of 18, the age of 25 can be seen as the majority of all respondents. The following Table 5 lists the demographic characteristics of the respondents.

### 5.2. Construct reliability and Convergent validity

Prior to the full-scale analysis, the reliability analysis was carried out to see if the measurement questions were consistently measured. The reliability verification was determined by the Cronbach's Alpha coefficient, which identifies the internality of the scale. The Cronbach's  $\alpha$  factor has a value between 0 and 1, and social science determines that reliability is high. The analysis of a total of 14 questions in the seven variants used in Table 6 shows that most of the variables were found to be from 0.630 to 0.855. An exploratory factorial analysis was performed using SPSS to determine the validity of the measurement variables. The KMO measure value (Kaiser-Meyer-Olkin), which indicates whether the correlation between the variables is well explained by other variables, was generally considered good with a value of 0.8.

### 5.3. Verification of hypotheses

Detailed results showed that the performance expectation had a static influence on the purpose of viewing, and that the condition of promotion and habit had a static influence on the intention of viewing. The expected and pleasurable motivation has not proven significant influence. The results of this analysis showed that the performance expectation had the greatest impact on the audience's intent, and that it was able to determine the influence of the spirit in the order of promotion conditions and habits. This regression equation shows modified  $R^2=0.327$  and Durbin-Watson = 1.895 and has a 32.7% explanation for the regression formula. In addition, Durbin-Watson appears to be 1.895, indicating that no residual exists in this regression equation.

Visitors' intent and habit were shown to have a positive influence on viewing behavior, and if you look at the regression equation, the revised  $R^2=0.343$  and Durbin-Watson =2.020 were found.

### 5.4. Validate adjustment effects

The results of the study show that "gender" and "age" have adjustment effects on Performance Expectancy and Effort Expectancy.

## 6. Conclusion

Results show that the performance of the anticipation, habits and promoting factors will have a positive impact to the audience to watch VR animation, the performance of positive influence is biggest, habits and promoting factors of positive impact is relatively small, that is to say, VR animation can bring the function of the utility can reaction of the audience most willing to watch the VR animation, therefore, in the VR animation production planning, increase the contents of the can let audience learn, or increase the contents of the can let the audience feel have practical use can let the audience more willing to watch the VR animation. The promotion factors show a positive influence relationship in the results of this study. Therefore, it is important for the audience to have convenient channels to watch VR animation. For example, it is important to increase the experience store of VR animation, or like Google stories, it is also possible to watch VR animation by only using mobile terminals. Used in this study has a positive impact on the audience also, habits is essentially "procedural memory", psychologists say habits is divided into three parts: suggest - behavior - reward, from this point of view, VR animation in the process of production, especially interactive VR animation, can provide more in the process of viewing audience can choose the different development of the plot, rich interactivity, or add incentives like games.

In the results of this study, efforts to look forward did not have an impact on viewing behavior. The reason for analysis may be that modern audiences have good receptivity to new technology affairs, and learning and use are relatively simple. Entertainment motives no has no effect on viewing behavior, there may be several reasons: first, the current audience entertainment project selection is more, but VR animation for the audience, there are problems in the experience, such as the VR devices owing to lack of resolution and screen refresh rate, cause vision, body feeling out of sync, even to an audience of vertigo. Secondly, most of the entertainment factors of VR animation are generated through the interaction between the audience and the film. There are also technical problems in how to make the audience have no barriers to interact. For both of these reasons, developing the right hardware or software solution might be one of the ways to solve the problem.

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# Research on Ethnic Style of Animation Performance Based on Drama Performance

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## Abstract

People in every ethnic group all have the actions that reflect this group's life behavior characteristics. It is important for the formation of a distinctive ethnic feature to apply these behavior performance to animated character shows. This is how a set of action in opera formed. There are two characteristics: from the perspective of technique, a set of action in opera possesses standardization and inheritance; from the perspective of art, it owns flexibility and creativity. Researching on the type of role, the four skills and five methods of a set of action in opera has reference significance for the creation of animated program action. This thesis makes a comparative study of a set of action in opera and animation performance and tries to extract the content suitable for the development of animated program action.

*Keywords-standardized action, animation character performance*

## 1. Introduction

The act of combining standardized action as a performance model with the artistic features of animation and applying it to the standardized concept of animation plays an important role in the formation and diversified expression of the performance style of the art movie. The formation of the so-called national style performance is not only reflected in animation technology, movement rules, or a set of standardized actions absorbed from the opera. It is a performance language system accumulated gradually with abundant practice, which is attributed to animation ontology category. The "standardization" is a necessity for art and film performances and a common feature of Chinese art. That is to say, it is not only a simple technical feature, but one of the characteristics of Chinese national thinking.

## 2. Research on the Art Law of Art Films

### 2.1. Artistic and narration

Just as its name implies, art films are attributed to films like story films, science and education films and documentary films. It has both the general commonness of the film's comprehensive characteristics and the features of art form. Thanks to the broad application of art forms, it has aesthetically stronger "artistry" than ordinary story films and documentaries. With the help of the comprehensive narrative ability of film language, art breaks away from the limitation of static narrative features or that of association of activity and inertia in the general sense, and the general art works are "more narrative"

### 2.2. Hypothetical nature and Sense of Reality

An art film is one kind of cinematics which is made by painting or a specific process material. It

has inherently great hypothetical nature with false characters and false scenes, and all its elements are hallucination and illusions created by means of artistic expression. The technique, degree, and nature of this hypothetical nature are full of infinite possibilities because of the freedom of the material. All the elements on the screen are simulated by special materials, such as the scene of going up to heaven and down into the earth, endless changes, fireworks, clouds, storms, thunder and lightning. It doesn't even need live actors to create characters and set scenes with real props, as in the story films. The hypothetical nature of art films achieves unprecedented freedom in means of expression.

### **2.3. Alienation and Hallucination**

The role of art film is not shaped by the actors themselves, so the performance of animation characters enjoys its own unique innate characteristics. When the effect of "alienation" is showed or "illusion" is performed, it is necessary to extract the essence and discard the dross according to its aesthetic standards. It is obviously not advisable to draw the performance theory of drama into the performance theory of art films. However, since different performance theories have their advantages, only by combining the aesthetic pursuit of art films can we achieve the purpose of better reference and absorption.

## **3. Research on standardization**

### **3.1. Type of roles**

In order to summarize and refine the actions of different roles, the opera is divided into four categories according to people's status: male roles, female roles, painted roles and clowns-on stage. They represent four different groups of people, which are subdivided into different small groups, such as an actor playing a martial role, an elderly character, a special role of a young gentleman ; female role, maidenly female role, the demure middle-aged or young female character type ; the painted face playing acrobatic fighting in Chinese operas ; military comedian, a kind of comedian, old comedienne, etc. This method of roughly dividing people according to different levels, men and women, occupation, age and other elements can clearly extract the commonness of actions in a certain group of people, and extract representative typical actions as standardized actions. When they are applied to different characters and scenarios, and Standardized actions can produce different changes according to the actor's psychological experience and performance requirements. This division of type of role can be used as a reference for the role classification of art films and form a standardized animation role that can be inherited and developed. This is also consistent with the law of animation art.

### **3.2. Four Basic Skills and Five Techniques**

Chinese opera deduces stories through song and dance. Therefore, it is often said that Chinese opera tell a story by poetic drama and dance. The ancients described the emotional response to a matter as a progressive process, expressing it through speaking part at the beginning, singing when they cannot enjoy it, and dancing when they are not enough to express their inner emotions. It can be seen that song and dance are the most expressive way to express people's feelings, but it is very difficult to tell stories with song and dance. After thousands of years of development, an adequate bonding agent is found between song and dance and stories, which is the standardized action. Therefore, the formation of opera is much later than other traditional Chinese arts. The standardized actions include four basic skills and five techniques

The four basic skills include singing, dialogue, acting and acrobatics. The singing focuses on the rising and falling in cadence. Acting requires actors to act reasonably on the stage with beauty as if it is real, which requires a strict technical system. Dialogue requires not only a reasonable expression but also a "pleasing quality". Acrobatics, also known as acrobatic fighting, is a highly technical skill



among the four skills. It is necessary for fighting to make the character's performance incisively and vividly in the fighting plot and make the audience thrilling, as if they were on the battlefield.

Five techniques refer to gestures, eyes, figure, specifications, gait, which are a set of standardized actions for performance with the four basic skills.

The standardized actions of four basic skills and five techniques is a precise movement system which is precipitated by stylized thinking with exaggeration and beauty, as well as the bridge and foundation for actors to shape their roles. The actors mobilize various parts of the body to perform. We need to inherit and improve this set of mature standardized actions, reconstruct and create new standardized actions by combining with the artistic pursuit of animation performance for further development. If animation performance continuously is formed independent system, and shaped with different genres, it will play a significant role in the nationalization development of animation performance.

### **3.3. “Movements and Postures of Actors in Traditional Operas” and “Every Gesture and Motion”**

The standardized action of the opera is composed of the movements and postures, which are formed by linking up the posture with beautiful shape through every gesture and motion. It is consistent with the technical principle that key frames with narrative function link up tween frames to form a set of animation performance actions. While we introduce the posture, attention should be paid to integrating the special time rhythm, exaggeration and other technical factors of animation so that it conforms to the law of animation performance and realize the aesthetic pursuit of animation performance.

## **4. Conclusion**

The aesthetic pursuit of animation performance is very similar to that of traditional opera performance. Many representative works of early Chinese animation have made bold reference and innovation to opera performance in the process of performance of animation characters, and perfect results have been achieved. It will play an important role in the development of Chinese animation to form an independent style by deeply develop opera performance and selectively absorbing and transplanting it theoretically.

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# Analysis of Chinese Public Service Advertisements Based on Narratology

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## Abstract

Advertising is the cultural product of modern consumerism society, and plays the role of social texts. However, the current research on public service advertisements based on narratology is not enough. This paper combines the relationship among Chinese public service advertisements, narratology and advertisements. From the perspective of the classical narratology theory, the writer analyzes how to interpret Chinese public service advertisements. The writer selected the cases of Chinese public service advertisements at various stages, and analyzed the successful factors of Chinese public service advertisements. Through research, it can be used in the production and exchange of public service advertisements in China.

**Keywords-** *Chinese public service advertisement; Post-classical Narration; narrative advertisement*

## 1. Introduction

As a form of advertising, public service advertisements has been developed in China for more than 30 years. Since the broadcast of the TV public service *Water Conservation* (节约用水) in 1986, the number and quality of public service advertisements in China have been significantly improved. The various interdisciplinary research on public service advertisements has also been continuously enriched. The study began in 1991, Du Yanling (杜延龄), *Social Function of Public Service Advertising* (公益广告社会功能之刍议) was published in the year. After 2000, the production and broadcasting of public service advertisements have become more active, but the analysis of public service advertisements from the perspective of narratology was still insufficient compared with other fields. The research on this content can provide reference for the research of public service advertisement production from the aspects of linguistic narrative elements and narrative elements besides languages. At the same time, through the theory of narratology, it can provide a new perspective and breakthrough for the production and dissemination of public service advertisements in China.

This thesis uses post-classical Narration theory, starting from how to develop the narrative of Chinese public service advertisements and what kind of narrative method is used, etc., and explores the successful factors of Chinese public service advertisements through cases analysis. I hope it can be used in the production and dissemination of public service advertisements in China.

## 2. Chinese Public Service Advertising

Public service advertisements are non-commercial advertisements created for the public interest of the society[1]. Unlike general commodity advertisements, they are produced for the purpose of social progress or welfare policies. China refers to PSA (Public Service Advertising) as a public service advertisement. During the period, there were various names such as public service advertisements and public business advertisements. Like other commercial advertisements, public service advertisements have various medias such as newspapers, radio, television, and prints. There are also slogans, images, poems, stories, interviews, interviews and other forms of expressions.

In 1978, China Central Television broadcasted a public service advertisement similar to the current public service advertisements. In January 1979, Ding Yunpeng (丁允朋) stated in *Corporate for Advertising* (为广告正名). The knowledge and convenience should be provided to the public through advertising. This has had a very

positive impact on the regeneration of the Chinese advertising industry [2].

The development of China's public service advertisements has gone through three stages [3]. From 1986 to 1995, it was the initial stage of the formation of public service advertisements in China. At this stage, television became the central channel for the dissemination of public service advertisements. In 1986, Guiyang(贵阳) TV Station in China and Guiyang City saved Water Office co-produced the public service advertisement *Water Conservation(节约用水)*. "This public service advertisement symbolizes the birth of modern public service advertisements in China. [4]" In October 1987, China Central Television broadcasted the special public service advertisement *Growth and Report* for the first time in prime time. The program produced and broadcasted many public service advertisements that are consistent with social reality, with diverse themes and good communication effects. According to statistics. From 1987 to 1995, the number of public service advertisements broadcast in *Growth and Report* has reached 844. The concept of public service advertisement has gone deep into the body and mind of the public.

From 1996 to 2007, Chinese public service advertisements were in a stable development period. After the broadcast of *Growth and Report*, TV stations and broadcasting bureaus in other regions were positively affected by major TV stations, such as Beijing Evening News(北京晚报) and Guangzhou Daily(广州日报). The newspaper also participated in the production of public service advertisements. During this period, the government and relevant departments intervened to strengthen the management of the public service advertising industry. The number of companies participating in TV public service advertising activities has also increased. It has provided support for the development of public service advertisements.

Since 2008, Chinese public service advertisements have entered a stage of rapid development. The business organization of the government and related departments is also constantly improving. More enterprises participate in the public service advertising industry. The China TV Public Service Advertising Competition was held during this period. Public service advertising has been inserted into news programs. Chinese public service advertising industry has entered a planned, organized and diversified stage of rapid development under the leadership of the government.

### 3. Chinese public service advertisement based on narratology

As a cultural product and social text of modern consumerism, advertising naturally enters the research scope of narrative theory. In other words, narrative provides a new perspective for the study of public service advertising. However, many existing researches use narratological theory to study advertising. Public service advertisements are the research object. That is to say, post-classical Narration theory is very insufficient for the development of public service advertisements. Therefore, this article is a classic narrative. Based on the theory of post-classical Narration, it will analyze the public service advertisements in China.




After examining the academic theories of various narratology, Zhu Kezhen(祝克懿) divided the definition of narratology into four aspects from the perspective of cognitive linguistics, namely, the language action process, the language result, a means or method used in the language action process, a cognitive framework or schema[5].

China Central Television is the only state-level television station in China and a state-run television station representing China. According to the three stages of development of Chinese public service advertisements, this paper has selected three most authoritative public service advertisements broadcasted by China Central Television Station, which are familiar to the people, as examples.

In 1991, China Central Television broadcasted a public service advertisement on the theme of 'Discovering Unnecessary Expenditure.' Every time a child in a department store sees a toy, the child's mother buys the toy for her child. One day, the child throws away the toy, and the child's mother shows a surprising expression. In the public service advertisement, the story itself is a process of language action, and the result of the language is what the public knows after seeing the public service advertisement. Theme: Reducing unnecessary spending.

In 2002, Chinese famous mineral water company, Nongfu Spring(农夫山泉), passed a public service advertisement : *a Drop of Water; a penny*, and every time a bottle of mineral water was sold, it will donate a penny to the poor areas. In this public service advertisement, there is no traditional 'problem-solving' model, even no dialogue. But post-classical narratology theory includes senders, information, recipients and 'post-language results', so the public service advertisement is also a narrative process. As a sender, the production company sends out information to the public, attracts the attention of the public through out-of-school children in poverty-stricken areas, and takes considerable action to help such children. The information content is a scene of desperate children in poverty-stricken areas who are eager to learn and 'a drop of water'. The advertising word of 'a penny.' The recipient of the information is the public. The result of the language is that the heart of the public is moved by the advertisement and participates in 'helping out-of-school children in poverty-stricken areas.'

Table 1. Cases Analysis Objects.

Development Stage	Topic	Theme	Image
1988-1995 The initial stage	The public service advertisement broadcast in the TV program <i>Growth and Report</i>	Reducing unnecessary expenses.	
1996-2007 Stable development period	<i>A Drop of Water, A Penny</i>	Raise funds for out-of-school children in poverty-stricken areas."	
From 2008 Rapid development stage	<i>Apocalypse of the Eggs</i>	The importance of child safety seats	

In 2013, China Central Television broadcasted the public service advertisement *Apocalypse of the Eggs*(鸡蛋启示录). The little girl who observed the eggs on the car seat was the protagonist. Every time the girl saw the eggs hopping and jumping with the movement of the car, laughed. While the car brakes suddenly, the egg falls behind, but the girl is safe in the child safety seat. Although there are certain storylines in the public service advertisement, there are basically no contradictions and confliction, and the satisfaction rate reminds the audience of the necessary appeal of the child safety seat. It also has the characteristics of abstraction and warning.

It can be seen from the examples that with the different stages of development, the narrative techniques of public service advertisements in China are gradually growing. Later, the classic narrative theory explores public service advertisements, which will provide a powerful reference for the expression of public service advertisements.

The successful factors of public service advertisements are mainly reflected in the following aspects. The first is the abnormal narrative structure, even if there is no story of the benefactor, the supporter, the beneficiary, etc. It can also deepen the impression of public service advertisements in the hearts of the public by moving forward in turn. For example, in the moment when the egg is broken, the public is warned. At the same time, the message 'Children's car seat is very important' will be received. Secondly, other narrative elements except language. For example, the laughter of the girl, the brakes of the car, the egg broken sound. These factors can also help the audience understand the narrative of public service advertisements. Finally, the social environment plays a very important role in the success of public service advertisements. In 2013, China's economy has achieved great development. With the popularity of private cars, the hidden danger of children riding in cars have become a problem that cannot be ignored. The public service advertisements have revealed safety hazards to the public and popularized child safety seats. The importance of the chair has been widely praised by the masses once it is broadcast. The media is also the most authoritative China Central Television station in China. It is easy for the public to accept and the possibility of adoption will increase.

#### 4. Conclusion

A new attempt to explore Chinese public service advertisements with the theory of narratology. It is also a very necessary exploration in the development of public service advertisements. In fact, the process of public viewing the public service advertisements is also a process of interpreting public service advertisement concepts and ideas. In this process, the expression of the theme of public service advertisements, the public's information acceptance, and the communication effects are not negligible. Therefore, the research on public service advertisement through the theory of narratology can provide a new perspective and breakthrough for the production and dissemination of public service advertisements in China.

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# A Study on the Development of One IP(intellectual property) Animation & Game in Chinese Market

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## Abstract

"No IP, No Content" has become a phenomenon in the content industry, high-quality IP has a strategic importance. It has become a Trinity in the movie-anime-game basic package, Competition is more intense. However, there is a tremendous amount of know-how hidden behind the use of IP to operate games well. We are worth exploring in detail.

**Keywords-** *Chinese Market, Digital IP, Derivative product.*

## 1. The Value of IP

High quality IP can bring a lot of users in the early stages. This saves on promotional costs. The conversion rate is affected by 3 to 7 times and the income is also doubled.

First, you can see the game world faster through IP. Whether the game is fun or not depends on whether the world view of construction is complete, IP generally has a complete and logical world view.

Second, IP reduces user learning costs. With IP, players can become accustomed to the product as quickly as possible. Increase user loyalty by making game characters more recognizable and increasing game substitution and input sensation.

Third, IP brings tricks to attract fans. IP can provide a good publicity effect. Not only can you drag the original IP punk, you can distinguish it from regular games.

Fourth, the dual effects of fans and famous writers, the ability to pay more money

The fans who pay for the contents of the novel are all big fans of the novel, and the possibility of payment is bigger than that of ordinary players.

Fifth, your work has been verified by the market and you can easily target the target group. - Young users

Serial novels have been identified in markets with small risks. And IP awareness can increase the import efficiency of new users. In addition, the Chinese online literature reflects young people's desires as much as possible and overlaps with the audience of the game.

Sixth, emphasis on channel.

Games are IP standard already, if there is no IP in the game, there is no channel interest or recommended seats.

## 2. Animation industry in China, USA and Japan

### 2.1 Current Status of the American Animation Industry

The development of the American animation industry is heavily influenced by Hollywood development models, so the next example is Disney.

Disney's main business segment

Department	Revenue	Profit
Radio and Television Media Group	20,356	6,818
Theme parks and resorts	14,087	2,220
Film and Television Entertainment Group	5,979	661
Consumer product division	3,555	1,112
Interactive media department	1,064	-87
total	45,041	10,724

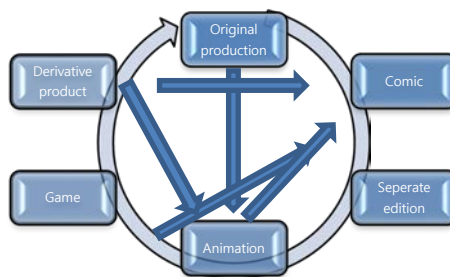


### Disney Financial Data ( 2013 ) Unit: million dollars

Four of Disney's five divisions account for 90% of its revenue. Of which \$ 20 billion in revenue from broadcast and television media groups. Disney's classic cartoon images and many movies are well known to us, but their contribution to the sales and profit ratio is only 13.3% and 6.2%. On the other hand, the advertising and copyright of Disneyland, Disney-approved clothing, food and media networks have been derived from various industries to maximize the value of the animation industry. Disney's business philosophy is to use brand-based content as a reader to produce home movies for all ages. Family watching can target audiences of higher ages and there is room for expansion in late derivatives development.

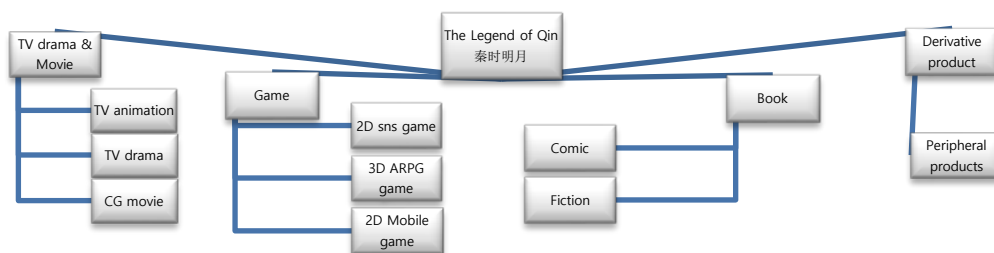
## 2.2 Current Status of the Japanese Animation Industry

Since the development of animation in Japan has been almost one century, the animation has already developed into the three major industries in Japan, and the GDP has exceeded about 10%. As an example of development, the mode of operation of the Japanese animation market has been completed through long- The country that develops around other animation industries is also of great value.



## 2.3 Current Status of the Chinese Animation Industry

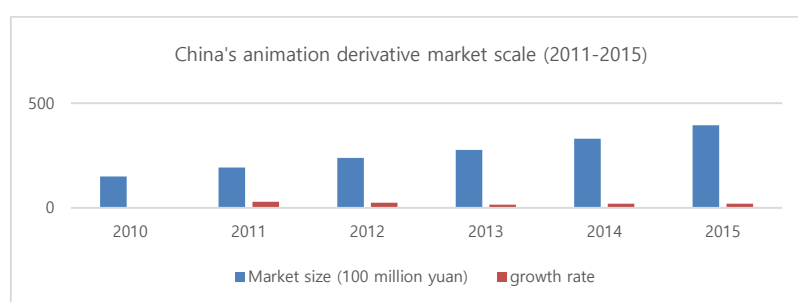
Comparing the US and Japanese industrial models: All derivative products are derived from animated content. This includes derivatives of other industries as well as derivatives of animated characters and plot lines. The classic animation brand, itself has the characteristics of industrial chain expansion. Referring to China's animation derivatives market, we have seen inferior toys, but now we are laying out many excellent animation industries derivative industrial layouts. "The Legend Of Qin", for example, has developed these animated works for many years, has a very good industrial layout.



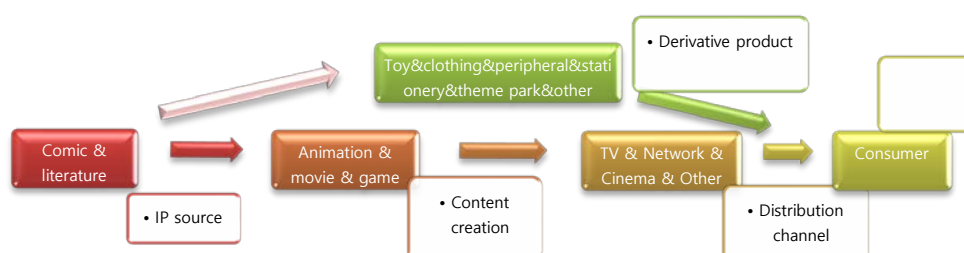
As you can see, "The Legend of Qin" not only developed live TV dramas on numerous TV animations, large movies, movies and TVs, but also developed the same names, books and audio games, and the products we saw around. Likewise, by expanding the content of the animated film, The Legend of Qin's monthly biography series produced not only seven, but also produced a variety of formats such as prequel, movie versions and extras.

## 3. Current Status of Animation & Game Derivatives in China

Derivatives are secondary sales of animated products downstream of the animation industry chain. Figures, toys, clothing, stationery, and handicrafts. Currently, the animation derivative market is a pillar of the animation industry, and it is the key to excessive profitability of the animation content brand and the driving force of the re-creation of the original animation.



According to the development trend of the animation industry and how to realize it, China has already started to operate the operating mechanism of the industrial chain of animation integration. It is usually divided into three levels: IP core layer, intermediate development layer, and surrounding derived layer.



The IP core layer mainly includes two aspects, cartoon and literary creation. The IP core layer brings together a lot of writers and comic novelists, and the number of works is enormous, so you can easily get the best quality plot and get a high quality original IP. IP is a source of industry chain. It directly affects ability.

The middle development layer is mainly the development of animated IP including movies, TV series, animated video and other works. While this market is modest, film and television animations can have strong communication effects, expand IP influence, accumulate users, and foster an excellent user market.

The surrounding derivative products are based on the second development of IP such as game production, animation toys, animation clothes, animated stationery, theme parks, etc. to achieve commercial profitability mainly through IP license development and direct contact with consumers.

#### 4. Chinese market popular same IP game & animation work statistics

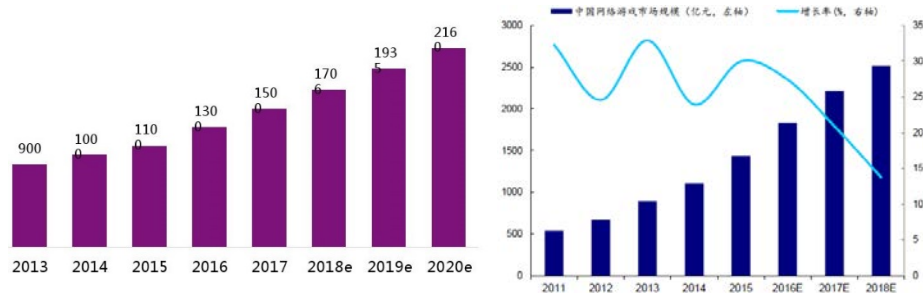
	The Legend of Qin	Azur Lane	Onmyoji	Fantasy Westward Journey	I'm MT	Fate/Grand Order	Final Fantasy	Blade & Soul	Revelation
Game production company	Fuchun Technology (CN)	bilibili(CN)	Netease(CN)	Netease(CN)	LOCOJOY(CN)	TYPE-MOON(JP)	SQUARE ENIX(JP)	NCsoft(KR)	Netease(CN)
Game Distribution Company (CN)	Beijing Chukong Technology (CN)	Bilibili(CN)	Netease(CN)	Netease(CN)	locojoy (CN)	bilibili(CN)	SQUARE ENIX(JP)	Tencent(CN)	Netease(CN)
Animation production company	Sparkly Key Animation Studio(CN)	Bibury Animation Studio(JP)	Thundray Technology (CN)&BLADE(JP)	Bluearc Animation Studios (CN)	Colorful cinema studio (CN)	TYPE-MOON(JP)	SQUARE ENIX(JP)	GONZO(JP)	Sparkly Key Animation Studio(CN)
Animation type	3D CG movie / 3D animation	3D animation	3D animation	3D animation	3D animation	3D animation	3D CG movie / 3D animation	3D animation	3D animation
Game type	Mobile game/web game	Mobile game	Mobile game	PC online game/Mobile game	Mobile game	Mobile game	Mobile/PC/PI afform Game	Mobile game/PC online game	PC online game
Other digital industries	TV drama		Movie	TV drama	3D CG movie				

The online gaming industry has grown at a CAGR of 21.7% over the past five years. In 2016, sales reached 16.57 billion yuan (17.7%), of which the mobile game market sales were 81.92 billion yuan

(59.2%), accounting for 49.5% for the first time in the client game market. PC game market sales reached 582.5 billion yuan (%) Negative growth for the first time. The number of Chinese game users reached 566 million (+ 5.9%). In 2017, the Chinese gaming market recorded 178.92 billion yuan, 480 million PC gamers and 520 million mobile game users.

In 2017, China's animation industry reached 150 billion, accounting for 24% of the total output of the cultural and entertainment industry.

Games, animations and movies have become the backbone of the Chinese cultural entertainment industry jointly.



Chinese animation market output (Left side) Chinese game market output (Right side) Unit: 100 million yuan (RMB)

## 5. Analysis

Market research and analysis reveals the importance of IP in all areas of the digital multimedia industry, and it is important to have and use one or more superior IPs for the success of related products. Whether it's an animation or a game as IP grows, it's the most important means of carrying IP. It is to notify the public through animations and games. After intent to write to it, you can get unexpected revenue and development if you have many of the same IP products.

The creation of the initial IP is more economical and convenient than the production of the latter, either by creating more than one priority IP, by popular IP and investment cooperation, or by setting up an IP for sufficient preliminary market research and product line use Will produce relevant multimedia industries to obtain more economically stable results.

It can also be reused for existing high quality IPs. In pursuit of collaboration and innovation, more derivatives can be promoted in the Golden Age of Series IP to maximize the value of a single IP.

For small and medium-sized manufacturers, there are two problems in developing animation derivatives: capital pressure and resource constraints. On the other hand, small and medium-sized manufacturers with limited capabilities should consider urging investors to "make a realization cycle" and realize the fastest way to realize cash, accelerate the collection of funds through approvals and cooperation, You must choose. In addition, head manufacturers, media monopoly of traffic, lack of resources, SMEs can not find the right entrance and marketing can not go smoothly.

Large companies such as Blizzard, Tencent, and Aofei have already built marketing systems for animation derivatives, but they are mostly online. The marketing of offline scenes is often hampered by the limitations of inter-industry resources and internal coordination. For years, most large companies have chosen the form of "outsourcing agency."

Increased consumer spending and the emergence of a new middle class have begun to increase the number of offline entertainment scenes and word of mouth promotions.

## 6. Conclusion

The Chinese market and China's export market research show that the future development space of IP suitable for China market is enormous. Studying advanced technologies and mature systems in the US, Japan and Korea, cultivate talent, learn traditional culture, perform bold and unique innovation activities, develop IP with cultural characteristics of China, develop new digital content market in China And promote Chinese culture.

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# The Proposal of Pipeline for Photorealistic 3D Object Modeling

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## Abstract

In this article, an extremely simple method is used to make digital models. In this production process, firstly the object which needs to be produced is shot by a camera. Then a variety of 3D tools will be used to process, and finally a group of models and textures can be obtained. This article also shows the digital models produced by the author using this method, together with Agisoft, Warp 3, Maya and other production tools. And based on the contents hereby, the advantages and disadvantages of this production method are summarized.

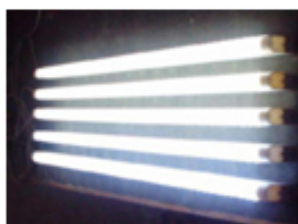
**Keywords-***3D Modeling; Topology; Maya*

## 1. Introduction

Nowadays, digital technology has become much more developed than before, and the digital models production has reached to a very high level. However, there is still much room for improvement in production efficiency. There are numbers of 3D production tools used to improve production efficiency. This paper also adopts a new production method, which is more convenient than the production method used before. Meanwhile this new method guarantees the quality of the model, and lays a solid foundation for later production.

## 2. Preparation for Shooting

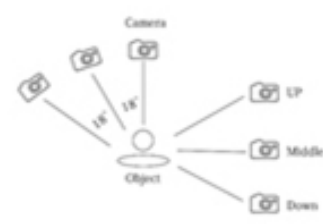
The production method used this time, as shown in Fig. 1(a), is that the shooting is carried out in a room illuminated by a led fluorescent lamp and the brightness can be unified, by which shadow interference can be greatly reduced. Thus it can be ensured that the model texture will not be interfered by the shadow. As shown in Fig. 1(b), then a Canon 5D digital SLR camera with manual focus and a fixed-focus lens set to 55mm will be used to shoot the object which needs to be made into a digital model. As shown in Fig. 1(c), in order that the texture marking of each detail of the object can be accurately got, the camera should shot the object by 360-degree surrounding. Finally it can be ensured that every detail of the object can be seen clearly by the materials shot. When preparing shooting, the better the equipment is, the better the results will be [4][5].



(a) Shooting environment



(b) Camera Settings



(c) Shooting Method

Fig. 1 Preparation for shooting

### 3. Production Method and Production Procedures

In this study, the three essential tools are Agisoft, for processing photo materials, Maya, for making models, and Warp 3, for topologies, which can be reasonable used to quickly get a group of models and textures.

Fig.2 shows the whole workflow, which includes three parts: The first part is about how to deal with the materials obtained from shooting. The screened photos are imported into Agisoft tool to get a group of models and textures. But the model surface number is too large, and the UV is not regular; the second part is about the acquisition of the digital model. Refer to the photo materials and do modeling by manual. Although it takes a long time, a high-quality model of regular wiring can be obtained; the third part is the acquisition of the texture. Use the textures obtained before the topology by Warp 3 tool, and get a regular texture.



Fig.2 Pipeline of production method

### 4. Research Procedures and Results

The above method was previously applied to the production of digital character models. So in this study, it is wanted that the production method can be applied to the production of hard surface objects. As shown in Table 1, this study basically follows this workflow. The production content of each step, and the digital model pattern produced after this step is completed, are also recorded in this table.


#### 4.1. Research Procedures

According to the method as described above, prepare a room that brightness can be unified and a camera for shooting. Due to lack of equipment, etc., it is impossible to shoot a 360-degree subject, so the materials are obtained by surrounding shooting from three angles of up, middle and down.


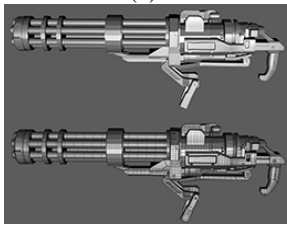


Screen the photo materials obtained shooting and import into the Agisoft tool for processing. Then a group of high-mode textures can be obtained. However, they cannot be used because the number of models obtained is too large and the wiring is irregular. So it is needed to use the Maya tool referring to photo materials and the obtained high poly model to do manual modeling. Thus a high quality model with a well-organized wiring can be obtained.

A group of models through the Agisoft tool is obtained, at the same time, a group of textures are also obtained. The texture quality is very high, but because the UV of the model is irregular, the texture is also irregular. It is therefore necessary to import the obtained model and the model produced in the Warp tool into the Warp 3 tool for topology. While in the topology, attention should be paid to align the two models. The better the models are aligned, the higher the quality of the texture will be. By this method, a group of regular textures can be got quickly.

Table 1. Pipeline Offer for Photorealistic 3D Prop Modeling

Steps	Illustration	Images
Preparations for Shooting	The image on the right shows the object which needs to be made into digital model.	



Acquisition of Modeling	<p>Image (a) is the model processed by the Agisoft tool.</p> <p>And image (b) is the model and the wiring of the model obtained by the Maya tool.</p>	 <p>(a)</p>  <p>(b)</p>
Acquisition of Texture	<p>The image on the right is the produced six groups of textures and the final rendering.</p>	 

## 4.2. Combination and Results

In this study, combination is not involved. But if the shape of the object that needs to be made into a three-dimensional model is too complicated, the model needs to be divided into several parts to be topologically mapped and then merged. Otherwise, the new texture will lose a lot of details and the topology time will take longer, then the work efficiency will be reduced. It can be seen from the table, by this method, that a group of models and textures with a high degree of precision can quickly be obtained.

## 5. Conclusion

In this article, an extremely simple production method is used to obtain high-quality digital models and textures. This method requires the flexible use of three production software: Agisoft, Maya, and Warp 3. Agisoft is able to quickly acquire a group of models and textures, which although cannot be directly used, they can still play a crucial role in the future work. The obtained model can be used as a reference to make the newly-made regular wiring, which is much closer to the real object. And the obtained texture, by the topology tool, can be processed to a regular texture.

The shortage of this method is that there is no way to topology the model as it does a digital character model, so manual modeling is required and a lot of time will be taken. However, compared to other methods, the addition of a group of models as reference can save some time. And this production method, compared to other production methods, can save a lot of time in texture production, and promote work efficiency.

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## **Realization of Realistic Wave Effect in Houdini under the Overlooking Angle**

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### **Abstract**

This paper analyzes and summarizes the process of making realistic marine special effects through Houdini. According to the different position of the camera, the wave effect can be simulated by 2D plane when making the wave special effect with the overlooking angle. Compared with the traditional way of marine 3D, it simplifies the production process and effectively shortens the time required for later rendering.

***Keywords-component; wave effect; the overlooking angle; Houdini***

### **1. Introduction**

As a part of special effects, marine special effects play a very important role in many film and television works all the time. Because of its randomness and complexity, marine special effects require a lot of computation time to render through later software. In view of this phenomenon, this paper shows that when making realistic wave special effect under the overlooking angle, the three-dimensional effect of the waves can be expressed by the whitewater and mist visual effects. By changing the marine model from a 3D container to a 2D plane, this dimension reduction can effectively reduce the computational time required for rendering and maintain a high level of realism in visual effects. Through the use of special effects software Houdini to make realistic marine special effects under the overlooking angle, this paper analyzes and summarizes the workflow of marine special effects and brings the concept of overhead view angle into the production process, it further streamlines and refines the original production process, and puts forward an innovative marine special effects production idea.

### **2. Prior study of marine special effects**

#### **2.1. Marine special effects and production software**

Nowadays, Maya and Houdini are the main after-effects software to make marine special effects. Maya can use built-in fluid systems and third-party plug-ins to make marine effects. However, due to the complexity and intelligence of the Maya fluid system, the third-party plug-in has become the first choice for Maya to make marine special effects, where Maya Bifrost is widely used as a simple and visually realistic plug-in. Maya Bifrost's production process can be divided into 1. creating liquid; 2. adding collisions and accelerators; 3. adding whitewater; 4. adjusting water material; 5. final rendering. From the making process of Maya Bifrost, it can be seen that the focus of this plug-in is to simulate the true texture of marine water, but there is no good solution to the details of marine fog, whitewater diffusion and so on, and it often needs to be assisted by other software [3]. For example, Maya Bifrost does not have a wet map generator, it needs to use the echo special effects in after effect to make the effect of wave trailing. Maya Bifrost offers a solution for controlling the visual effects of waves by adjusting attribute values. This approach is easy to use, but it can be overstretched in response to complex marine scenarios.

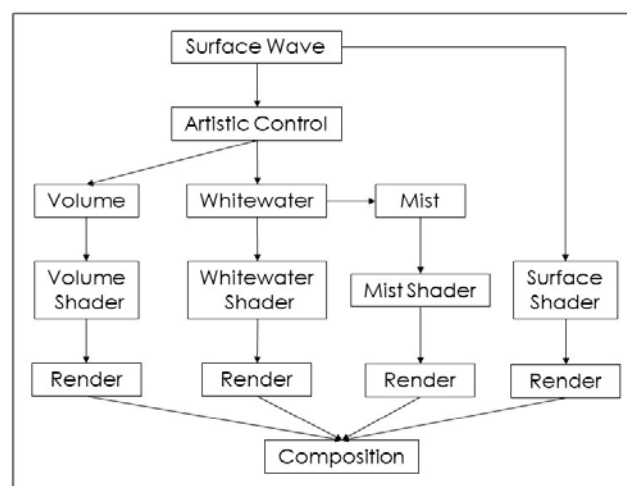


Fig. 1 The Schematic Diagram of Marine special effect by Houdini

As a professional special effect software, Houdini has unique advantages in making marine special effects. Maya Bifrost has the same function as Houdini for creating the texture of the waves, at the same time, Houdini can also provide more abundant force field, as well as superimposed marine fog and whitewater splash to enrich and enhance the visual effects of the marine. This series of adjustments only needs to be done in the Houdini software (e.g., “Fig. 1”), in terms of the completeness of the production process and the richness of the final marine special effects, Houdini is more professional than Maya Bifrost, which is the reason for this paper to select Houdini as the after-effects software for making marine special effects.

## 2.2. Wave effects and lens angle

In the shooting of marine special effects, the camera lens angle can be roughly divided into two angles: side angle shot and high angle shot (e.g., “Fig. 2”). The high angle shot shows the vastness of the marine, while the side angle shot shows the surging waves. As can be seen from the figure below, the marine is divided into four parts: the volume, the surface, the whitewater, and the mist (In Fig. 3 red line is the marine surface, Dark blue under the water surface represents the ocean volume, light blue is whitewater, above the whitewater is mist).

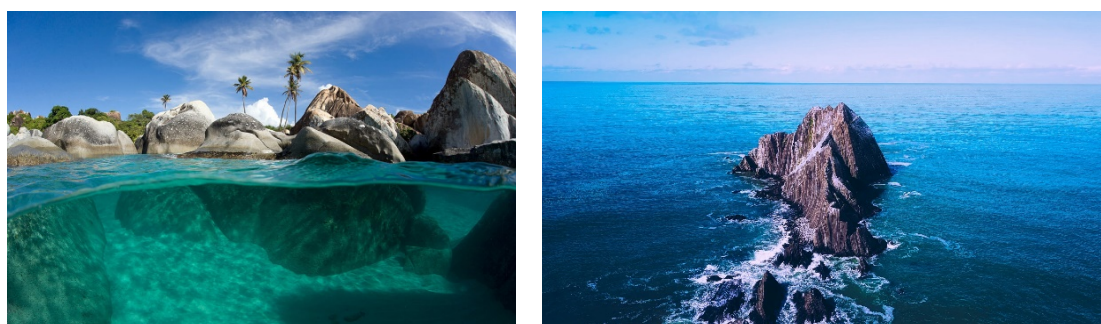


Fig. 2 Real view of side angle shot(left) and high angle shot(right).

The distance between the camera and the marine surface is long in high angle shot, and the marine surface is made up of three parts: surface wave, whitewater, and mist. At the angle of the side shot, the camera is closer to the marine surface, so the camera will record not only the three parts of the surface but also the deep volume below the marine surface, especially when the waves immerse themselves in the camera, all levels of the waves will be recorded. It is precisely because of the difference in the recorded content caused by the difference in lens angle, in this paper, it is proposed that the special effects of

marine waves do not need to have all the details as side shots, but can be simulated by making surface waves, whitewater and mist. In other words, only the surface of the marine is made and the depth volume of the marine is omitted, and the processing process is simplified by using the characteristics of the lens angle, thus reducing the time of making marine special effects.

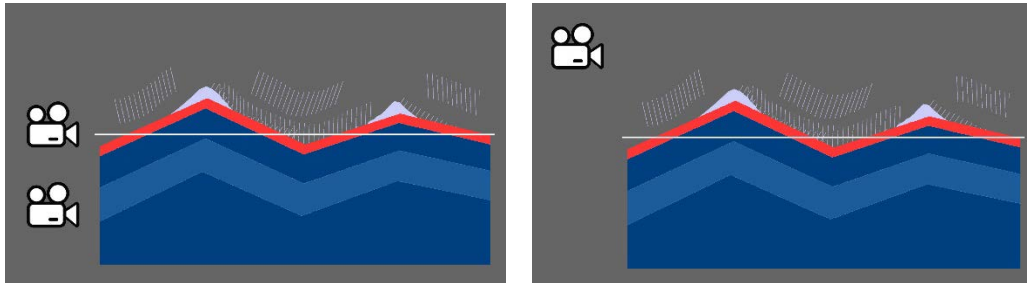


Fig. 3 Camera position diagram of side angle shot(left) and high angle shot(right).

### 3. Using Houdini to make realistic wave effects under the overlooking angle

#### 3.1. The process of making the special effect of the realistic wave under the overlooking angle

In Houdini, the process of making wave effects can be divided into nine steps, including 1. adding waves; 2. adding the motion of waves; 3. adding whitewater; 4. adding wind; 5. adding mist; 6. marine textures; 7. whitewater gridding; 8. mist textures; 9. final rendering (e.g., “Fig. 4”).

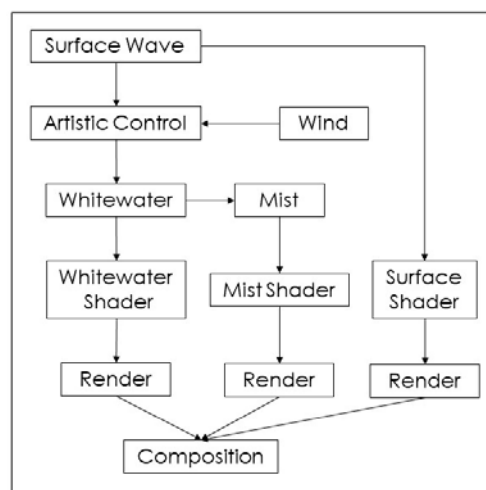


Fig. 4 The Schematic Diagram of Our Method.

#### 3.2. Innovation in production process

In the traditional process of making marine special effects, it is often necessary to make the overall depth of the marine. Due to the particularity of the overlooking angle mentioned above, it is only necessary to understand the marine as a 2D undulating plane, and not to make the marine into a 3D shape with depth, the volume of the marine model has therefore been greatly reduced.

The three-dimensional sense of the marine at the overlooking angle depends on the whitewater.

Therefore, in the experiment, the distribution and simulation of whitewater have also been studied and explored. The marine surface material is also changed to basic liquid. And change the value of the refraction color and attenuation, so that the fluid gives people the visual experience in line with the size of the water created.

In addition, in order to meet a variety of environments, such as the shoal, the ground will be exposed through fluids such as the bottom of the beach, and Fig. 5 uses simple planes and textures to simulate this visual effect.

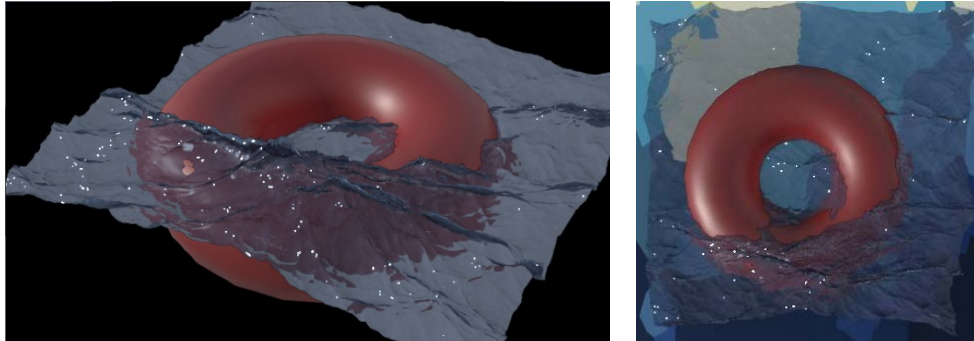


Fig. 5 The surface test result(left) and the top view(right).

#### 4. Conclusion

This paper shown the marine special effects of the overlooking angle as the starting point, and proves by the example in Houdini that the deep volume of the marine can be neglected when making the special effect of overlooking angle, a 2D plane is used to simulate the effect of the marine, and marine surface, whitewater, and mist are added to the 2D plane to create a three-dimensional sense of the marine, and the texture of marine water and mist is further enhanced by the addition of shader. Because the overhead view is a commonly used camera angle, the process proposed in this paper is practical and innovative, which can not only simplify the original process of making marine special effects, but also save the time needed for rendering, and provide a new way of thinking for the making of marine special effects. In the future research, the research and exploration of ocean special effects and game engine connection made by Houdini will be carried out, and the realistic marine effects created by Houdini will be imported into the game engine. Since the application scene of the game engine in CG industry is increasingly abundant, if the ocean special effects made by Houdini can be successfully imported into the engine, it will be a very significant supplement to the special effects board of game engine.

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## National Narrative of Chinese Animation: Monkey King vs. Little Door Gods

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### Abstract

Since the early twentieth century, Chinese animation has achieved great success by emphasizing national narration. However, with the accelerated process of reformation and globalization, Chinese animation began to imitate American and Japanese animation. With the tremendous changes in production form and content, the national narrative crisis of Chinese animation is increasingly emerging. This paper mainly compares and analyzes the national narrative forms of <Monkey King, 2015> and <Little Door Gods, 2016> from the aspects of material, theme, story line, character. It can suggest implications for improving the expression of national narrative of Chinese animation in the future.

**Keywords-***Chinese animation; National narrative; Globalization; Culture industry*

### 1. National Narrative in Chinese Animation

National narratives originated from the early twentieth Century in Chinese literature [1]. The national narrative in film and television works can be viewed as the description of material, spiritual culture, language and social organization generated from a country's historical practice [2]. The older generation of animators led by Wan Laming and Te Wei began to implement the creative policy of "exploring the road of national style", which opened the exploration of national narrative of Chinese animation. After that, "Chinese School" animation emphasized national narrative at the same time, but also has a higher production capacity, for the prosperity of Chinese animation has made contributions. The representative works of this period are <Proud General, 1956>, <Baby Tadpoles Look for Their Mother, 1961>, <Havoc in heaven, 1961-1964>, <Reed pipe, 1963>, and <Nezha Conquers The Dragon King, 1979>.

"Chinese School" animation fully utilizes the Chinese traditional culture and art (e.g. Chinese traditional opera, Chinese painting, Chinese traditional music) or folk art (e.g. shadow play, puppet show) to express the national narrative. The "Chinese School" animation is mainly created based on traditional literature, inheriting the national spirit (morality, ethics) of traditional culture and taking traditional culture as its material. But with the development of the Great Cultural Revolution, reform and opening, and the deepening of globalization, Chinese audiences have begun to contact the Richness and diversity animation films in the United States and Japan. In order to adapt to the development of market economy, many creators adopt OEM mode to process overseas animation, which weakens the inherent identity of Chinese animation.

With the advent of TV animation <Pleasant Goat and Big Big Wolf, 2005>, Chinese animation is gradually to attract the attention of the audience. But the competitiveness of the theater version animation is still lower than that of overseas animations. However, the release of <Monkey King hero is back, 2015> shows the success of Chinese animation, which has been stagnant.

### 2. Monkey King vs. Little Door Gods

We compare and analyze centred on the national narrative (material, theme, story line, character) of two

works <Monkey King Hero is Back, 2015> and <Little Door Gods, 2016> which are noteworthy in recent Chinese animation.

The <Monkey King> is directed by a new director Tian Xiaopeng [3]. It tells the story of Monkey King under the Wuxing Mountains, who was released by Jiang Liuer and rescued the people and himself with Jiang Liuer. The Director Tian Xiaopeng believed that the values in <The Pilgrimage to the West> conflict with modern audiences and are adapted with fantasy elements. The <Little Door Gods> is directed by another new director Wang Wei [4]. This work tells the story of the door god who faced the crisis of being laid off in the world of immortals. In order to prove his value, the door god released the monster 'year' and eventually destroy the 'year' with the people and find their own value. Both works are based on traditional Chinese culture and feature ethnic narratives, but the difference in box office receipts is significant (Monkey King: \$ 140 million dollars, Little Door Gods: \$11 million 500 thousand dollars.)

## 2.1. Material

The <Monkey King> is adapted from the classical masterpiece <The Pilgrimage to the West>. and <The Pilgrimage to the West> is adapted <Havoc in heaven, 1961-1964>, <Jen Monkey Subdued the Evil, 1985>, <Princess Iron Fan, 1941>. Unlike other works, Monkey King does not directly represent the original story, but creatively adapts it in the aesthetic way of modern people and makes large-scale improvements. The <Little Door Gods> is a work based on door god, which is handed down from Chinese folklore. Creation based on the folklore of the door god is an original factor. These two works are based on traditional Chinese material and focus on 'national narratives'. This point has common ground in the viewpoint of source material. But in Little Door Gods, traditional and modern cultures are described as contradictory structures of conflict, which are somewhat negative in attracting audiences.

## 2.2. Theme

In <Monkey King>, Monkey King was relieved by Jiang Liuer for the seal of 500 years. Since then, Monkey King has taken an adventure with Jiang Liuer to show the heroic aspect of saving the people. The theme of <Monkey King> fully reflects the Chinese national spirit and shows the hero of Chinese style. In China, Monkey King's heroic image has been expressed in many artistic forms, such as drama, opera, animation, TV drama, film and so on. It is naturally accepted in the long-term understanding of the Chinese nation. Therefore, the national narrative of hero theme in <monkey King> can be said to be enjoying wide popularity.

The <Little Door Gods> shows that unemployment caused by China's economic reconstruction has been introduced into the fairy world and degraded the immortals to ordinary people. Door God believes that the peace and happiness of mankind lead to a crisis of unemployment. Therefore, Door God wants to release the seal of the monster 'year' and make the world face danger and prove his value. The theme of <Little Door Gods> emphasizes the conflict between tradition and modernity, and expresses the modern meaning of folklore. However, because it contains the settings of inconsistent world outlook and values, the theme of Little Door Gods cannot be well delivered to the audience.

## 2.3. Story Line

The Story Line of <Monkey King> is mainly about Monkey King, who was detained at the foot of Mount Wuxing for 500 years and was released by Jiang Liuer. Then, they risked against the goblin and rescued the people. It emphasizes Monkey King and Jiang Liuer's brave and fearless spirit of sacrificing themselves for the comfort of the common people. The work expresses the virtues of Chinese traditional culture through the image of Monkey King as a national hero in the psychology of Chinese audiences. Monkey King and Jiang Liuer, regardless of their own safety, first rescued the people, which is a good manifestation of the spirit of collectivism in Chinese society. In addition, by describing the friendship between Jiang Liuer and his master, the virtue of respecting the old and loving the young is fully expressed.

The Story Line of Little Door Gods shows that door god relieves the monster's 'year' seal for his own personal desire and turns himself into a monster. The main character, door god, only pursues personal interests and selfishness, expresses his individualism in spite of the safety of others. Especially the plot of turning the great immortal image in Chinese traditional culture into ordinary people makes it difficult for the audience to accept. Moreover, the reasons for the occurrence of a series of incidents are not fully explained, the relevance before and after the incidents is insufficient, and the persuasion of national narrative is lacking.

## 2.4. Character

The Character designed in <Monkey King> embodies the dual characteristics of inheritance and innovation. Freed from the existing Monkey King Character design, the design is more Materialization and adult, in line with the aesthetic requirements of modern audiences, showing the image of middle-aged people. The character of the main actor shows the Chinese people's modesty and prudence, unity and friendship of the fine characteristics and the spirit of collectivism. The action and gesture of the characters get rid of the inherent theatrical formulaic performance and show the characteristics of the modern culture [5].

On the other hand, the character design in Little Door Gods shows the national elements and conforms to the aesthetic standards of modern people. However, the character personality and acting express exaggerated movements and facial expressions that are out of traditional Chinese rituals and habits. From the design style of the characters in the two works, it is deeply influenced by the American animated characters, showing the characteristics of Materialization and adult. Money king is described as a middle-aged uncle. Door God is described as a middle-aged crisis uncle, which illustrates this change.

## 3. Conclusion

Recently, the reform of Chinese animation narrative structure based on national narrative is an important topic. This paper focuses on <Monkey King> and <Little Door Gods>, which are based on Chinese traditional culture, makes a comparative analysis in terms of material, theme, story line and character. It is concluded that the two works fully utilize the national factors, especially in the selection of materials, character and scenes, space design and other aspects, which actively reflect the national narrative style. But there are still obvious differences between the two works in the way of expressing national narrative content. This implies that it is necessary for Chinese animation to innovate its narrative structure and grammar, which are different from national spirit and emotion.

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# Analysis On The Development Direction Of Chinese Animation In The Animation Market Under The New Animation Industry Chain

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## Abstract

In recent years, with the diversified development of China's animation and film industry, many excellent animation works have appeared on various platforms, including many animation works on the theme of Chinese traditional culture, which has enabled people to have a more detailed understanding of Chinese traditional culture. . This paper mainly analyzes the application of Chinese style elements in the creation of modern Chinese animation works and its role in commercial animation

**Keywords-***component;internet+; Chinese style animation; ink-wash painting*

## 1. The development of China's animation industry in recent years

Since the launch of the "Internet +" program in China in 2015, it has promoted the generation of intellectual property cluster effects, making full use of the huge influence of the network platform and the original animation IP, forming a relatively complete novel - comics - The animation industry chain unifies the consumer groups in various fields. At the same time, Tencent Animation, there is a demon, the relatively large media communication platform such as the Reading Group has also begun to sign up for popular IP for animation.

At this stage, the Chinese animation industry model is close to Japan's industrial model, but there are still some differences. The animation works that have been shown since 2015 are not only the use of Internet comics IP, but also the online novel IP. They form a viewing consumer group through lower cost investment, and then adapted into anime and film, realizing cost recovery and expansion through fan consumption, and finally forming a series of works. Or add value to derivatives. In the process of anime/manga content broadcast-fan reception-content feedback, the post-bar became a venue for fans to gather, discuss stories and re-create, similar to an animation sub-culture production organization. As shown in Table 1, the scale of Chinese animation users is increasing year by year. Based on the above situation, with the increase of the broadcasting platform, more applications of Chinese wind elements have also increased.

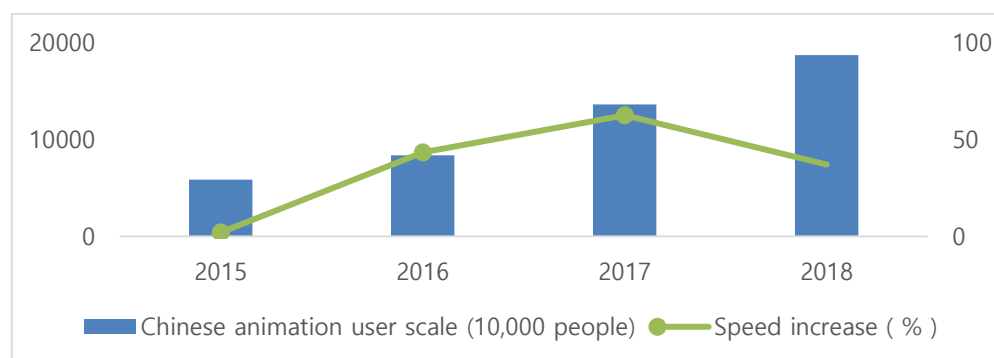


Table 1. Chinese animation user scale in 2015-2018 (Unit: 10,000 people, %)

## 2. The development and application of Chinese style elements in animation

When it comes to China, many people will think of ink and wash landscape paintings, Beijing opera, red Chinese knots, food, kung fu, etc. These elements are all transmitted to the audience through many film and television works. Similarly, Chinese animation works are also full of various Chinese elements.

In the development process of Chinese animation, the use of elements of Chinese style has never stopped, and Chinese elements such as Chinese style, art, art and humanities are integrated into the animation. From the application of paper-cut and shadow puppetry to the use of traditional opera and dance for reference, the music USES flutes, guzheng and xiao to create Chinese style. At the same time, it fully combines with the external elements, and forms a rich aesthetic artistic conception.

The popular Chinese style works in the animation works after the formation of the emerging industry chain have many themes, which are divided into two categories according to the genre: martial arts themes, Xian xia and myths.

**The theme of martial arts:** The story of animated characters is a story based on the ancient historical background. It is rooted in Chinese national culture and historical themes, and integrates Chinese history into the story. In the setting of animated stories, the martial arts theme will be more inclined to the performance of kung fu and chivalrous. Each country or nation has its own chivalrous epic and special attitude or expectation towards chivalry. This expectation continues with the continuous development of society. Transform. The animated film and television works adapted from this chivalrous epic are born with uniqueness, reflecting people's expectations for the existence of chivalrous heroes. In the history of animation, the chivalrous spirit of animated characters, with the development of the times, shows different styles. Xia culture spreads the common value proposition that is in line with the world civilization. <The Legend of Qin> interprets the essence of the literary thoughts of the philosophers in a special way. <The Bad Man of the Rivers and Lakes> shows the romantic and magnificent martial arts culture by telling the story of the rivers and lakes in the background of the Chinese Tang Dynasty. In particular, in terms of character, costumes, scenes, etc., the poetic oriental charm is highlighted.



Fig. 1 <The Legend of Qin> <The Bad Man of the Rivers and Lakes>

**Xian xia and myths:** this kind of theme is mostly adapted from Internet novel IP or comic book IP. For example, the design philosophy of <Douluo Mailand> and <Guan Hai Ce> is to pursue ink charm, and the costume modeling of characters adopts the design elements of nationalization. In terms of background music, there is a lot of selectivity of Chinese wind elements. A large number of instruments such as guzheng, chime bells, flute and pipa can show strong national characteristics and regional customs.



Fig. 2 <Douluo Mailand> <Guan Hai Ce>



### 3. The value of Chinese style elements in stylization

The Japanese and Man Man are already mature markets. They all have their own characteristics. The works created by China in these two fields are certainly better than the creators of their own country. However, in the Chinese market, if you want your work to attract readers, the author must use his own familiar culture and use the local characteristics to create the works, so that the competitiveness of the country can be spelled. As a commercial work, it must be rooted in the market and positioned in the minds of readers. This is the competitive advantage of Chinese animation in China's local characteristics.

Based on Chinese culture and oriental culture, China Wind Animation maintains its unique charm and style while adapting to the global game development trend, and incorporates the Chinese style into the animation creation. The traditional Chinese painting gives people the greatest feeling of being elegant and agile, a plausible implication. Animation is not a reference to its methods, it is more about learning how to grasp its regularity.

Whether it is < Monkey King: Hero Is Back >, < Da Hu Fa >, or < The Wind Guardians >, although the style is different on the "Chinese style" issue, the use of Chinese elements is actually quite consistent. Whether it is from the production of clothing, names, lines, sets, or the application of motion capture technology. This gives people a very long time from the paper, bringing the high-definition that domestic animation has gradually caught up on the screen.

The Chinese style is actually a generational name for Chinese cultural elements. It includes kung fu, architecture, yin and yang, and Tang costumes, poetry, and more. Just because the works produced in China are martial arts and kung fu, these elements are clearly remembered by people, but they cannot be limited to them. At the same time, it is necessary to create new Chinese style, technology, and humanities. These are actually included. It is Chinese style.



Fig. 3 < Monkey King: Hero Is Back >, < Da Hu Fa >, < The Wind Guardians >

### 4. Analysis of the development direction of Chinese style animation

At present, the biggest problem with cartoons is not making, but how to make accurate Internet marketing. For example, < Junior Jinyiwei > is a high-quality IP, not only for animation, but also for game development and comic creation. The first is the fan activity operation, the animation industry's first film-tailed small theater, offline exhibition signing activities, online fan activities, etc., in order to obtain first-hand fan feedback, improve the series; followed by word-of-mouth maintenance, and finally platform cooperation "Junior Jinyiwei" has cooperated with many video platforms, live broadcast platforms, cable TV stations and digital TV platforms, so that excellent works can reach the audience through various channels.



Fig. 4 < Junior Jinyiwei >



## 5. Conclusion

Nowadays, the animation works published through many platforms are the products of the Chinese network generation culture in the era of media fusion. Consumption is consumed by the new generation of netizens. At present, China's animation creation is at a stage of development, how to reflect the profound nationality in Chinese animation creation. Cultural heritage and distinctive features show a clear style, which is a question worth pondering. On the one hand, the work should avoid rigidity, ingest unlimited and fresh materials, and integrate and innovate; on the other hand, it must respect the uniqueness of national art, reflect the aesthetic psychology of the Chinese nation, and reflect the inner spiritual pursuit of modern people. This requires us to find the advantages and unique styles of our national traditional art elements in the process of animation creation, and create a new animation with a strong Chinese traditional art style without losing the characteristics of the times.

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# Sunlight Radiation Analysis in Urban Scenario using Layered Accumulative Shadow Map

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## Abstract

In modern architecture, duration and reachability of direct sunlight is important factor for designing buildings. However, measuring specific amount of sunlight in real environment comes with many constraints and time-consuming task. Therefore, architects use sunlight analysis modules integrated in CAD system like “Rhino 3D” or “Autodesk Revit” that simulates emitting of rays from sun to analyze amount of sunlight. Our previous work proposed another way of analyzing sunlight using accumulative shadow map, which utilize both depth shading and parallel processing features of GPU. In this paper, we also design a method to analyze sunlight duration in urban scenario that consists of high story buildings by vertically layering accumulative shadow map.

**Keywords-***sunlight radiation analysis; depth shading; parallel processing*

## 1. Introduction

As high story buildings constructed these days, blocking another building's direct sunlight frequently happens in urban areas. As a result, many lawsuits are held to protect their right to light. Hence, authorities like United Kingdom law commission has published recommendations for buildings to protect right to light [1]. Thus, to prevent shading other buildings and follow local regulations on right to light, architects use sunlight analysis systems integrated in Computer-aided design (CAD) system prior to actual construction of buildings.

Study on analyzing amount of sunlight is actively researched and developed according to [2] and [3]. They have researched about analyzing duration of sunlight by simulating sun's vector (path) and tracing emitted light of the sun onto geometry. Although we can compute these operations in a relatively short time with aid of massively parallel processing techniques, they have some limitations. Among limitations, the biggest drawback of current sunlight analyze systems is that they can conduct limited analysis on few user defined sample points or grid cell of geometry.

In this paper, we introduce our design to analyze reachability and duration of sunlight not only for user defined sample points, but also on whole geometry using layered accumulative shadow map. Moreover, we also adapt our design to analyze sunlight in urban scenarios, which consist of many high story buildings.

## 2. Accumulative Shadow Map

In this section, we will briefly introduce our previous research, accumulative shadow map. In [4], we discussed accumulative shadow map, which is effective method to analyze duration of direct sunlight of given geometry and period. We can summarize acquiring process of accumulative shadow map into

several steps. First, build depth map of whole geometry by using depth shading with single light source, Sun. Then project depth map onto bare ground of geometry. As a result, we can acquire a single image and we call this shadow map. Next, acquire other shadow maps consecutively by changing light sources' position, which is Sun's path within given period. After that, we can accumulate all shadow maps by adding each pixels' value and divide it by the number of shadow maps. Finally, we can calculate average duration of direct sunlight of given geometry  $T_s$  by (1).

$$T_{s(\text{minute})} = (\text{Average Daylight Hours}_{(\text{minute})}) \times (\text{Pixel Value}) \quad (1)$$

### 2.1. Adaption to Urban Scenario

As we introduced method on generating accumulative shadow map, we can generate "Fig. 2" which is annual accumulative shadow map for of given geometry in our scenario, "Fig. 1". As we can notice on "Fig. 1", the area we want to analyze amount of direct sunshine is dark-highlighted area. Several buildings surround this area and each building has different heights.

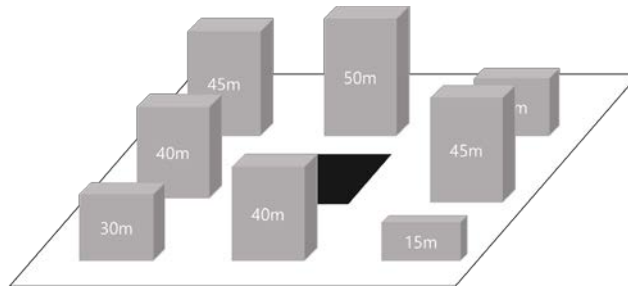


Fig. 1 Geometry of urban scenario used in this paper

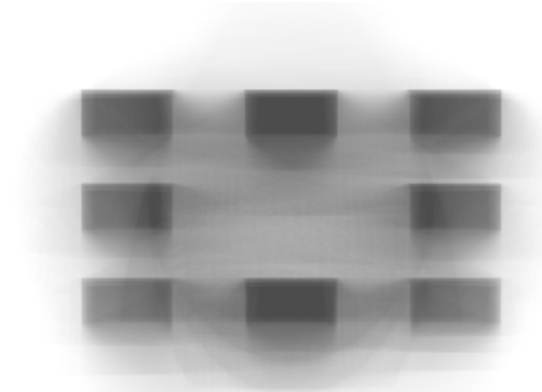


Fig. 2 Annual accumulative shadow map of the geometry

We have already analyzed dark-highlighted area's duration of direct sunlight, and the result is as shown in Table 1.

Table 1. Analysis result for an geometrical area used in our scenario

	Min.	Avg.	Max.
<b>(Pixel Value)</b>	0.600	0.607	0.631
<b><math>T_{s(\text{minutes})}</math></b>	492	498	517

As we can see in the Table 1, at most 60% of direct sunlight is reachable to the area. Since the average daylight hour of given geometry is about 13 hour and 40 minutes, we can calculate average duration of direct sunlight as 517 minutes accordingly. Note that this method assumes that there's no interference of weather conditions while creating shadow maps. It means, in real-life, reachability and duration of direct sunlight will decrease dramatically.

## 2.2. Limitation of Accumulative Shadow Map

Though we can acquire precise analysis data of the geometry in relatively short time manner using presented method, accumulative shadow map, it has a limitation to its born. The most critical limitation is, since it was originally designed to analyze effect of surroundings on bare ground by simulating occlusion of direct sunlight, it has limitation in analyze effect of it on high story buildings. That is, since the analyze data is based on a bare ground model, as we analyze data of higher story buildings, error becomes bigger. To overcome this limitation, we design yet another way of analyzing sunlight radiation analysis.

## 3. Designing Layered Accumulative Shadow Map

To overcome limitation we mentioned in last section, we introduce layered accumulative shadow map. “Fig. 3” shows our synopsis of layered accumulative shadow map. Each layer is accumulative shadow map which is projected on a same geometry with only different elevation of bare ground. We can simply define each layers’ distance  $\delta$  by dividing  $h$  by  $n$ , where  $h$  is target elevation of analysis area (or building) and  $n$  is user defined number of layers.

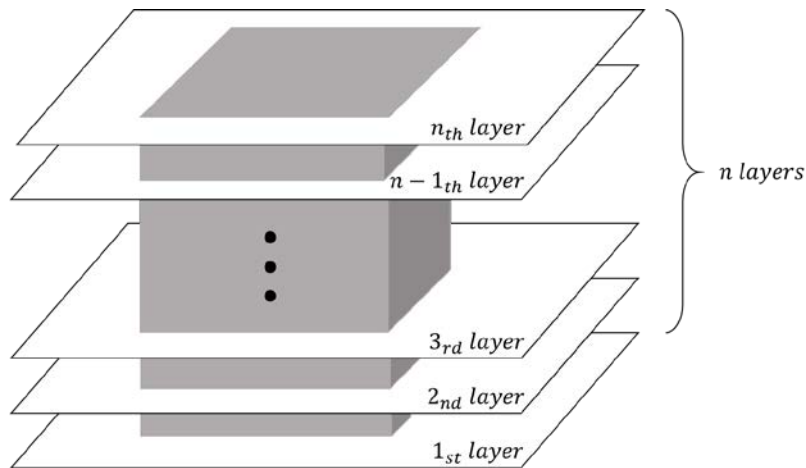


Fig. 3 Synopsis of Layered Accumulative Shadow Map

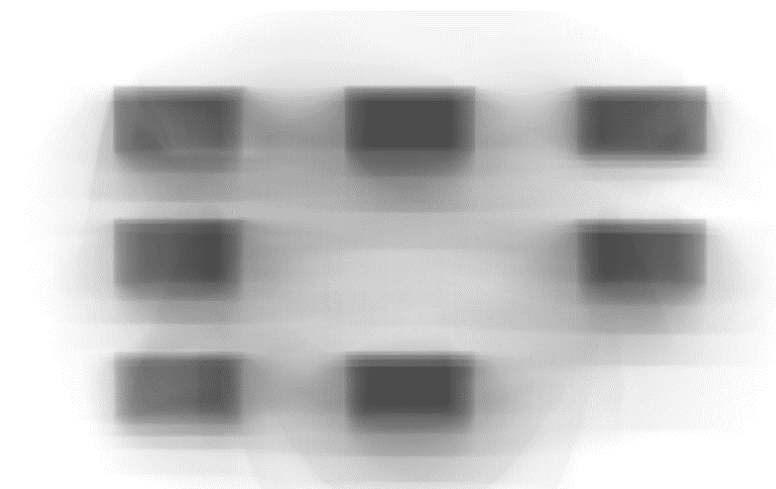


Fig. 4 5th layer of Layered accumulative shadow map for our scenario, where  $\delta = 5\text{m}$

“Fig. 4” shows. And our analyzed data for given geometric, especially for 5th layer of Layered accumulative shadow map. We can see that as layer is higher than bottom-right building, it’s effectiveness to another geometry is not represented. Analyzed data for given layer is shown in Table 2.

Table 2. Analyzed data for 5th layer of accumulative shadow map for our scenario

	Min.	Avg.	Max.
<b>(Pixel Value)</b>	0.733	0.800	0.866
<b><math>T_s</math>(minutes)</b>	601	656	710

As we can check in the table, reachability of direct sunlight to the specific area can get higher as the elevation of interested area is getting high. Hence, we can plan the area to use lower part, where reachability is lower than given time, as non-residential area like parking lots.

We analyzed single layer's data to acquire exact result, we also can analyze overall geometry's data. By accumulating each layer, we can get a final accumulated single map for our given geometry. We can analyze effect of the Sun by analyzing this final map in the same way as explained in Section. 2. Note that to acquire this final map, we need to use parallel processing to accumulate multiple layers for real time output, since as number of layer increases, reliability of overall analyzed data gets higher.

#### 4. Conclusion

In this paper, we designed effective way to analyze radiation of sunlight on given period. Our design can analyze whole geometry without sampling small area, whereas recent studies focused on analysis of few sampled points or grids. In addition, our design can be adopted to any scenarios since it is not limited to only urban scenario. Our next goal is to implement system that utilizes our design in near future and compare efficiency and effectiveness of our designed method with other well-known systems like Rhino 3D, Grasshopper 3D, or Autodesk Revit.

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# **Analysis of Success Factors of Korean Web Entertainments and Development Direction.**

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## **Abstract**

With the development of OTT (Over the Top) service business around the world, and the development of smartphones and mobile communication networks, the use of broadcasting media is shifting from TVs to smartphones. A proliferation of Snack Culture, broadcasters and MCN companies have begun to produce 'Web Entertainment', and their popularity and impact are growing. Through the success of 'Web Dramas' and export abroad cases, it is highly likely that Web Entertainment will also develop into global cultural contents. In this study, we analyze the success factors of succeeding Web Entertainment, propose the contents development method of Web Entertainment and new profit structure.

***Keywords-component; Web Entertainment; Snack Culture; success keywords; profit structure***

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## **1. Introduction**

With the popularization of smartphones around 2010, the development of LTE and the expansion of the wireless internet, many people have been able to enjoy internet access and web contents regardless of time and place [1]. As a result, people's consumption of contents began to change from TV to smartphone starting in 2016 [2]. People use their smartphones at breaks and when they are waiting for someone or when they move, so they prefer cultural content that can be enjoyed fast and short. As a result, the number of viewers increased who watch TV programs in the 3-5 minutes clip than who watch the whole video.

Snack Culture, a culture that is easily enjoyed in a short time, has emerged in response to such changes in the viewer's content consumption behavior. Broadcasters and MCN companies have begun to produce Web Entertainment for Snack Culture. Among them, <Sin Seo Yu Ki> and <Big Picture> passed 100 million hits and proved the development potential of the Web Entertainment market.

Web Entertainment is likely to grow as the center of global cultural contents because the copyrights to Korean Entertainment programs are continuously exported and OTT (over the top) service, Snack Culture are world trends. However, Web Entertainment does not have stable profit structure at present. Focusing on value-added markets such as copyrights, format export and co-production in the future, Web Entertainment should continue to be produced based on stable profit structure as well as diversity and quality improvement of contents. Therefore, this study will help early planners as references to analyze the success factors of successful Web Entertainment and propose a new profit structure to help the status of the Web Entertainment.



## 2. Previous Studies

### 2.1 The Status and Definition of The Web Entertainment

Web Entertainment is entertainment contents in which broadcast on the web about 5 to 15 minutes, not on TV. Because the primary distribution network is communication, it is not applied to broadcasting law. Therefore, unlike TV broadcasting, there are no special regulations such as a mention of a brand name, program composition time and format. So, it is possible to produce various experimental contents. In the broadcasting situation where the interaction between TV and the web is active, there is relatively no restriction to the content material, and the importance of the Web Entertainment which is easy to collect the real-time reaction data of the viewers is increasing.

### 2.2 Possibility of Development of Web Entertainment

Web contents have entered the foreign market as well as the domestic market thanks to the Korean Wave. The web drama <EXO lives next door>, starring K-pop Idol star who the center of the Korean wave, was released throughout Asia including Taiwan, China, Japan, and Thailand [3]. The web drama <Aftereffects>, starring another Idol star "Kim Dong Jun", was exported not only to Asia but also to the United States [4]. In the case of 'Korean Entertainment shows' such as <Running Man> and <Dad, where are you going?> etc., its rights sales and exports of the foreign market are actively come to. Therefore, it is highly likely that Web Entertainment which turned 'Entertainment Shows' into 'Web Content' will become the center of global cultural contents.

## 3. Main Subject

### 3.1 The Success Measure of Web Entertainment

Prior to collecting and analyzing successful Web Entertainment, we surveyed the measure of 'Korean Web Entertainment success' scale to exclude the ambiguity of language of the word 'success'. It was distributed to the community site, SNS, and messenger for a total of five days from Aug 27, 2018 to Aug 31, 2018 and conducted online. The number of respondents was 22 men (17.1%) and 106 women (82.2%).

As a result of the survey, 'a cumulative number of playbacks' was judged to be the success criterion by the highest average 5.7109. Based on the "cumulative number of playbacks" which is the success criterion that the respondents think, I selected success Web Entertainment that <Sin Seo Yu Ki> series with 121,666,895 views and <Big Picture> with 118,066,005 views [5].

### 3.2 Analysis of Successful Web Entertainment

We analyzed the department of contents and profit model of <Sin Seo Yu Ki> and <Big Picture> through in-depth interviews and literature search. First, in-depth interviews were conducted with viewers who watched Web Entertainment for content analysis. Considering that web contents users are focused on the 10th to 20th generations, I selected the interviewers who watched the <Sin Seo Yu Ki> And <Big Picture>. They were respectively able to freely express their opinions and characteristics for an hour and a half, and I filled in transcripts with interview's contents and then the items mentioned in common were derived. Duplicate words and sentences were removed from the derived items and the remaining items were classified into final keywords. As a result of the analysis, the success factors of <Sin Seo Yu Ki> were total 6 things that 'the place selection', 'entertainment element idea', 'editing ability', 'realistic', 'PD awareness', 'cast'. And as for the success factors of <Big Picture>, 4 things are derived from 'unique material', 'realistic', 'cast', and 'guest'.

According to the literature search on revenue, <Sin Seo Yu Ki> does not include CG, subtitle effect, etc., and reduces the number of production staff in order to produce with a low-budget. Revenue structure is the 30-second Internet advertising revenue in front of the program [6], and since every session is uploaded in five clips, more ad revenue is gained as page views increase. In addition, the production cost is covered through sponsorship and sales of copyright rights [7], and the possibility of direct advertising is shown in that because there is no restriction on the mention of business names.

In the case of <Big Picture>, the material itself that entertainers become a direct advertising agency in

order to cover the production cost, and they use PPL using the strength of the Web Entertainment that the brand name exposure can be done [8]. Most of the filming locations were offices, and two entertainers don't take any wage. And they cast the guest who is their acquaintances to reduce their overall production costs [9].

### 3.3 Suggestion for Continuous Success of Web Entertainment

#### 3.3.1 Contents Sector

As a result of the analysis of success factors, it can be seen that the keywords 'realistic' and 'cast' are important, and each differentiated strength can be seen as 'entertainment element idea' and 'unique material'. Differentiated content ideas are the most important thing in Web Entertainment that spring up everywhere. To this end, I propose to throw open the contents planning department such as Web Entertainment contents planner's workshop or competition etc. to give viewers the opportunity to become the planners and to get as many ideas as possible at the lowest cost. It is a method that is used in the 'Web Toon' market which is more than 1 trillion won in Snack Culture [10]. It can even absorb ideas related to OSMU (One Source Multi Use) business beyond only contents planning.

#### 3.3.2 Profit Sector

I propose that building a system that allows viewers to donate in real time through SNS. It is a thing like a 'star balloon' profit system which is being practiced on African TV by live broadcasting which can communicate vigorously, not a culture of commenting after televising the whole video. According to the results of 'Korean Web Entertainment success' survey conducted in this study, 'number of mentions in SNS' is the second highest next to 'cumulative number of playbacks.'. As such, current Web Entertainment are being uploaded as gif or clip videos on 'Facebook', 'Instagram', and so on. Using this system is simultaneously obtaining publicity and profit because the accessibility of viewers is enhanced and receiving viewer's donations.

## 4. Conclusion

Since the Snack Culture has been fully established, people have become to feel natural to click on short videos. As such, if it continues to develop, Web Entertainment will become the center of global culture contents which is accessible and enjoyable freely without time and space limitations.

The results of this study are as follows: the common success keywords are 'realistic' and 'cast', and it judged the keywords which can govern a success are 'the place selection', 'unique material', 'entertainment element idea'. And the main revenue sources of Web Entertainment are 'Internet advertising' and 'PPL', and it is important to reduce production costs. We propose to throw open the planning department in order to development of contents' materials. And in the profit structure sector, it will establish own SNS get the publicity effect and I propose thing to get profit through building a system that the viewer can donate freely at the same time.

This study has limits that there are only four people who are participated in an in-depth interview for the Web Entertainment contents analysis, and no various method of study. In the future, it will be necessary to conduct extensive research to produce various high-quality Web Entertainment contents and to provide a stable profit structure.

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# Location Estimation Algorithm of Docent Robot in Art Gallery Using Object Detection

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## Abstract

Docent robots to replace the role of a docent are being actively researched. However, existing docent robots require installation of landmarks in various places in art galleries, and are expensive because they require high-priced sensors and depth cameras. To solve these problems, this paper proposes an algorithm for detecting specific objects and recognizing the current location of the robot using a single camera instead of various sensors and depth cameras.

**Keywords-component:** *object detection, location estimation*

## 1. Introduction

The number of art gallery users is increasing with the increase of national income and improved standard of living. Consequently, the role of a docent is becoming important and the development of docent robots is increasing. However, most existing docent robots require installation of landmarks, magnetic wires, RFID tags, etc. in various places in the exhibition hall so that they can recognize their current location or a specific work of art[1-2]. This study proposes an algorithm that enables the docent robots to identify their current location through the exhibits that are already installed in the exhibition hall instead of using the conventional method.

## 2. Location Recognition Using Object Detection

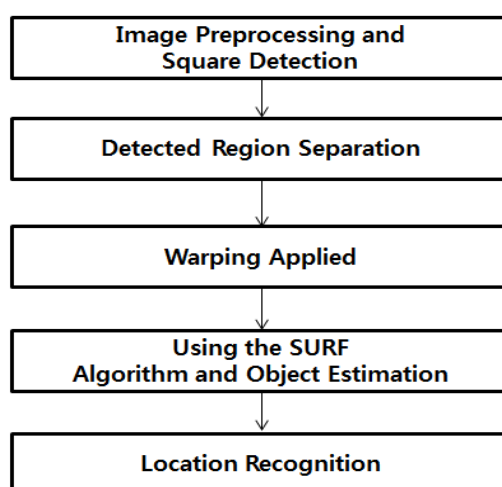


Fig. 1 Proposed Algorithm

The whole process of the algorithm proposed in this paper is shown in Fig. 1. Considering the fact that most art galleries have white backgrounds and exhibits attached to the wall, the exhibition hall environment was virtually created for experiments.

At first, the input images were converted to black and white. Then, the Gaussian filter was applied and image binarization was performed to remove noises. Considering the fact that most works of art have rectangular shapes, the outlines of objects were extracted and only the objects having four vertices were detected as works of art. Extracting information about the works of art from the entire area of images input through the camera has the problem of increasing the amount of computations. Thus, in this study, the rectangular detected areas were separated so that the SURF algorithm can be applied only within the area of the work of art. Because the cameras are mostly positioned at the bottom of the docent robots, the photographed images will be images of looking up from below. In this case, the shapes of the exhibits change and the matching accuracy of the SURF algorithm can be decreased. Therefore, the extracted objects were converted to rectangular shapes using the warping method. Because the exhibits in an art gallery have the same sizes, the sizes of the works to be detected are stored in advance and then compared with the detected rectangular area to determine the work information of the detected area by comparing it with the detected rectangular area.

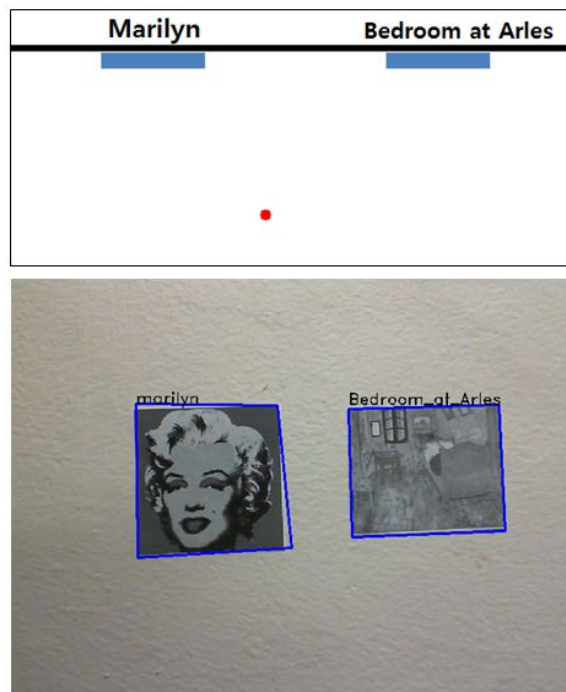


Fig. 2 Experimental Result

In this study, two images were compared using the SURF algorithm[3], which extracts strong characteristics at a high speed. The distance between the camera and the work that is being shot can be calculated by using the ratio of the size of the detected object to the size of the actual work. Using this result, the current location of the robot was marked on the existing map. Fig. 2 shows the detected object and the location of the camera at the time, marked by a dot on the map.

### 3. Conclusion

This paper proposed an algorithm for recognizing the locations of docent robots by detecting the installed exhibits as objects in order to remove the inconvenience of estimating position information through RFIDs or tags installed in the exhibition hall.

## Acknowledgment

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# Introduction to Coding Education Using an Interactive ALTINO Robot

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## Abstract

Technology has developed rapidly and is changing at the fastest pace in our society. Recently robots appear more and more frequently in our daily lives as well. It is also well-known that new interactive devices and methods will make the learning process more efficient. Those new interactive devices and methods in the learning process of programming would improve student participation and improve communication and programmable mobile robots. In addition, a new teaching method using robots can enhance the attitude to robot programming and programming concepts. In this paper, the authors reviewed the importance of coding education using interactive devices such as robots and introduced a coding robot called Altino. This paper also explained common problems that typically occur in a traditional classroom environment when teaching coding for beginners and recommended a potential solution.

**Keywords-***component; Altino; Autonomous Car; Coding Robot; Block Coding; Scratch*

## 1. Introduction

Technology has developed rapidly and is changing at the fastest pace in our society, and a new generation must learn the evolution of these technologies in order to solve many future technical problems [1]. Recently robots appear more and more frequently in our daily lives, and robotics is a very popular field. It is therefore increasingly important to introduce the basic knowledge of robots to children [2]. It is also well-known that new interactive devices and methods will make the learning process more efficient. Those new devices and methods in the learning process of programming would improve student participation and improve communication among them, and make the programming learning process more concrete, practical, and fun [3]. In addition, programmable mobile robots and a new teaching method using robots can enhance the attitude to robot programming and programming concepts [3].

Alvarez and Larranaga reported that most students have a high sense of accomplishment in programming proficiency, but lack algorithm design skills [4]. They performed two years of experimentation using the Lego robot and about 100 college students reported satisfactory results in motivation and awareness of the learning process. For many students this course is the first contact for programming issues [4]. Both students and teachers are in a difficult process with high failure rates and dropout rates and there are a significant number of repeat students. Generally, students believe that this programming course will be very difficult [4].

Alvarez and Larranaga found that nearly 100% of new students want to learn programming using robots. 62% of students wanted to use robots in more classes or other courses, and 70% wanted to use robots after school [4]. Seventy percent of students found that using robots would help increase their knowledge, and 65% of students answered that using robots has helped them understand the condition statements. When students use robots, the course becomes more interesting and exciting, and they want to

study programming using robots after school [4].

## 2. Configuration of Altino Robot

The driving unit of the Altino robot is composed of one steering motor and two rear wheels. The display unit includes two front lights, two rear lights, two leftward lights, two rightward lights, two brakes, an 8x8 Dot-matrix, and a buzzer. The sensor is composed of 6 sets of Infrared (IR) sensors for detecting obstacles (front: 3 sets / rear: 1 set / side: 1 set), steering control variable resistance, 3 axis acceleration sensor, 3 axis geomagnetic sensor, 3 axis gyro sensor, ambient light sensor, remote control receiver, battery detection sensor, two rear motor torque sensors, and one steering motor torque sensor. A detailed product features including sensors and modules are shown in Figure 1.

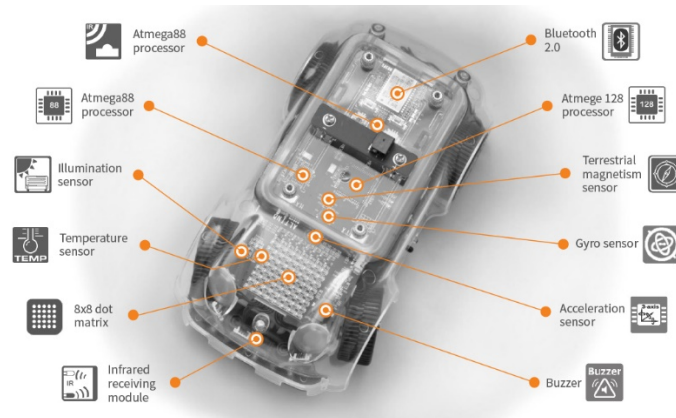


Fig. 1 Altino Product Features: Sensors and Modules

## 3. Early Coding Education Using an Altino Robot

### 3.1. Altino Orchestra App: Remote Controller

The user need to download an application named “Orchestra” from App stores. There are three options included in the Orchestra App. One of the options focuses on a remote control function. The users can use this app that can steer the robot. This app has a feature used in automobiles and allows you to experience auto light on, side alarm, ABS, UDC, emergency braking, emergency light, and cruise control.

The user can experience various functions used in control and automobiles directly using the app even before the user starts learning software coding. Later, the user can learn how to control the Altino robot using software languages such as Scratch, Android, Python, C language, etc. This will make the learners instill confidence that they can perform the same job using software languages without a remote control app. The graphic user interface of the app is structured as shown in Figure 2.



Fig. 2 Remote Control App for Altino

### 3.2. Altino Orchestra App: Block Coding “Crayon”

Another option included in the Orchestra App focuses on learning block coding. Through these Apps that can be used in preschool to elementary grades, the user can understand the sequential concept of the program. It is programmable with one second intervals, and can control speed, steering direction, sound, light, and 8x8 dot matrix. The faster the speed, the longer the distance traveled for 1 second, and the slower the speed, the shorter the distance. Various problem solving missions such as return destination using sequential processing only and L-shaped passage mission can be performed. A screenshot of Crayon User Interface of Altino Block Coding App is shown in Figure 3.

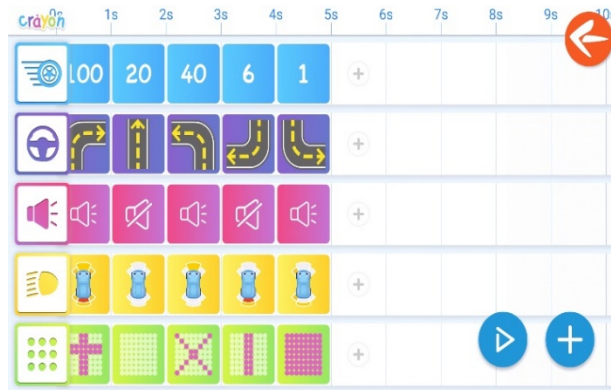


Fig. 3 Screenshot of Altino Block Coding App Crayon User Interface

### 3.3. Altino Orchestra App: Scratch Block Coding

Scratch block coding is also included in the Orchestra App. Using Scratch block coding, the user can control the Altino robot and make it drive autonomously. Programing languages that are typically learned on PCs can be easily learned using Altino robots with fun. By using blocks that can control Altino in Scratch, users can enjoy the scratch program while moving Altino. The blocks used in Scratch are made identical to the function names used in the C language so that students can easily access the C language. A screenshot of Scratch block coding user interface is show in Figure 4.

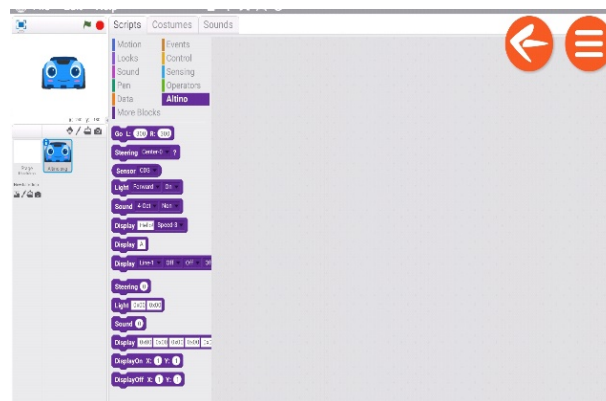


Fig. 4 Screenshot of Altino Robot Scratch Block Coding User Interface

#### 4. Coding Education: Traditional vs. Interactive Coding Robot

In the previous section, tools for early coding education using Altino coding robot is introduced. However, Altino robot can also be used for intermediate and advanced level programming users. Altino C language programming is designed for providing an interest and fun by demonstrating the movement of the

coding robot while the students are learning the C language program. Through the functions of Altino robot such as Go, Steering, Sound, Light, Display, DisplayLine, Displayon, Displayoff, and Sensor, you can learn the C language and make the function a header file so that students can make modifications. In addition, image processing education can be done using Python, Android app programming, Arduino scratches, or Raspberry Pie.

#### 4.1. Traditional Coding Education

Traditionally, software engineers have learned coding in college using the traditional method of coding education such as a large classroom environment and the lack of personalized feedback. They also hardly used any type of interactive mobile devices helping them understand how the programming commands work with the tangible devices. However, in these days, young generations are generally so good at dealing with high-tech mobile devices and continuously exposed to new technologies day after day. Those young generations will frequently get bored in the traditional classroom environment teach coding without using and tangible devices which can interact with what they are learning in class.

Based on the author's experiences in the classroom methods of teaching programming languages, the traditional teaching method without using hands-on devices frequently failed to maintain the student's attention and enhance their learning in both Korea and the United States.

While taking a computer science course teaching Java and Python in high school in the United States, it was found that some students were dozing off during class. Sometimes, the students were discouraged by the difficult homework problems. Students reported that they felt that these problems weren't applicable to real life and they were more like brain puzzles meant to trick them. This led to a disinterest in the class and some students soon found it to be one of their hardest classes. In this situation, students will ultimately be left with the feeling that they have no desire to continue studying programming languages.

#### 4.2. Coding Education with an Interactive Robot Altino

On the other hand, using an interactive coding robot such as Altino is extremely helpful for the students who got easily bored in the traditional classroom environment. For example, students who had the opportunity to learn coding using the Altino, an educational robot focused on taking a fun approach to coding immediately found the experience coding with the robot to be entertaining as they could see the tangible results of their work.

It was also easier for them to correct their mistakes since they could observe the functions of the robot car and in doing so, figure out what was wrong with their approach. Even though they still found coding to be difficult and had moments where they were frustrated with some of the challenging missions, they frequently felt more willing to come back and tackle the problem the next day.

In conclusion, the Altino is an effective coding education tool because it provides people with an entertaining, hands on coding experience. In contrast with the traditional school curriculum, students frequently felt more engaged using the Altino and felt that it was easier to self-study coding. Furthermore, there is always room to grow and implement more advanced programs as the robot car has numerous functions that can be used in various different ways.

### 5. Conclusions and Future Work

From various literatures, robots are an important part for teaching software. It may be a hard task to select which one to use for what purposes. In this perspective, Altino is a well recommended coding robot for various purposes and various learners such as from preschool to college students. Frequently, students express their difficulty in learning programming languages. However, utilizing the Altino robot in the programming language curriculum, students can learn the programming languages with more interest and fun.

We will conduct case studies and surveys on students in future studies. In the case study, the authors will divide students into two groups and compare the differences between the performances of the

students. For one group, the students will be taught a programming language using block coding and the other group learns the programming language in a traditional way to quantify the effectiveness of robot-based coding training and gain useful information in a new software education system.

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# Initiating Global Service Learning Movement: A Best Practice of Petra Christian University<sup>1</sup>

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## 1. Introduction

The era of Industry 4.0 has already been started. There are some keys of technologies that play important roles in this era such as Internet of Things (IoT), Big Data, Artificial Intelligence (AI), Robotics, etc. In business, the investment in Industry 4.0 is predicted to reach one trillion USD in 2020. Revenue and cost reduction are increased annually more than 400 billion USD. Disruptive innovation happened in all fields of life as a part of digitalization by means that the disruptive innovation is any constructive change of creating a new way in replacing the previous approach for improvement.

As an impact of disruptive innovation, by 2022, 9 percent of youth would be deployed in new jobs that do not exist today; 37 percent would be deployed in jobs that have radically changed skill sets (Leapfrogging to Education 4.0: Student at the core, November 2017). Report published by Dell Technologies on 12 July 2017, based on research led by the institute for the future mentions that 85 percent of jobs in 2030 have not been invented yet. The pace of change will be so rapid that people will learn “in-the-moment” using new technologies. The ability to gain new knowledge will be more valuable than the knowledge itself. Here, the ability to gain new knowledge may be considered as knowledge about knowledge, known as meta knowledge. Therefore, one of the most important purpose of education is more on the enhancement and enrichment of the meta knowledge than merely on the knowledge achievement. Through the enrichment of the meta knowledge, one may have ability to learn a new knowledge faster.

It is well known that disruptive innovation is mainly triggered by digital technology and internet. In education, it would be happened that online educational resources will cause traditional colleges and universities to close. As mentioned by Clayton Christensen, Professor of Harvard Business School, the author of “The Innovator’s Dilemma” and “Innovative University”, 50 percent of the 4,000 colleges and universities in the U.S. will be bankrupt in 10 to 15 years. It is because the online education will become a more cost-effective way for students to receive an education, effectively undermining the business models of traditional institutions and running them out of business. The education institution must realize that we are now entering the Education 4.0 as mainly characterized by Learner-centered Learning, Personalized Learning, Complete Flexibility, Adaptive Assessment, AI Building upon Learning Analytics, Andragogy, Heutagogy and Paragogy (Leapfrogging to Education 4.0: Student at the core, November 2017).

All the characteristics are generally talking about the methodologies of learning which is supported by the development of digital technologies and internet as a result of Industry 4.0. However, the sixteen 21<sup>st</sup> Century Learning Skills and Competencies as adapted from World Economic Forum ([www.weforum.org](http://www.weforum.org)) are not only to improve the cognitive skill, but also emotional skill, spiritual skill, cultural skill, moral skill, etc. Therefore, it is necessary to apply the concept of whole person education in obtaining the sixteen 21<sup>st</sup> Century Learning Skills and Competencies. Here, the whole person education could not only be realized by the online learning, but also offline learning (face to face and social interaction), especially when we are talking about how to improve emotional, spiritual, cultural and moral skills. Moreover, in the process of education, the students actually need struggle of life for strengthening their perseverance.

<sup>1</sup> This paper is an extended draft of the manuscript that has been presented and published in the bulletin of Asian University Presidents Forum 2018



## 2. A Best Practice of Petra Christian University

Petra Christian University (PCU) is a private Christian university established in September 22<sup>nd</sup>, 1961. Tracing back its history when there was a significant necessity in providing higher education opportunity and service in Surabaya, especially for Christian and Chinese-Indonesian people; PCU was initiated to fulfill the needs. As a population of academic community, up to present the majority of PCU student body is Chinese-Indonesian descendants with middle-level economic family background.

Through its vision “*To be a Caring and Global University with Commitment to the Christian Values*”, PCU enhances its concern and commitment in applying the “whole person education” or “holistic education” to equip the students with at least five excellences (academic excellence, emotional excellence, moral excellence, spiritual excellence and cultural excellence). Hence, the mind, heart, spirit and cultural engagement are blended nicely within their learning process in the university to prepare their roles successfully in global era as global citizens. PCU, then, learns that Service-Learning (S-L) program is one of the most effective and powerful concepts as well as learning methods in order to achieve the holistic education objective. In the program, the students as participants obtain opportunity not only to mingle amongst the rural society, but also to purposely support the society life by sharing their expertise, involving their emotion in building relationship and communication, and earning personal reflection and commitment to continue the caring spirit toward others.

## 3. Supporting Units and Policies

The Service Learning (S-L) program in PCU is designed structurally and practically among all departments. Currently, this Program is established under the integrated cooperation of two academic entities:

- *Center of Community Service*, this center is the Project Organizer who conducts the field survey, builds relationship with the targeted society to elaborate their needs and correlates the field needs with the blueprint of SL program;
- *Faculty and Department*, this entity supports the SL program by reviewing the academic curriculum and courses’ contents which in-line with the SL concept.

In the future, it is necessary to establish one more supporting unit, called *Excellent Learning and Teaching Center*, as the “think-tank” that designs the learning and teaching methods on how to effectively implement S-L concept in pedagogical perspective.

In general, there are two types of S-L Program based on the fields of study. First, *mono-discipline* S-L program is an S-L program which particularly related to a certain course of department. In this S-L course, students learn how to serve community using the skill/ competency obtained from the specific course. Each study program or department is obligatory required to provide at least one course which applies the S-L concept. Currently, there are 45 mandatory courses provided in all departments of PCU. Table 1 shows some examples of course provided by a certain department that related to the mono-discipline S-L program.

Tabel 1. Some S-L courses provided by department at PCU

Departments	Service Learning Courses
Architecture	<ul style="list-style-type: none"> <li>• Architecture for Children</li> <li>• Inclusive Design</li> </ul>
Visual Communication Design	<ul style="list-style-type: none"> <li>• Packaging Design</li> <li>• Destination Branding</li> </ul>
Hotel Management	<ul style="list-style-type: none"> <li>• Introduction to F &amp; B Service</li> <li>• Introduction to Pastry Bakery</li> </ul>
Interior Design	<ul style="list-style-type: none"> <li>• Interior Design 2</li> <li>• Creativepreneurship</li> </ul>
Electrical Engineering	<ul style="list-style-type: none"> <li>• System Energy Management</li> </ul>
Communication Science	<ul style="list-style-type: none"> <li>• Interpersonal Communication</li> </ul>

Second, *multi-discipline* S-L program is an S-L program organized by faculty or university. As the S-L programs provided by faculty or university, the participants of the program are the inter-discipline students who come from various departments. Multi-discipline participants are a potential demography to conduct the inter-discipline S-L program as they will apply various expertise to support the field needs in larger aspects (not only infrastructure or physical support, but also community soft-skills enrichment in education, basic/ personal hygiene, small economic enterprises and other practical skills).

Nevertheless, students and lectures are often reluctant to participate in S-L class due to the big efforts and extra loads for running the S-L class. Therefore, it is necessary to encourage the lecturers for utilizing S-L method in their class and to appreciate those lecturers who are willing to be the coordinator of an S-L class. Similarly, an encouraging policy or regulation is necessary to motivate students to take at least one S-L class as a requirement of graduation.

#### 4. Successful Stories of Mono-discipline S-L

In the relation to *Packaging Design* S-L class, students of *Communication Visual Design* helped Micro-Small Enterprises in designing the packaging of their products to increase sales. Figure 1 shows students and villagers are in discussion how to design packaging for products manufactured by the villagers in Kediri Regency.



Figure 1. Discussion between students and villagers in Kediri Regency

One of the most outstanding results was a design of honey product by the students of Packaging Design class (batch of 2009) as seen in Figure 2. Along with remarkable sales increase of the product, the design was awarded the **1<sup>st</sup> winner Pack 2i Academy Design Award for Herbal Category** in 2009, and **Packaging Excellence Asia Star 2009** for student's category.



Figure2. Design of honey product packaging

Before starting to serve community through S-L class, students are required to prepare not only their skills/ knowledge, but also their heart (feeling); so they could serve the community eagerly. For instance, the S-L class of “*Architecture for Children*” as seen in Figure 3 prior to their project to design some facilities of a Junior High School for blind children. The Architecture students were given the experience of being blind people to improve their empathy and appreciation in order to understand the significance of their design in helping the blind children.



Figure 3. Given the experience as blind people

Another example is shown in Figure 4. In order to support the program of Surabaya city in rehabilitating ex-prostitution area – known as “Dolly”- to be a green and healthy residency, the students of Civil Engineering Department did a project of the healthy coloring village within clean and health characteristic in urban village through S-L class “*Environment Science*”.



Figure 4. Rehabilitating ex-prostitution area in Surabaya

## 5. Successful Stories of Multi-discipline S-L

Besides the mono-discipline service learning program integrated in particular classes of each department, PCU also organized an international multi-discipline S-L Program known as *Community Outreach Program* (COP). Accordingly, COP might be considered as an embodiment of PCU vision: “*To be a Caring and Global University with Commitment to Christian Values*”. Historically, COP is a pilot project of international multi-discipline S-L program commenced in 1996 under the partnership with

Dongseo University, Busan, South Korea. During 4 weeks of COP with a tag line “*Making the world a better place*”, students from different countries, cultures and backgrounds stay and work together with villagers to cultivate a fertile learning experience in serving and empowering the community. At least, there are four essential points that students can beneficially learn from their participation in COP:

- Multi-cultural Understanding and Wisdom
- Inter-religious Dialog and Understanding
- Inter-disciplinary Approach and Team Work
- Peace Building Issues

Up to the celebrating the 20<sup>th</sup> anniversary of COP in 2016, COP has noted in total remarkable participation of 2684 students coming from 21 universities and 12 different countries. Amongst them are 1594 international students and 1090 PCU's students. List of partner universities of COP is given in Table 2.

Table 2. Lists of COP Partners

No.	University	Country	Year of Join
1	Petra Christian University	Indonesia	1996
2	Dongseo University	Korea	1996
3	InHolland University	The Netherlands	1999
4	Hong Kong Baptist University	Hong Kong	2002
5	International Christian University	Japan	2004
6	St. Andrew University	Japan	2005
7	Chung Chi College (China University of Hong Kong)	Hong Kong	2006
8	Polytechnic University of Hong Kong	Hong Kong	2006
9	Soochow University	Taiwan	2007
10	Lady Doak University	India	2009
11	Guang Xi Normal University	China	2013
12	Guang Xi University in Science and Technology	China	2013
13	Lingnan University	Hong Kong	2013
14	Widya Mandira University	Indonesia	2013
15	Fu Jen Catholic University	Taiwan	2014
16	University of Newcastle	Australia	2014
17	Hong Kong University of Science and Technology	Hong Kong	2015
18	Hong Kong Institute of Education	Hong Kong	2015
19	Dallas Baptist University	USA	2015
20	Coventry University	United Kingdom	2016
21	Singapore University of Social Science	Singapore	2016

As the results, there are three primary outputs of COP. First, students gain *personal enrichments*, hard skills and soft skills. Students have the opportunity to directly implement their knowledge and hard skills to understand the community needs and to overcome the challenges. They also have personal character development by learning to understand and to work together as a team with participants from diverse cultural backgrounds. Second, the relevant needs of the villagers on *physical development*; such as infrastructure support, school rehabilitation, water piping and filtering, are substantially answered. Last, the quality life of community is enhanced through *community empowerment* on health care and children education.

## 6. Summary and Future Challenges

As a summary, S-L program may be started as a domestic S-L that means domestic students serve their local community. However, the cultural challenge of domestic S-L lies in the gap of life style and level of education between students and villagers. Thus, to improve cultural understanding in global perspective, domestic S-L may be extended to international S-L by inviting international students, as a team who stays and works together in serving local community. In the perspective of PCU students, COP is a good example of the growing initiative of global S-L movement in serving local community.



As a future challenge, PCU would like to propose COP as the best practice of an international multi-discipline S-L program to be imitated and organized by international partner institutions in serving their community. COP is one of the inspiring momentum which necessarily followed up with larger international partnerships to initiate the global movement. It will provide opportunity for PCU students to have international experience in collaborating and serving international community. Therefore, there are milestones to initiate the global movement as shown in Figure 5.



Figure 5. Steps of S-L to initiate global movement

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# Research on the Problems and Measures of the Construction of "Double-Qualified" Faculty in Independent Colleges

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## Abstract

The "double-qualified" faculty is an important guarantee and strategy for independent colleges to build applied universities and cultivate advanced applied talents. The core characteristics of "double-quality" teachers are reflected in their dual abilities and qualities. In the process of transforming and upgrading the ability of teachers in independent colleges, there are some problems, such as the "dual" differentiation of the capacity structure of teachers, the low practical ability of full-time teachers, and the lack of institutional guarantee for the transformation. This paper suggests that independent colleges should flexibly employ diversified teachers, cultivate full-time teachers' transformation, mold "school-enterprise cooperation community" to realize "faculty education" for both sides, and build a security framework for "double-qualified" teacher development system.

**Keywords-***"Double-Qualified" Faculty; Independent College; Application-Oriented University Construction; Cooperation Between Colleges and Enterprises*

## 1. Introduction

In October 2015, the Ministry of Education, the National Development and Reform Commission and the Ministry of Finance jointly issued the Guiding Opinions on Guiding Some Local General Undergraduate Universities to Transform into Applied-oriented Universities, which clearly puts forward "Promoting the transforming universities to transfer the idea of running schools into serving local economic and social development and to transfer into cultivating applied-oriented talents". As a young local undergraduate college, in order to meet the needs of economic and social development, the independent college establishes the orientation of the construction of application-oriented Colleges and universities. It is not only the need of structural adjustment of higher education in China from the "national perspective", but also the only way to return to the beginning and seek for characteristics development. At the National Education Conference in September this year, great importance was attached to the construction of the teaching faculty, which was regarded as the most important basic work. Teachers were regarded as the first resource for the development of education. "Double-qualified" teaching staff is an important guarantee for independent colleges to build application oriented universities and train advanced applied talents. However, at present, the pace of the construction of "double-qualified" teachers lags far behind the needs of the construction and development of independent colleges, which has become one of the main problems restricting the transformation and development of independent colleges.

## 2. The Core Elements and Logic of the Construction of "Double-Qualified" Faculty in Independent Colleges

Since the 90s of last century, the discussion of concept of "double qualified" faculty has never been interrupted. However, there are different opinions on this concept in the expression of educational administrative departments in policy documents, the discussion of academic circles, and the understanding of universities in practice, and yet, no unified understanding has been formed. The



absence of national standards and the difference standards between colleges make the logical starting point of the research on the theory and policy of "double-qualified" faculty unclear, which affects the practice of the construction of "double-qualified" faculty.

### **2.1. Competence and Quality: the Core Elements of "Double-Qualified" Faculty**

As for "double-qualified" faculty, there are many expressions, such as "double certificate theory", "double Title theory", "double identity theory", "double quality theory" and "double source theory", which can be basically divided into the following categories:

Firstly, from the perspective of explicit characteristics, it has the rigid requirement of "double qualifications", or both academic certificates and technical grade certificates, or dual titles of academic series and technical series. This understanding is usually adopted in the practice of identifying the qualifications of "double-qualified" faculty in independent colleges. Its definition is clear and easy to implement. But the definition ignores the common problems in reality: sometimes the qualifications and competencies are not matched and unequal.

Secondly, from the perspective of internal characteristics, individuals should have dual abilities and qualities, which have different applications in different contexts. For example, professional knowledge and skills are required in the professional field, theoretical teaching ability and practical teaching ability are required in the teaching field, and theoretical research ability and practical application ability are required in the research field. Wang Yicheng, who first put forward the concept of "double-qualified" faculty, defined the "teacher&engineer" model, focusing on the improvement of teachers' competence and quality. Ye Xiaoming considered that "Double-qualified" should be the individual standard of teachers, which emphasizes skills and ability. Although this point of view grasps the essential characteristics of "double-qualified" faculty, it is difficult to measure and define them with clear quantitative criteria in practice.

Thirdly, from the point of view of the source structure, if a college's teaching team has its own teaching and research teachers, as well as senior technical talents from enterprises and institutions, it can also be defined that the college has its own "double-qualified" faculty. This viewpoint pays attention to the structure of the faculty and does not emphasize the comprehensive ability of the individual teachers. It is a realistic reflect of the construction of the "double-qualified" faculty in independent colleges at the primary period.

Fourthly, from a comprehensive perspective, some people think that "double-qualified" faculty should have both "double qualifications" and "double certificates"; others think that for the "double-qualified" teachers team, there should be "double sources", and for individual, one should have "double-quality ability". There are differences between the above views because of different perspectives, lack of unified standards or evaluation indicators, and no one can fully explain the connotation and extension of "double-qualified" faculty, whose concepts still need to be further scientific and systematic.

To sum up, the definition of "double-qualified" faculty in this paper refers to teachers with dual abilities and qualities, which means, individual teachers not only have systematic and solid professional theoretical knowledge and higher level of teaching skills, but also have rich practical experience and noble professional accomplishment; they are not only competent for theoretical teaching, but also for practical teaching. Based on the preconception that the ability and quality of individual internalization are more important for talents cultivation, this paper does not include "double certificates" or "double professional titles" in the identification. This paper argues that such a definition is more in line with the current situation and development of the construction of "double-qualified" faculty in independent colleges.

### **2.2. Application-Oriented Construction: the Logical Start for the Construction of "Double-Qualified" Faculty**

Although the concept of "double-qualified" faculty is not clear and mostly used in the context of vocational education, the construction of "double-qualified" faculty is an inevitable choice for the construction of teachers in Independent Colleges in the internal and external background. From the external context, it is needed for independent colleges in the construction of application-oriented universities and the cultivation of applied-oriented talents. According to statistics, there are 265 independent colleges in China until May 31, 2017, accounting for about 9.08% of the national institutions

of higher education. After nearly 20 years of development, the number of independent colleges has been basically stable, but if we want to continue to develop, we must find a correct position, highlight the characteristics and compete differently. At the local level, more than 20 provinces (districts and municipalities) including Zhejiang, Guangdong, Henan, Liaoning, Jilin and Yunnan have issued documents to guide the transformation of some general undergraduate colleges and universities into application-oriented ones. More than 300 applied-oriented undergraduate Colleges and universities have been selected nationwide to carry out transformation reform pilot projects. Some of the independent colleges are among the pilot reforms, such as Zhijiang College of Zhejiang University of Technology, Dongfang College of Zhejiang University of Finance and Economics, Bowen College of Lanzhou Jiaotong University and College of Technology and Engineering of Lanzhou University of Technology in Gansu Province. Application-oriented transformation and cultivation of applied talents have become the general consensus of the development direction of independent colleges. However, how to transform and how to cultivate applied talents are the complicated problems, in which the transformation of teachers' ability and quality is the foundation.

In fact, the orientation of running independent colleges and training talents has always focused on adapting to local economic and social development. Taking Zhejiang Province as an example, from the analysis of talent cultivation orientation of 21 independent colleges in Zhejiang Province (see Table 1), it is easy to find that all independent colleges have clearly put forward the aim of cultivation of applied-oriented talents. It can be seen that, unlike other academic undergraduate universities in training academic talents and higher vocational colleges in training technical and skilled talents, the orientation of applied undergraduate talents training is to highlight the advantages, which is the only way to survive from competition, while the construction of "double-qualified" faculty is an effective aspect.

From the internal environment, the construction of "double-qualified" teachers is a breakthrough in the connotation development of independent colleges. Under the background of deepening supply-side reform, independent colleges can achieve sustainable development only by continuously improving their connotation and quality, and the "soft rib" of "double-qualified" teachers has become a bottleneck problem to be solved urgently. At present, the structure of knowledge, ability and quality of most teachers in independent colleges are still in the discrete stage, which has not reached the level of integration and practicality. Under the inertial thinking of traditional subject teaching, the teaching of "integration of theory and practice" is a challenge for teachers, and the theoretical teaching and practical guidance for students are pale and weak. The improvement of competence and quality is even more impossible. The independent colleges are advocated to train advanced applied talents to meet the needs of economic and social development, and to improve students' technical application ability and innovative practical ability.

**Table 1.** The orientation of talent training in independent colleges Zhejiang Province

Name of independent college	Orientation of talent training	Location	Founding time(year)
City College of Zhejiang University	High-quality applied, compound and innovative talents with a sense of social responsibility and a strong capacity of social, political and economic construction, an international perspective and ability to participate in international competitiveness	Hangzhou	1999
Ningbo Institute of Technology, Zhejiang University	High quality "application oriented, compound and export-oriented" talents of innovation and entrepreneurship	Ningbo	2001
Tongji Zhejiang College	Advanced talents with reasonable knowledge structure, applied, innovative and practical abilities.	Jiaxing	2008
Shanghai University of Finance and Economics Zhejiang College	High quality applied talents in finance and economics	Jinhua	2008

Zhijiang College of Zhejiang University of Technology	A senior practical person who can work, learn, and live well	Shaoxing	1999
Xingzhi College of Zhejiang Normal University	High quality undergraduate applied talents with solid foundation, thick literacy, fine skills, strong ability and good innovation.	Jinhua	1999
College of Science&Technology Ningbo University	Applied undergraduate talents with strong self-learning ability and strong practical ability	Ningbo	1999
Hangzhou Dianzi University Information Engineering School	High level comprehensive vocational technical talents suitable for the development needs of industrial enterprises	Hangzhou	1999
Keyi College of Zhejiang Sci-tech University	The Comprehensively developed talents with both theoretical basis and practical ability, which meets the needs of local economic and social development	Hangzhou	2000
Zhejiang Gongshang University Hangzhou College of Commerce	High-quality applied undergraduate talents with comprehensively development talents	Hangzhou	1999
Zhengjiang Ocean University Donghai Science&Technology College	Applied talents with high comprehensive quality, strong practical ability and sufficient development potential	Zhoushan	2000
Jiyang College of Zhejiang A&F University	Applied entrepreneurial talents with coordinated development of knowledge, ability and quality	Shaoxing	2000
Wenzhou Medical University Renji College	A combination of applied talents meeting the needs of economic and social development, meeting the needs of the industry and post competency	Wenzhou	1999
Binjiang College of Zhejiang Chinese Medical University	Applied talents with innovative spirit and practical ability, strong adaptability and wide selection of jobs.	Hangzhou	2000
Hangzhou Normal University Qianjiang College	Applied talents with abundant foundation and strong ability	Hangzhou	1999
Qiuzhen College of Huzhou Teachers College	High quality applied talents with innovative spirit and practical ability	Huzhou	1999
Shaoxing University Yuanpei College	Advanced applied talents with strong sense of innovation, practical ability and social adaptability	Shaoxing	2000
Wenzhou University Oujiang College	High level applied technology talents	Wenzhou	2000
Jiaxing University Nanhu College	High quality applied specialized talents meeting the needs of social development	Jiaxing	2003
China Jiliang University College of Modern Science&Technology	Qualified talents in line with the requirements of Zhejiang's economic transformation and upgrading under the new normal	Hangzhou	1999
Zhejiang University of Finance and Economics Dongfang College	High-quality applied technical talents with innovative spirit and practical ability for local economic and social development	Haining	1999

### **3. Major problems in the construction of the "double-qualified" faculty in independent colleges.**

Competencies is the core of "double-qualified" teaching staff. Nevertheless, the currently competencies structure of "double-qualified" faculty in independent colleges shows "dual" division that the individual teachers' competence quality appears low practicality. From the perspective of teachers' professional development, it is urgent to strengthen the institutional guarantee system to support teachers to improve their competence quality and complete the transformation.

#### **3.1. "Dual" division of teachers' ability and quality structure**

On the whole, the teaching staff of independent colleges presents a structure of "dual" division, therefore, the competencies quality of the teaching staff seems to be "dualistic" differentiation generally. On one hand, full-time teachers of independent colleges, graduating of master's and doctor's degree from mother colleges and universities, mostly, have solid academic skills, but limited working experience and practical skills. Hence, it is highly possible for them to encounter the difficulties of "passive water, rootless wood". Besides, they lack the foundation and motive force of serving regional economy. On the other hand, introducing senior managers or technical backbone of enterprises and institutions, which has abundant working experience and practical skills, as part-time teachers, indeed infuse new blood into teaching activities. However, due to the weak theoretical basis, relatively limited teaching ability, and heavy work tasks, the introduced talents could hardly have a deep impact on students. The situation of complementary cooperation between full-time teachers and part-time ones has not been formed. For example, In 2018, A independent college has nearly 400 full-time teachers, while part-time teachers were less than 50. Such a polarized "dual" teaching team can not meet the requirements of the constructing independent colleges and training applied talents. In the teaching staff of independent colleges, the competencies and quality of this two kinds of faculty, which influence students through teaching activities, show a "dual polarization" state of theorizing and practising. It is obvious that theorization occupies the upper hand.

The reason lies in the "hereditary genes" of host universities. Considering many factors such as teacher qualification certificate, high education level, high professional title leads to the inflexibility of independent college's policies and institutional mechanisms. Unlike other private colleges and universities, It is difficult for independent college to introduction "double-qualified" teachers without relaxing the employment system or promoting the internal competition mechanism. Based on the teaching tasks of semester or academic year, short-term employment and short-term salary could hardly make it easier to introducing part-time talents.

#### **3.2. Low practical ability of full-time teacher**

Teachers in independent colleges are mainly self-employed full-time teachers, so the competence and quality of these teachers play a leading role in the quality of education and teaching. In order to promote the construction of "double-qualified" teachers, most independent colleges have carried out relevant qualification confirmation work for full-time teachers. However, to making the identification work quantifiable and less controversial, many independent colleges have chosen the relatively simple and intuitive elements such as certificates, experience and qualifications as the identification criteria. As mentioned above, the "from school to school" teachers will not encounter too many difficulties in certificate examination, title evaluation and so on. But in the area of professional skills, professional qualifications and other abilities, they are difficult to achieve the level of vocational guidance, operation and training, and even will be out of touch with the actual needs of society. That is to say, most of the full-time teachers in independent colleges have advantages in theoretical ability quality, but their low practical ability quality can not meet the requirements of social and economic development of students' quality development needs. For example, B College stipulates that apart from a series of professional qualifications of teachers, achieving an extra professional qualification certificate can be awarded as a "double-qualified" teacher.

Although it also stipulates the time limit for enterprises to work, the social benefits of scientific research achievements, and the conditions for teachers to participate in competitions and win awards, which have the same effect as the certificate of professional qualification, the acquisition of professional

qualification certificates is obviously more convenient. Whether teachers' practical operation and practical guidance ability can be effectively improved remains to be discussed. The goal of forcing teachers to improve their practical ability quality through practical assessment has not been achieved.

The main reason for the above problems is that the logic of the establishment of the "double-qualified" teacher qualification criteria in most independent colleges, which is far from the goal of the construction of applied universities and the cultivation of applied talents. Teachers apply for "double-qualified" teacher qualification with the need of job promotion or higher-level assessment. The recognition criteria also make them spend more time on textual research, rather than improving the ability of instructing students in practice. In addition, teachers are short of the place to practice or corresponding higher level of technical guidance. The cooperation between independent colleges and enterprises often pays more attention on students' practical training and other teaching activities, ignoring the need for teachers to study advanced modern technology and management experience in enterprises. Furthermore, according to attach great importance to efficiency, few enterprises are willing to take the social responsibility and take part in the personnel training of independent colleges. Even if the mode of school-enterprise cooperation take accounts, enterprises are unwilling to invite teachers into enterprises to participate in practical exercises or give technical guidance. For on thing, they are afraid of leaking business secrets or core technologies of enterprises. For another, they are afraid of affecting the timeliness of enterprises' production and operation activities. The different of interest between schools and enterprises leads to the inability to expand the scope and depth of school-enterprise cooperation, as well as the achievement of mutual benefit.

### **3.3. Lack of institutional guarantee for the transformation of teachers' competence and quality**

Institutional system guarantee such as assessment and incentive, as external factors in the transformation of teachers' competence and quality development, play a guiding role of "baton", which is of great practical significance. The present situation of the "dual" division and the insufficient practicality "double-qualified" teachers makes it imperative for the transformation of teachers' competence and quality. However, the process of "double qualification" teachers' dynamic transformation and development is limited due to the absence of assessment, incentive and training systems. For instance, the personnel department of C independent college stipulates that teachers of professional courses and basic courses, whose under 45-years old, are required to practice for three to six months in enterprises and institutions within five years at least, in principle. Priority should be given to professional title assessment and backbone teacher selection with subsidizing 5 class a performance points in 5 years with .

Apart from whether the duration of practical exercise can meet the needs of teachers' practical ability and quality improvement or not, this regulation does not specify the requirements of assessment and incentive, only requires the total amount of teachers' practice. This provision does not provide guidance and arrangement on how to practice, and lacks the content of responsibilities and rights that make teachers practice deeply in enterprises in a planned, targeted and hierarchical way. Besides, It is difficult to calculate the workload, performance and remuneration during the period of on-the-job training in enterprises. It is difficult to calculate the workload, performance and remuneration during the period of on-the-job training. In addition, "priority" can hardly be put into practice from a quantitative point of view, and it is difficult to stimulate teachers' enthusiasm to improve their practical ability.

The deficiency of system guarantee is a lack of understanding and attention to the construction of "double-qualified" teachers at the national level and at the level of independent colleges in reality. At the national level, there is no unified definition and standard for "double-qualified" teachers and no corresponding qualification certification system. Independent colleges fail to consider the issue of "double qualification" teaching staff from the perspective of top-level design. Most of them feel that taking corresponding measures of "double-qualified" teachers has been a matter of trial and error. To fulfilling the requirements of education administrative departments, based on the simple understanding, simple actions and quantitative figures are adopted with relatively passive progress.

## **4. Measures for Improving the Competency and Quality of "Double-Qualified" Faculty in Independent Colleges**

The transformation and upgrading of the competence and quality of the "double-qualified" faculty is a



systematic project. We should not only pay attention to the structure of the teachers' group, but also to the improvement of the individual competence and quality of the teachers, and establish a assurance system.

#### **4.1. System Construction: a Guarantee Framework for Improving the Competency of "Double-Qualified" Faculty**

The transformation and improvement of the competence and quality of "double-qualified" faculty need a strong institutional guarantee framework to achieve effective results. Firstly, the concept of "double-qualified" faculty should be clarified from the national level, and corresponding policies should be issued to encourage the transformation and development of teachers into "double-qualified" faculty, which should be included in the assessment of colleges. Secondly, independent colleges should deeply realize that the construction of "double-qualified" faculty is a key to realize the construction of application-oriented colleges. They should be considered at the strategic level related to the development of colleges, do a good job in top-level design, and establish and improve a institutional system that helps the transformation. For instance, independent colleges should cooperate with leading enterprises, trade associations and industrial bases to establish characteristic industrial colleges. They should work with enterprises with disciplines development, develop project-based courses development, teaching and scientific research teams building, practical teaching platforms building, technological innovation institutions setting up, which are conducive to the development of students and teachers. And then make the transformation and development of faculty a self-conscious action.

#### **4.2. Self Cultivation: the Internal Driving Force for Improving the Competence and Quality of "Double-Qualified" Faculty**

The stability of the existing full-time teachers in independent colleges determines that it is still an important way to foster the transformation of teachers to "double-qualified" and improve the application-oriented competence. Independent colleges should start with the analysis of the age structure, educational background structure, professional structure and academic relationship structure of the teaching staff. And make a reasonable school-based training system which contains training projects of teachers' professional lifetime in order to promote teachers to learn professional theoretical knowledge, strengthen professional and practical ability. In order to embody the competency and quality of "application-oriented" faculty, we can further promote the circulation of talents between schools and enterprises with the help of local government, and relate the qualification of "double-qualified" faculty with their professional titles, performance appraisal, welfare and opportunities for further study, so as to exert the enthusiasm of teachers to take part in on-the-job training, project and technology tackling, training and management consultation and other activities.

#### **4.3. Flexible Introduction: a Fast Way to Improve the Competence and Quality of "Double-Qualified" Faculty**

Independent colleges should also follow the principle of "employing talents without restriction" in introducing teachers. different ways of employment should be adopted for different types of teachers. For newly-introduced full-time teachers, strict admission system should be formulated, and professional standards should be established in three dimensions: technical skills, practical ability and teaching ability, so that new teachers can basically possess the competence quality of "double-qualified" teachers at the beginning of their employment, and at the same time force the existing teachers stay competitive. But for part-time teachers, we should take the initiative to bring in those who are beneficial for school-enterprise cooperation and talent cultivation, so that talents with both professional operation skills and teaching abilities can participate in all aspects of talent cultivation in independent colleges, stimulate the vitality of teachers' team, and promote full-time and part-time teachers to learn from each other. Of course, independent colleges should also pay attention to the standardization of part-time employment, sign employment contracts, reduce temporary part-time tasks, improve the treatment of part-time teachers, strengthen humanistic care and organize exchanges and cooperation between part-time teachers and full-time teachers, so as to help the part-time teachers to gradually understand and identify with the school's philosophy, orientation and culture, to improve their sense of teaching responsibility and the theoretical literacy of education.



#### 4.4. College-Enterprise Cooperation Community: an Effective Form of "Double-Qualified" Faculty Competence and Quality Improvement

In the common case of the low quality of teachers' practical ability in independent colleges, establishing a "college-enterprise cooperation community" is an effective way to promote cooperation colleges and enterprises and to improve the competence and Quality quality of "double-qualified" faculty. This community relies on the following measures: Firstly, college-enterprise cooperation organizations, including schools, industry-enterprise organizations and relevant government departments, should be established, which are specially responsible for the operation of college-enterprise cooperation. So as to formulate cooperation charters and clarify the relationship between responsibilities and rights of all parties, promoting a long-term cooperation mechanism. In this organization, the role of the government can not be ignored. In the past, college-enterprise cooperation was not deep enough because that the government did not really play the role connection in college-enterprise cooperation. Therefore, we should actively strive for the support of government policies and funds, in order to provide necessary guarantee for the deepening of college-enterprise cooperation. Secondly, we should explore further face-to-face cooperation mode with enterprises, such as jointly formulating personnel training programs, implementing "dual professional leaders" and "one lesson, two teachers" project, and providing platforms and opportunities for teachers to participate in enterprise technological innovation, project designing, joint applying for programs, and joint guidance of students' practical activities. So that to update teachers' knowledge framework, enhance their technical skills, and also meets the demands of enterprises' efficiency. Finally, the advantages of both sides should be shared by establishing and expanding the practice bases inside and outside colleges to make long-term stable cooperation. Generally speaking, the in-depth cooperation mode of "two-teacher co-education" benefits from the flexible talent management system of two-way circulation between colleges and enterprises. In other words, college and enterprise should participate in the whole process of talent cultivation to meet the needs of social economics and industrial development, and eventually realize the role exchange and development of both sides.

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# Pedestrian Detection using Spatial Haar-like Features

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## Abstract

In this paper, a simple yet effective detector for pedestrian detection is proposed. The motivation of our method lies in the basic observation that not only the local information but also the global context information is used for more accurately discriminating the people from others in the cluttered background. Therefore, we propose a novel type of feature, called Spatial Harr-like Features (SHFs), to characterize the co-occurrence between one image patch and other image patches. To verify the effectiveness of the proposed method, we evaluate our SHFs on INRIA and Caltech dataset. Experimental results convincingly show that the SHFs are effective to model the geometry context and our pedestrian detector outperforms the published state-of-the-art methods using the HOGs.

**Keywords-pedestrian detection; SVM**

## 1. Introduction

Recently, pedestrian detection has become an active research field, and a variety of methods have been developed. However, detecting the people in a cluttered background is still challenging, since different human postures and illumination conditions can cause high variation of human appearances in images. Pedestrian detectors are based on human designed feature maps and auto-generated feature maps which are obtained by deep learning. Here, we concentrated on finding more discriminative features maps among human designed ones and on developing a robust human body model.

In the literature, there are two popularized methods in pedestrian detectors based on human designed features: 1) Papageorigu [1] employed a polynomial support vector machine (SVM) to learn a single pedestrian detector, where Harr wavelets are used as features to describe the full human body; 2) Zhu et al. [4] employed the linear SVM with HOG features as a weak learner in the boosted cascade, where they first generated a number of parts-based detectors with variable sizes and then detected a human if some of all of its parts are presented in the cascade. Then, to improve the detection process, they used only 36-D HOGs from the image patches of different sizes, which allows a near real-time human detection system whereas results in low accuracy detection results.

To compensate the low accuracy in local-patch based detector, LDCFs are designated in [10], where the features are consists of PCA bases of local patches. That is, a LDCF uses learned PCA eigenvectors from training data and showed that top of PCA projections of image patches can be effective for image classification. In [8], a statistical pedestrian shape model is presented, which composed of three body parts such as head, upper body and lower body. Among a number of Harr wavelets extracted from integral channel features, they selected only the binary and ternary rectangle features positioned on the silhouette of their pedestrian shape model, which called as Informed Harr-like features.

In this paper, we propose a novel type of feature, called Spatial Harr-like Features (SHFs), to characterize the co-occurrence between one image patch and other image patches. The proposed method is performed by four steps: HOG-SVM computation, confidence map generation, spatial haar-like feature selection (SHFs), and cascade. We first extract HOG features from image local patch, each of which are

learned using linear SVMs as weak classifiers. Thereafter, we select weak classifiers with higher accuracies and then we generate a confidence map, where each cell represents the discrimination power in discriminating the pedestrians from others. Therefore, we can identify some body models which consists of two-pair wises for triple ones of local patches with high discriminative posers, which is called as SHFs. The SHFs can combine global context information using geometric relationships between local texture regions. Finally, the pedestrian detector is generated by traditional boosted cascade of SHFs.

## 2. Proposed Method

### 2.1. Weak Classifier Learning

In this paper, we compute the features for the variable size blocks. From the 64x128 detection window, feature vector is calculated for the variable blocks whose size ranges from 12x12 to 64x128 instead of fixed blocks. In total, 5031 blocks are defined in a 64x128 detection window. Thereafter, we divide each block into cells of size 4x4 pixels, and the cell integrated into the block in a sliding fashion, but the cells do not overlap with each other. In the block, each cell consists of a 9-bin HOG features and finally the block contains a concatenated feature vector of all its cells. Then, to extract features vector fast, we use the integral-histogram techniques.

The extracted feature vector is given to SVM, which minimized an upper bound of the generalization error to maximize the margin between the separating hyper-plane. In this paper, totally 5031 feature vectors is trained using a linear SVM, as a weak classifier. As the result of Learning, 410 weak classifiers with high accuracy are selected.

### 2.2. Confidence Map Generation

From all the learned weak classifiers, a confidence map is constructed on a OGM, each cell of which has the confidence value that represents its power in discriminating the target object from others. The value is obtained by aggregating the detection accuracies of all weak classifiers that pass on a cell  $(i,j)$ ,  $\text{confidence}(i,j) = \sum_{k \in N(i,j)} (1 - \epsilon(i,j,k)) / N(i,j)$ , where  $N(i,j)$  denotes the number of weak classifier that are passing on a cell;  $\epsilon(i,j,k)$  is the error of th weak classifier on a cell. That is, confidence value at a cell is the average of the accuracy of the weak classifiers containing the cells. Therefore, the higher confidence is at a cell, it can be seen that weak classifiers including the cell is more important.

### 2.3. Spatial Haar-like Features

To identify key positions with high confidence, we first selects 36 top discriminative weak classifiers composed of 22 from top region and 14 from bottom region. Then by combining the selected weak classifiers from each two high confidence areas in the confidence map, we made a novel feature with geometric relationship, called SHF. A SHF is composed of a pair-wise or a triplet of local image patches that have a strong geometry relationship. The computation of SHF is similar to traditional Haar-like feature. The output value of the SHF can be computed by the following formula:

$$SHF(x) = \sum_{i=1}^k w_i(x) * c_i(x), \quad k=2 \text{ or } 3$$

, where  $c_i(x)$  is the confidence value of  $i_{th}$  local patch, which are computed by accumulating the confidence values of cells within the image patch. Then,  $w_i(x)$  is determined by different mechanisms according to the feature space. For the single-dimensional features, the sum of the features in the local patch is used, otherwise the classification results is used. That is, for the multi-dimensional features, the results after feeding to SVM are used as  $w_i(x)$ .

For each SHF, the optimal threshold classification function is determined, such that the minimum number of examples are misclassified. Thus, SHF is represented as:

$$h_{shf}(x, shf, \theta) = \begin{cases} 1 & \text{if } shf(x) > \theta \\ -1 & \text{other wise} \end{cases}$$

, where  $shf(x)$  is SHF value evaluated from results of weak classifiers and  $\theta$  is a threshold.

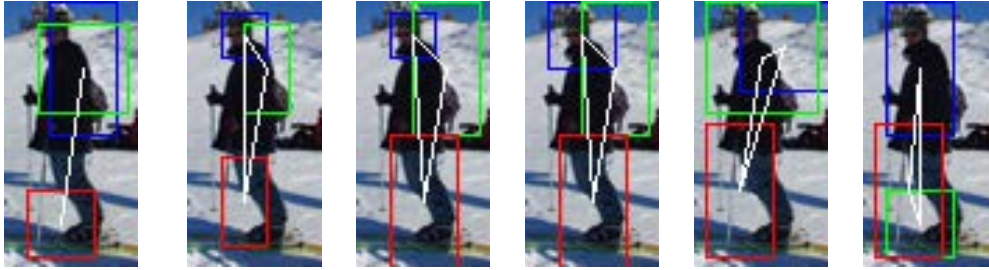


Fig. 1 Some examples of SHFs

Fig.1 shows some examples of SHFs selected depending on the process of Adaboost. By representing the human body model with these SHFs, we can handle the detection of people with a variety of poses.

Instead of learning all the SHF making into a strong classifier, we use the cascaded classifier composed of a boosted classifier for each stage as an efficient classifier. In order to prevent wasting time, we propose a new method for selecting reasonable SHFs of all possible SHFs.

#### 2.4. Cascade

This section describes an algorithm for constructing a cascade of classifiers which achieves increased detection performance while radically reducing computation time. In this paper, we use a standard cascade approach. For each stage of the cascade we construct a strong classifier consisting of several weak classifiers corresponding to SHF among 193 weak classifiers resulted from clustering. In each stage of cascade we keep adding weak classifiers until the predefined quality requirements are met. In our case we require the minimum detection rate to be 0.98 and the maximum false positive to be 0.7 in each stage.

### 3. Experiments

To assess the validity of the proposed method, the experiments with well-known datasets were performed. Among publicly used datasets, two datasets were considered in our work: INRIA dataset and Caltech dataset. Then, to evaluate its performance, four metrics were used: precision(PR), detection rate(DR), accuracy rate(AR) and miss rates versus false positives per window (FPPW).

Table 1 shows the experimental results of the proposed method, where it was compared to HOG + SVM [1] and HOG-cascade detectors [2]. They were also compared in terms of a per-window approach to compare the methods, which is shown in Fig. 2.

Table 1. Comparing to HOG-SVM and HOG-cascade

Method	PR	DR	AR	Testng time(per window)
HOG-SVM [1]	93.69	94.70	97.70	0.000745ms
HOG-cascade [2]	90.35	89.87	96.07	0.000037ms
Our SHF-cascade	93.11	93.23	97.3	0.000024ms

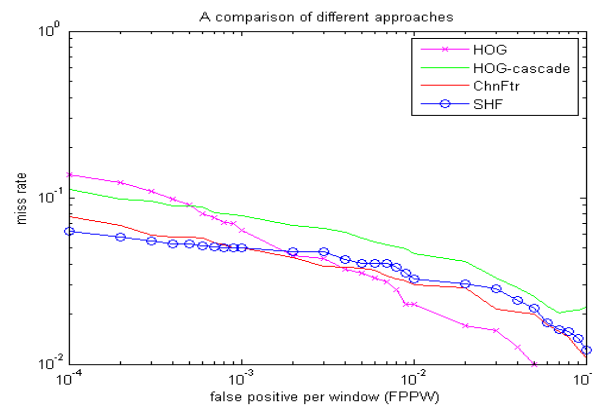


Fig. 2 Miss rate versus false positive per window curves shown for other approaches

As shown in Table 1 and Fig. 2, the HOG-SVM that use a global window to identify human body has the highest AR of 96.97%, whereas HOG-cascade has showed the lowest AR of 96.07%. Then, the proposed method has similar performance with HOG-SVM, but it has the fastest speed than other methods.

#### 4. Conclusions

We study the question of robust features for pedestrian detection. We propose a new mid-level feature, called Spatial Haar-like feature (SHF). As local features corresponding to a weak classifier, we use linear SVMs with HOG features computed on variable sized blocks. To reduce the computation in weak classifiers with slightly high dimensional feature, a few weak classifiers with high accuracy are selected and computed only for them. From the selected weak classifiers, we found that there is spatial relationship appearing to top and bottom regions. Based on this fact, we finally selected the best weak classifiers including that regions and generate SHF by combining them. Then, we learn the SHF using boosted cascade detector.

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# A Virtualization Approach for Accessing IoT Resources and Appliances Control in Smart Home

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## Abstract

Internet of things (IoT) is a paradigm envision to connect every physical thing by making a smart space. In IoT smart space, every physical object is capable of receiving and sharing data, however, the challenge is these physical objects are diverse in nature and require a uniform representation in the cyber world. This paper presents virtualizing diverse physical objects in a uniform interface so that it could be consumed and shared in different IoT application. We save the virtual objects of physical devices and provide the reusability and uniform representation in the IoT app store. A smart-home client-based application is developed to interact with the app store to consume commonly used virtual objects and share the application-specific virtual objects to the application store. It also allows connectivity to home appliances in a smart home environment from anywhere using the stored virtual objects' executables.

**Keywords-** *Internet of Things; smart space; cloud computing; virtual objects*

## 1. Introduction

According to the International Communication Union, in the near future, everything will be connected in an intelligent way through the "Internet of Things" [1]. Internet of things is the network of smart physical devices which are connected to the internet [2]. With the passage of time, the number of IoT devices are expected to increase exponentially, due to the awareness of Industrial internet of things and advancement in cellular networks [3]. In the recent past, IoT have remarkable applications in everyday life, therefore, a huge investment is being made by a number of research organizations to realize its potential [4].

The development of IoT devices is one of the key researches to enable mass participation in the realization of IoT applications and device management [5]. Due to an exponential growth of IoT devices, effective device management, configuration, authentication are the primary challenges owing to its limits. For efficient way of controlling the IoT devices remotely, we need a digital representation of IoT devices such as virtual objects. The virtual object is a replica of a real physical object, it is the programmatic representation of attributes and methods that composes a smart physical object. These virtual objects can be controlled easily through client applications and provide the controlling of a physical object in the real responsive environment. A virtual object also provides real-time visual feedback of a physical device. So it's essential to use a virtual object to control the physical IoT devices.

The main challenge in virtual objects' management is that there are a lot of instances in literature where these virtual IoT devices are employed, but the problem is that these devices are diverse in nature, so the virtual object also differs to reflect their physical counterparts. This creates a huge challenge of standardizing the representation of virtual objects, which is regarded as of paramount importance for the cyber-control of physical objects through virtual objects.

In this regard, the aim of this research is to provide a IoT-based virtual objects from different IoT domains in a near-to-uniform fashion. A client application is implemented as a proof-of-concept to develop and share virtual objects and communication with the cloud-based app store.



## 2. Virtualization and Sharing and Access of Physical Objects

We have 3 steps for virtualization and sharing and access of physical objects. First step, we register the user. And we support a virtualization to register physical object. Finally, user discovery and access physical devices using virtual objects.

First step, A new user wants to use the app store, he needs to access the app store registry interface. Once he gets access to the interface, the user requests the registration by triggering the registration service.

Second step, we register the virtual object into the IoT app store, user must be logged in to the application store. For this user can open the app stores' sign in page, fill out the credentials and then press sign in to proceed to the app store. App store checks the credentials from the database record and redirects the user to the main page of app store.

Third step, User requests to add the virtual object, app store display the form for adding the virtual object. The user adds the virtual object and its descriptions into the form and request to post the object. It shows the user interaction with the client application, and if the user did not have the executable installed on the mobile then he uses his mobile and login into the IoT app store to get the executable.

Example, we have electric fans, lights, motors, and CC-TV cameras in smart home appliances could be. IoT server deployed on Raspberry PI which allows running of IoT application and listening to the designated port to perform the corresponding actions to receiving the input.

We provide the repository for virtual objects for smart home appliances. The repository is a central place where similar virtual objects can be stored and retrieved by other similar applications. This allows a great deal of reusability and also provides uniform access from cyber space. A smart-home client-based prototype application is developed to interact with the cloud-based app store. And we exhibit consumption of commonly used virtual objects and at the same time register their own application specific virtual objects to the application store. It also allows connectivity to home appliances in a smart home environment from anywhere using the stored virtual objects' executables.

## 3. Conclusion

In this work we propose a virtualizing of physical objects to manage and control home appliances using virtual objects. It solved the challenge of physical objects heterogeneity by providing a uniform representation in virtual space. The effectiveness of the work is assessed by a mobile-based client prototype application which shares and consume virtual objects from the cloud and controls the appliances using them. The proposed work is the first ever attempt to provide a mechanism to share and reuse components of IoT applications.

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# CNN-based Single Object Tracking Framework for Autonomous Target Tracking Systems

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## Abstract

This paper proposes a visual tracking algorithm for videos with convolutional neural network-based single object tracking framework. To consider spatio-temporal constraints of object movement in a video, the proposed network estimates the relative pose change of the next frame with respect to the current frame. For each output of the convolutional layers, a batch normalization layer is added to reduce inertial covariate shift, which is the change in the distribution of network activations. In the training, input images are preprocessed with color distortion and standardization, and the input batches are randomly generated with bidirectional pairs. The proposed algorithm is trained on Visual Object Tracking (VOT) dataset and is tested on the Amsterdam Library of Ordinary Videos for tracking (ALOV300++) dataset, which is a standard tracking benchmark to demonstrate its performance.

**Keywords-component; object tracking; artificial intelligence; supervised learning**

## 1. Introduction

A single object tracking task aims to track a target object in a sequence of image frames and estimate the bounding box, which represents the center location, width and height of the target. The single object tracking systems should be able to track a target object among many of the same class or different classes of objects. Moreover, they should be invariant to occlusions, object or background motions, rotations, deformations, and lighting changes.

Numerous research works have done on the convolutional neural network-based approach for image classification such as [1]-[3]. However, they are not applicable for object tracking tasks in a video, which is a challenging problem due to their characteristics such as occlusion, motion blur, illumination change, and size change. Although there have been numerous works on object tracking such as [4] and [5], they are not applicable for tracking unknown object types. The single object tracking focuses on tracking generic objects such that a ground truth bounding box of an arbitrary object is given at the first frame and the tracker should estimate the bounding box of the object at each subsequent frame. The application areas of the generic single object tracking systems are much wider than that of specific object tracking systems since they are not limited to any specific object classes.

There are three main approaches in generic object trackers in terms of learning process. The online learning approaches, such as [6] and [7] train their trackers during test. While these approaches do not require offline training with large amount of data, they are vulnerable to any small shape change of a target object. Moreover, they often require a significant amount of time and computational resources to train the trackers while testing. In the case of the offline learning approaches, such as [8] and [9], a large amount of training data is used to train the trackers in advance of applying them for tracking. The hybrid approaches such as [10] and [11] are considered as the combination of the online and the offline approaches. Although they try to combine benefits from both approaches, they require complex structure and learning process.

The proposed framework in this paper can be categorized as the offline learning approaches. It is based

on the Generic Object Tracking Using Regression Networks (GOTURN) from [9], which uses a simple feed-forward network with no online training. Although GOTURN is widely used due to its capability to track novel objects that do not appear in the training set with fast speed, it is vulnerable to the covariate shift and weight initialization. Moreover, it is sensitive to the learning rate and requires a long learning time. To address these disadvantages, the proposed framework utilizes various deep neural network schemes such as batch normalization with no dropout and a sigmoid function as the activation function at the last fully-connected layer. In the training phase, preprocessing schemes such as image standardization and random color distortions are applied. Moreover, a mini-batch of bidirectional image pairs, which consists of forward and backward order of a sequence of image frames is proposed.

## 2. Proposed Visual Tracking Framework

The overall architecture of the proposed network is shown in Fig. 1. Similar to the most approaches in visual tracking, the proposed network uses the image crop pairs from the previous and the current image frames at each timestep. At the initial frame, the ground truth bounding box of the target object is given to the network and the crop region at the initial frame is defined by padding the width and the height of the ground truth bounding box to two times. For the next frame, the crop region is defined by padding the estimated bounding box from the previous frame to be twice the size. The ConvNet1 and ConvNet2 in the network extract features from a sequence of images and the features are fed into the fully-connected layers.

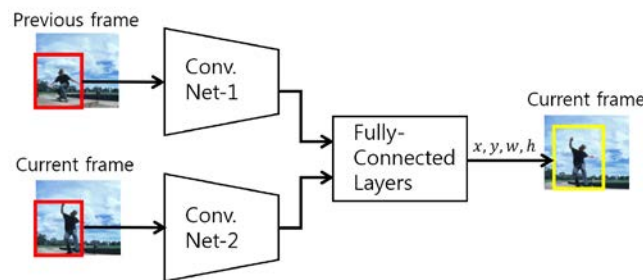


Fig. 1 Visual tracking network architecture.

The architecture of the proposed network is described in Table 1, where Conv and FCL in the table represent the convolutional layer and the fully-connected layer, respectively. The ConvNet-1(2) in Fig. 1 consists of Conv1-1(2), Maxpool1-1(2), Conv2-1(2), Maxpool2-1(2), Conv3-1(2), Conv4-1(2), Conv5-1(2), and Maxpool3-1(2).

Table 1. Network Architecture of the Proposed Tracker

Type	Filters	Size / Stride	Output
Conv1-1(2)	96	11 x 11 / 4	57 x 57
Maxpool1-1(2)	-	3 x 3 / 2	29 x 29
Conv2-1(2)	256	5 x 5 / 1	29 x 29
Maxpool2-1(2)	-	3 x 3 / 2	15 x 15
Conv3-1(2)	384	3 x 3 / 1	15 x 15
Conv4-1(2)	384	3 x 3 / 1	15 x 15
Conv5-1(2)	256	3 x 3 / 1	15 x 15
Maxpool3-1(2)	-	3 x 3 / 2	8 x 8
FCL1	4096	-	4096
FCL2	4096	-	4096
FCL3	4096	-	4096
FCL4	4096	-	4

Although the basic design of the proposed network architecture is based on GOTURN, they have different characteristics. In the proposed network, ConvNet-1 and ConvNet-2 share the same weights,

which is not the case in GOTURN. Since the input of the network is a sequence of image frames, the two convolutional networks (ConvNets) must detect similar features from the same target object for longer and robust tracking. By sharing the weights, the two ConvNets generate consistent feature maps for the same object as well as reducing training time. For each output of the convolutional layers, a batch normalization layer and the leaky rectified linear unit (ReLU) function is used as an activation function. The batch normalization reduces internal covariate shift and enables the training process much faster with less careful about initialization [12]. Since the batch normalization acts as a regulator, dropout is not used in the proposed network. For the last fully-connected layer, which is FCL4 in the table, the proposed network uses the sigmoid function is used as an activation function, whereas GOTURN uses a linear function. This causes GOTURN to have high initial loss, to require longer training time, and to be more sensitive to the change of the learning rate.

For robust feature extraction with respect to color distortion, the brightness, contrast, hue and saturation of the training images are randomly distorted. Moreover, the training images pass through the standardization process before fed to the network to have zero mean and unit normal distribution. Note that the image standardization is also used in testing phase. In the training, most of the other approaches use only a forward sequence for training image pair. However, the visual tracker should be able to track an object in video when the video is played backwards. For this reason, the proposed framework generates the random training image pair batch in both forward and the backward sequence for robust training.

The estimated bounding box in the previous image frame,  $\mathbf{b}_{prev}^I$ , is defined as

$$\mathbf{b}_{prev}^I = [b_{prev,x}^I \ b_{prev,y}^I \ b_{prev,w}^I \ b_{prev,h}^I], \quad (1)$$

$$0 \leq b_{prev,x}^I, b_{prev,w}^I \leq W^I, \quad 0 \leq b_{prev,y}^I, b_{prev,h}^I \leq H^I$$

where  $b_{prev,x}^I$  and  $b_{prev,y}^I$  are the  $(x, y)$  center position of the bounding box, which is the offset from the top-left corner of the image frame, and  $b_{prev,w}^I$  and  $b_{prev,h}^I$  are the width and the height of the bounding box, respectively. The width and the height of the image frame are denoted as  $W^I$  and  $H^I$ , respectively.

The crop box that is used for cropping image patch from the previous and the current image frame,  $\mathbf{c}^I$ , is generated by padding  $\mathbf{b}_{prev}^I$  to two times the width and the height. It is defined as

$$\mathbf{c}^I = [c_x^I \ c_y^I \ c_w^I \ c_h^I] \quad (2)$$

where  $c_x^I = b_{prev,x}^I$ ,  $c_y^I = b_{prev,y}^I$ ,  $c_w^I = 2b_{prev,w}^I$ , and  $c_h^I = 2b_{prev,h}^I$ .

In the prediction, the output of the proposed network is defined in the normalized crop image patch of the current image frame, which is the scaled crop image patch divided by  $c_w^I$  and  $c_h^I$  for the width and the height. The network output,  $\mathbf{t}_{curr}$ , is defined as

$$\mathbf{t}_{curr} = [t_{curr,x} \ t_{curr,y} \ t_{curr,w} \ t_{curr,h}], \quad 0 \leq t_{curr,i} \leq 1, i \in \{x, y, w, h\} \quad (3)$$

where  $t_{curr,x}$  and  $t_{curr,y}$  are the  $(x, y)$  center position of the bounding box, which is the offset from the top-left corner of the normalized crop image patch, and  $t_{curr,w}$  and  $t_{curr,h}$  are the width and the height of the bounding box, respectively. Since the sigmoid function is used as the activation function of the last fully-connected layer, FCL4, all the elements in  $\mathbf{t}_{curr}$  range from 0 to 1.

From (1), (2) and (3), the estimated bounding box in the current image frame,  $\mathbf{b}_{curr}^I$ , is defined as

$$\mathbf{b}_{curr}^I = [b_{curr,x}^I \ b_{curr,y}^I \ b_{curr,w}^I \ b_{curr,h}^I], \quad (4)$$

$$0 \leq b_{curr,x}^I, b_{curr,w}^I \leq W^I, \quad 0 \leq b_{curr,y}^I, b_{curr,h}^I \leq H^I$$

where

$$\begin{aligned} b_{curr,x}^I &= b_{prev,x}^I - b_{curr,w}^I + c_w^I t_{curr,x}, \quad b_{curr,y}^I = b_{prev,y}^I - b_{curr,h}^I + c_h^I t_{curr,y}, \\ b_{curr,w}^I &= c_w^I t_{curr,w}, \quad b_{curr,h}^I = c_h^I t_{curr,h}. \end{aligned} \quad (5)$$

From (5), the loss in the current image frame is defined as

$$l_{curr} = \|\mathbf{g}_{curr}^I - \mathbf{b}_{curr}^I\|_1 = \sum_{i \in \{x, y, w, h\}} |g_{curr,i}^I - b_{curr,i}^I| \quad (6)$$

where  $\mathbf{g}_{curr}^I$  is the ground truth bounding box in the current image frame.

### 3. Experiment

The trained networks with the VOT dataset were tested with the ALOV300++ dataset in [13], which consists of 12 different circumstances such as transparency, specularity, clutter, and so on. In the testing, the average intersection of unions (IoUs) and the average failure rates (with the IoU threshold of 0.1) of

the proposed network and GOTURN were measured with each of the circumstances as shown in Table 2. The average IoU represents the accuracy of the tracker such that the higher the average IoU, the more accurate target estimation. On the other hand, the average failure rate represents how often the tracker loses track of the target such that the higher the average failure rate, the less successful target tracking. As shown in Table 2, the proposed algorithm outperformed GOTURN for most of the circumstances. Some of the test results are shown in Fig. 2. As shown in the figure, the estimated bounding boxes from the proposed network (green) are closer to the ground truth (white) than that of GOTURN (red).

Table 2. Test Results of GOTURN and the Proposed Network with ALOV Dataset.

Aspects (# of videos)	GOTURN		Proposed	
	IoU	Failure	IoU	Failure
Light (33)	0.46	0.092	0.54	0.076
Surface Cover (15)	0.48	0.052	0.50	0.038
Specularity (18)	0.58	0.036	0.66	0.033
Transparency (20)	0.45	0.081	0.45	0.073
Shape (24)	0.42	0.041	0.49	0.035
Motion Smoothness (22)	0.41	0.270	0.52	0.250
Motion Coherence (12)	0.39	0.093	0.53	0.081
Clutter (15)	0.43	0.150	0.52	0.130
Confusion (37)	0.45	0.180	0.52	0.160
Low Contrast (23)	0.46	0.140	0.56	0.099
Occlusion (34)	0.47	0.110	0.51	0.100
Moving Camera (22)	0.41	0.210	0.50	0.180
Zooming Camera (29)	0.45	0.083	0.50	0.067
Long Duration (10)	0.45	0.071	0.54	0.070

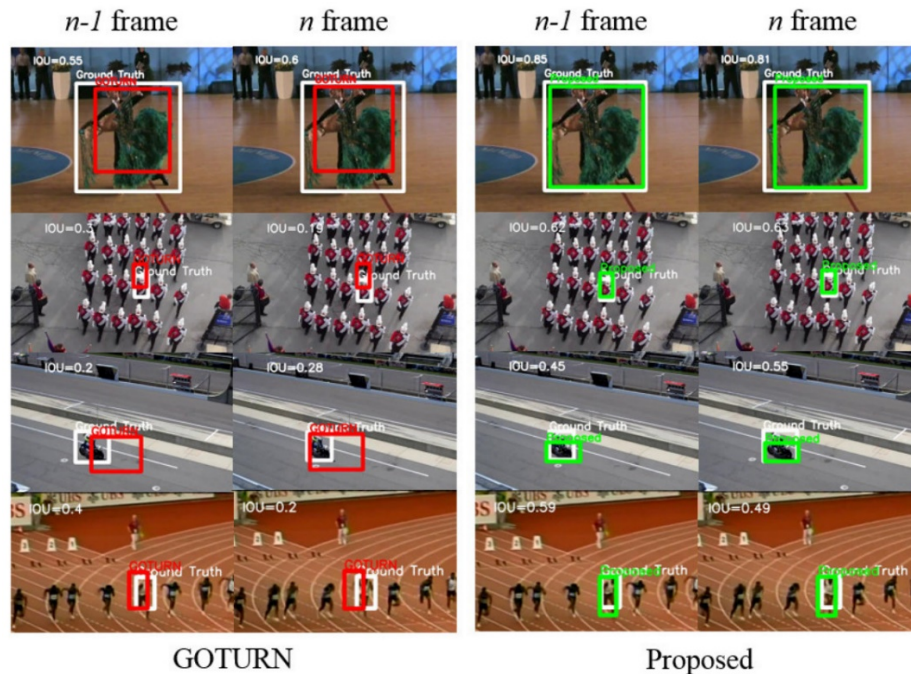


Fig. 2 Selected test results in a sequence of image frames.



## 4. Conclusion

In this paper, a robust single object tracking framework is proposed. To improve the tracking performance, the proposed network utilized image standardization, batch normalization at each convolutional layer, leaky ReLU as an activation function, sigmoid function at the end of the network. For efficient training, random color distortion is applied to the training image pairs and bidirectional image pair batch were used. The experimental results showed that the proposed network outperforms GOTURN with respect to accuracy and robustness.

## Acknowledgment

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# Voice recognition research and trend analysis

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## Abstract

Over the past several years, technologies such as cloud computing, machine learning, and deep learning have evolved, and voice recognition technology is advancing faster than in the past.

In addition, the use of virtual assistant using voice recognition is increasing, and natural speech processing technology, which is the basis of virtual assistant service, is also expanding.

In this paper, we will discuss the technical principle of voice recognition, the voice recognition technology used in the past, the artificial intelligence assistant service available in cell phones and speakers, and finally how voice recognition should be used in the future.

**Keywords-component; formatting; style; voice recognition, AI, assitant service**

## 1. Introduction

Voice recognition is the process by which a computer interprets a person's voice and converts it into text data. In other words, it is also called Speech-to-Text (STT). It is used when you need to control the device or search for information by using robot or telematics. A representative algorithm is HMM (Hidden Markov Model), which constructs a speech model by statistically modeling voices spoken by various speakers and constructs a language model by collecting as many people's voices. It is also used for authentication such as identity verification compared with the previously collected voice pattern, which is called speaker recognition [1].

Voice recognition can be largely divided into a method of executing a designated command using a mounted on a device and an method using a server. When mounted on a device, it is based on a limited set of commands and can be called quickly because it does not need to communicate with the server, but the range of languages that can be loaded and natural conversations are limited. Server-based execution has the disadvantage that it is not executed when the server is disconnected, but it has the advantage of constantly updating and improving the language and vocabulary used. In addition, search and service connection using the Internet network is easy, and the possibility of expansion is unlimited.

Voice recognition is used as voice secretary using voice recognition as artificial intelligence develops. Now, functions such as daily conversation and emotional exchange are expanding. This makes it easy to use voice recognition in everyday mobile phones and IoT devices, and it has become a necessary function for many people. In addition, voice recognition is recognized as a next-generation authentication service because it can be remotely authenticated unlike other body authentication methods such as fingerprint and iris.

## 2. Voice Recognition

### 2.1. Principles of voice recognition technology

Voice recognition technology can be divided into voice recognition and speaker recognition. Voice

recognition is categorized as a speaker dependent technology that recognizes specific speakers and speaker independent technologies that are recognized irrespective of speakers. The speaker dependent technology pre-stores and registers the user's voice and compares and recognizes the pattern of the stored voice and the pattern of the voice inputted when performing the actual recognition and is excellent in recognition performance. Speaker independent technology targets unspecified speakers, so it is necessary to have a large amount of speech database to improve accuracy when performing recognition.

Most voice recognition technologies have the following structure as shown in Fig. 1 and only speaker's speech feature is extracted from the input signal. Based on this, the pattern is classified by measuring the similarity with the existing speech model and processed as a human language based on the language model and recognized as a sentence.

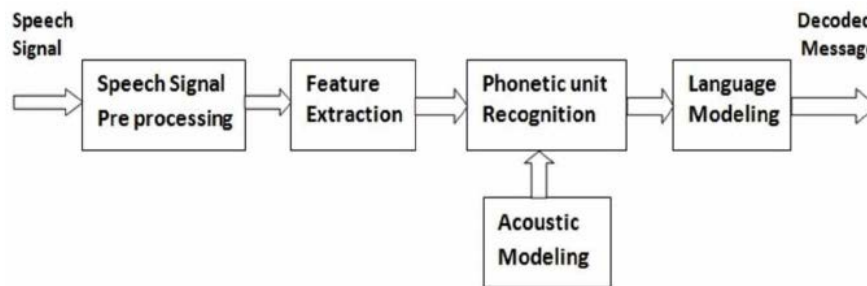


Fig.1[2]

In this case, even if a good recognition algorithm is used, it is difficult to expect a high recognition rate unless the detection is performed properly. Therefore, detecting the human voice greatly affects the performance of the recognition technology.

After the speech is detected, the feature of the speech is extracted. It is important to extract the features that can express the characteristics of the voice because the voice changes in various ways depending on the speaker's gender and age, and the sound changes when it is singled and when pronounced in words or sentences [3].

## 2.2. Past voice recognition technology [3]

In the 1950s, Bell Labs acoustical physicists in the United States developed an auditory system that recognizes people's numbers as a single voice. The combination of dozens of expressions based on the fact that the specific Hz region of the sound 'ah' is strong is able to synthesize sounds close to the human voice, so that the human voice can be described very concisely. When the mathematical model is coded to express the voice, it is possible to encode the voice. The rest of the researchers thought that applying the input voice to this model would detect the approximate pattern and the voice recognition would be completed.

In 1963, IBM unveiled a voice recognition device called the Schubbox at the World Fair., which allows the recognition of 16 spoken English words and even simple numeric calculations. However, because the tone of a person keeps changing, a prerequisite is that you must speak clearly in a quiet place. In other words, this mathematical model could not express well the 'articulation combination' in which the vowel is more or less the same as that of the preceding vowel in the words of more than two syllables.

Since then, IBM has solved the problems of HMM that Carnegie Mellon University applied to voice recognition, which was originally developed by voice recognition. The difference between 'ah' sounds is collected from a typical 'ah' to a high 'ah', and statistical learning is done on how 'ah' differs from the average 'ah'. In other words, it is a concept of the hidden Markov model to raise the recognition rate in a situation where there are various and uncertainties due to the limit of the data amount as if it cannot be expressed in a quiet place or cannot express the articulation combination well. Hidden Markov models (HMM) can represent speech statistically including time variations.

## 2.3. Voice recognition AI assistant service

Voice recognition AI secretary is literally a service that artificial intelligence acts as a secretary of the individual. Artificial intelligence, instead of people, is automated to help you get things done faster and

provide convenience services to improve your quality of life. Google's assistant has changed to a feature that allows users to respond more frequently to requests and questions that are more accurate and results in more accurate responses, and the ability of existing search features to provide links to answers more directly. It also provides customization options for each user. This is possible because Google has been collecting most of the information about users from the past, such as home, anniversary, and schedule. For example, it is possible to acquire information in advance based on questions that have been asked in the past when asked about the route that is the closest to the house at the time of the closing hour [4]. Samsung's Bixbee is a new intelligent interface designed to accept information in a variety of input formats, including voice, text, and images, and to use smartphones intuitively and efficiently. It consists of four functions: voice, vision, reminder, and home. We enhanced personalization and expanded support services such as knowledge search and music recommendation playback. We have strengthened the search function of life information and general knowledge in connection with portal such as Naver, and utilized 'Samsung Pay', which is connected with banks, as a financial service platform such as remittance, exchange, and balance inquiry [5].

### 3. Conclusion[6]

The first voice recognition system in the '50s was able to recognize numbers only. Research institutes located in USA, Japan, UK, Soviet Union developed special hardware to recognize human voice and extended voice recognition technology to support 4 vowels and 9 consonants.

The Department of Defense's DARPA Speech Understanding Research Program from 1971 to 1976 is one of the largest projects and has been the basis for Carnegie Mellon's harpy speech understanding system. Harpy could understand 1,011 words, which is equivalent to the vocabulary level of a 3-year-old infant. In addition, Threshold Technology, the first voice recognition business, was established and voice recognition technology such as a system that can interpret various people's voice introduced by Bell Labs has developed rapidly.

In the '80s, we studied a new approach to analyzing what people were saying, and over a decade the perceptual vocabulary grew rapidly to thousands of words and had the potential to recognize unlimited vocabulary. One of the reasons was a new statistical method known as the Hidden Markov Model (HMM). The Kurzweil Text-to-Speech program in 1985 recognized 1,000 words and supported 5,000 words, and IBM's system had a similar function, but only by word-by-word recognition.

In the '90s, automatic speech technology developed rapidly, computers were equipped with faster processors, and the public could access voice recognition software.

Until 2001, the accuracy of voice recognition technology was 80%, which was stagnated for 10 years. Recognition systems have been able to perform well when language experience is limited, but they have still guessed sounds based on statistical models and the language experience has grown as the Internet has developed. Since then, Google Voice search for iPhone has emerged and Google has begun to develop again, providing the ability to do big data analysis needed to analyze the words and voice samples collected by the device. Since then, Google has developed more accurate and efficient ways of adding personalized perceptions.

It combines artificial intelligence with voice recognition and is developing radically and is being used by many people conveniently. With this feature, users will not only be able to control or text their mobile devices with voice, but will also be able to use various languages and voices. Future upgrades will be more sophisticated and more accurate, and people will become accustomed to talking to speakers, cell phones, and so on, as well as other devices.

### Acknowledgment

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# Analysis of Artificial Intelligence Speech Recognition Technology

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## Abstract

As artificial intelligence (AI) evolves, it is being used with many technologies. Language and voice recognition were the starting point of all new machine learning capabilities that have come out in recent years. In this paper, we introduce trend of AI personal assistant service and speech recognition technology and propose future direction of development.

**Keywords-component; AI, speech recognition technology**

## 1. Introduction

AI means a program that explores solutions through machine learning through thinking, learning and judging like a human being. [1] AI conversed various area. One of the areas where these achievements were most prominent was AI for speech recognition. According to Gartner, it is expected to grow to \$2.1billion by 2020. So, many companies are trying to preoccupy the AI speaker market. In May, at the Google I/O Conference, Google introduced Duplex that can make phone bookings on behalf of users. AI tricked our ears into thinking a robot is human. We introduce trends of AI personal assistant service and speech recognition technology and presents future direction of development.

## 2. Service using speech recognition

### 2.1. AI personal assistant

AI personal assistant is software that provides services through voice or text conversation with the user. It can analyze the dialogue with the user and extract the intent of the context to provide the personalized service by processing the information.

*goal-oriented spoken dialogue systems have been the most prominent component in today's AI personal assistants.*

Table 1. AI personal assistant

Services	Google Assistant	Apple siri	Bixby	Amazon Alexa
Features	- continued conversation, - work with more than 5,000 smart home devices - 38 Languages - Delete specific recording	- User profiling for voice input processing	- Understand context - Vision service	- Work with 12,000 smart home devices like Ring video - Order and manage shopping list - Delete specific recording
Home IoT	Google Home	Homepod	Samsung Home IoT	Amazon Echo Show & Spot

The new Google Assistant feature will share a summary of a positive news story when a user prompts it with the simple phrase, "Tell me something good." Also, Alexa expanded from what it learned about

user's voice so that it could grasp even visual information. Most AI personal assistants have been simple results-displaying programs, but Google and Amazon assistant have been enhanced.

## 2.2. AI speech recognition technology

Watson from IBM can improve the accuracy by setting important items such as product name and related topics as keywords and provides Text to Speech function. The Google Speech API identifies and translates text in up to four languages into multiple languages, recognizes and annotates multi-channels. Kaldi is a popular open source that is free of charge on GitHub.

Table 2. AI speech recognition technology

Services	IBM Watson	Google Speech API	Microsoft Bing Speech API	Dialogflow API	CMU Sphinx	Kaldi
Languages	9	120	32	14	7	-
Features	- Use selected keyword - Text to Speech	- Multilingual identification and text conversion of up to 4 languages - recognition multi-channel	- Using LUIS, extract intent and entities in text - Text to Speech	- support to wearable, mobile, smart-car, speaker	- Due to low resource requirements can be used on mobile - GitHub	- Integration with finite state transducers - Open license
price					free	free

Recently, speech recognition technology provides a function to distinguish various noises, add punctuation when converting text, and to divide the subject of each utterance in conversation.

## 2.3 Security Risk of AI Assistants

AI speakers have many security risks. For example, AI speakers perform commands from unauthorized users or other devices. And If you use AI Assistant on IoT device, you have many Wi-Fi vulnerabilities. The biggest concern is privacy. Usually, many companies, except Google and Alexa, don't delete voice recording.[5]

## 3. Conclusion

Recently, AI has developed from descriptive analytics to cognitive analytics. AI assistant technology, like Duplex, becomes similar human being. A problem of Identification of people and machines must be solved. AI assistants easily access and collect our information. This Services may have other vulnerabilities too. As is often the case, whenever a communication advancement like voice recognition starts to go mainstream, criminals looking to take advantage of it aren't far behind. [2]

## Acknowledgment

This research was supported by the MISP (Ministry of Science, ICT & Future Planning), Korea, under the National program for Excellence in SW (2016-0-00022) supervised by the IITP (Institute for Information & communications Technology Promotion)

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# IoT-based Space Security Solution

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## Abstract

We present a new concept of the space security to protect from potential risk. Using IoT-based space control unit and space security server, this concept provides reliable security level and low complex structure with simple certification process. It is thus suitable to use human-biometric information as certification password and easily construct intuitive alarming system associated with around IoT devices. In this paper, we discuss a concept system for practical applications with analysis of performance and complexity.

**Keywords;** *IoT, Human-biometric, Space security*

## 1. Introduction

After IoT(Internet of Things) was coined by Kevin Ashton [1] in 1999 and the term of IoT has been interpreted in extended way for many areas [2][3][4]. One of the best explanations for the IoT would be from ITU-T [5] as the following; "Global infrastructure for the society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

Although IoT technology is regarded as a fundamental infrastructure toward future Industry 4.0, security issue in IoT system is a challenge to be solved as soon as possible. For IoT security as well described in [6][7][8], we need to consider the security problem in cyber world as well as in real world because a boundary between online and off-line is getting closer.

One of security methods in real world is to block an intruder to enter a physical space. Door lock system can be a typical example for the space security in permitting a human who knows password. For real-time monitoring, we can use a surveillance system with supervisors. However, door lock requires a unique password at each door or the real-time monitoring system needs a supervisor who watches a screen all the time. Those methods do not seem desirable for large area application due to cost burden for massive door locks or operating surveillance system.

We present a new concept of space security based on IoT solution to improve security reliability, low complexity, and human-friendly interaction. In the concept, a unit space is used to judge whether a human or a device can stay on a given physical space or not. The size of the unit space is represented with 3D dimension (vertical X horizontal X height) and flexible depending on its capability.

As the number of space units to be used increases, the security level is linearly improved. Assume that ten security space units can be operating in a building. Although an intruder can pass a unit space, it would be difficult to pass all other units.

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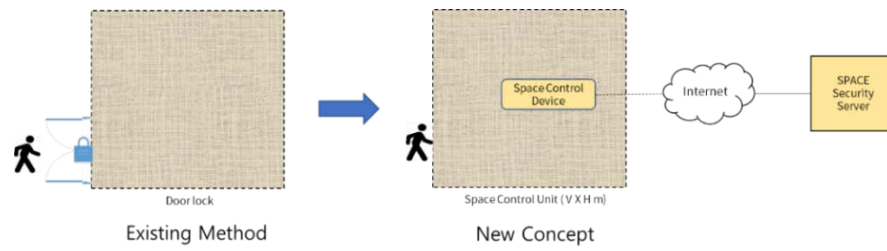


Figure1. New concept of space security

Each unit space has IoT device called Space Control Device (SCD), which collects bio-metric data of a target, and communicated with Space Security Server (SSS) for certification processing. When SCD detects a target who has approached a unit space and has collected some bio-metric information of the target, SCD sends it SSS (Space Security Server) with a query message. The SSS sends to SCD the result of the query as feedback via communication link after certification processing with high-performance computing. SCD is a simple and light device while SSS has high-end computing capability to analyze biometrics information collected from a unit space and manage database.

The new concept has scalable structure consisting of SCD, SSS, and IoT network so that it contributes to low cost system. For a large size of space security application, we just needs to increase the number of SCDs. A single SSS still can exist with reasonable computing capability, and a general communication link is used for IoT connectivity without additional cost burden.

IoT-based space security system provides human-friendly interaction in terms of password-asking-procedure and reaction procedure. SCD collects necessary biometric Information without human intervention from a unit space. If SSS sends a result of a target identification to SCD, SSS or SCD takes actions in human-friendly way using peripheral IoT devices, which they can control. For example, if a target is verified as an intruder, smart bulbs around the location turn on with red to inform current situation in rea-time.

We introduce our system in section 2, state system design with discussion of security reliability and complexity in section 3 and give a conclusion in Section 4.

## 2. IoT-based Space Security (ISS) System

In this section, we present the concept of IoT-based Space Security (ISS). When a human or device approach a unit space, Space Control Device (SCD) detects the moving, collect biometric-based information like face, bone structure, finger printing, and convey it to Space Security Server (SSS) via internet link between SCD and SSS.

IoT connectivity in ISS system plays a role to deliver data and control information in a local link of a unit space and in external via internet.

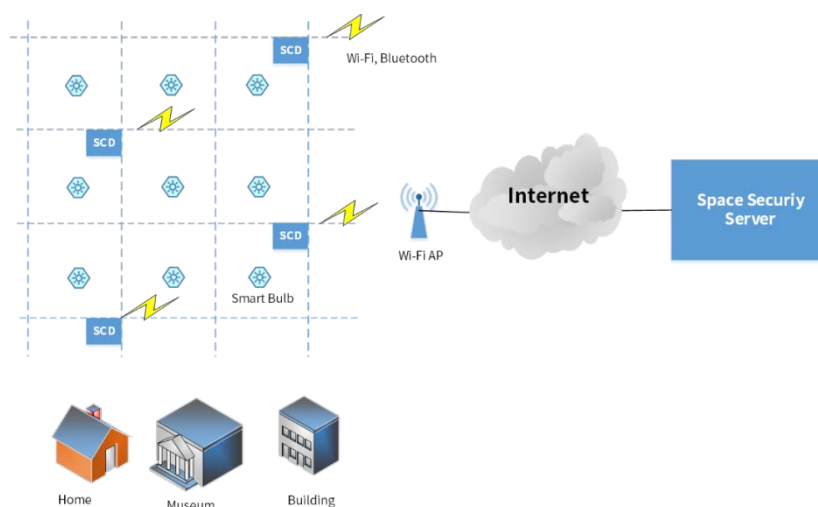


Figure 2. Overall Scenario of ISS

Figure 2 shows overall scenario in ISS system. Based on IoT defined in ITU-T [5], things and device are regarded as biometric information and SCD, respectively. The SCD can have sensors or camera to obtain bio-metric information camera such as face, bone structure.

The SCD in Figure 2 has two wireless communication links, Bluetooth [9][10] and Wi-Fi [11][12]. Bluetooth is used for control of smart bulb in unit space and Wi-Fi is link is used for internet connection between SCD and SSS to transfer bio-metric data and control message.

Each SCD is responsible for unit space identified as its unique location. The number of SCDs is decided according to size of overall space.

Space Security Server (SSS) is the server to have communication link with SCD and to analyze bio-metric information, manage database, and control all situations, which can occur.

In a practical system, since SCD cannot connect directly to internet, there is a gateway between SCD and SSS. In TCP/IP reference model for communication between SSS and SCD, HTTP and Wi-Fi can be understood as protocols for application layer and network interface layer, respectively. Figure 3. Shows overall communication link for ISS system

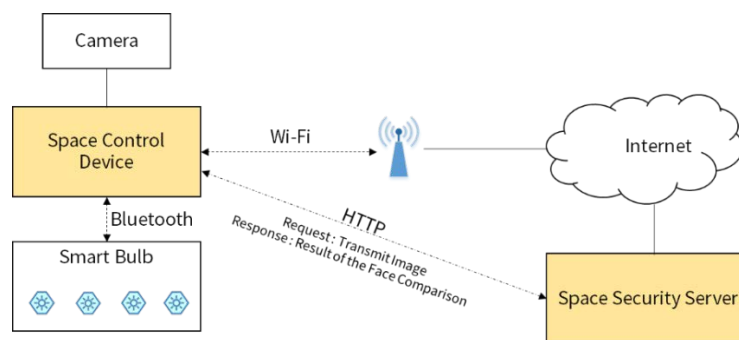


Figure 3. Communication Link in ISS

Use case for ISS is described as the followings:

- 1) A human approaches a unit space.
  - 2) Space Control Device (SCD) in the unit space detects the moving through a sensor and then collects biometric information (picture, fingerprint, frame, etc.)
  - 3) SCD sends the biometrics information data to Space Security Server (SSS)
  - 4) SSS analyzes the biometric information and gives a positive or a negative feedback to SCD based on the result of the analysis.
  - 5) After SCD received a feedback from SSS, it take an action to the human in positive or negative way depending on the result.
- e.g.
- a) In case of negative feedback, SCD regards the human as an intruder and then initiates alarming system
  - b) If the user is permitted, SCDs provides friendly guide beam

### 3. ISS (IoT-based Space Security) System Design

ISS System consists of four parts; Space Control Device (SCD), Space Security Server (SSS), Network and Connectivity, and Peripheral Devices.

#### 3.1. Space Control Device (SCD)

SCD has detect a target moving a unit space, collect bio-metric information from the target, followed by transferring the data to Space Security Server(SSS). Figure 5 illustrates the structure of SCD composed by three modules, which are space detector, Biometric collector, and communication model.

Space Detector recognizes approaching of someone through sensors using ultra-sonic, infrared wave, sound, etc. If someone have been detected in the unit space, Bio-metric Collector gets some bio-metric information such as face picture, moving pattern, etc. Then SCD sends the data to SSS for analyzing access right of someone. The Communicator of SCD is responsible for communication link management in network interface and application layer, respectively. In Figure 4, Communicator is connected to

Peripheral Devices to express a reaction scenario according to the result of SSS's feedback on the access right of someone.

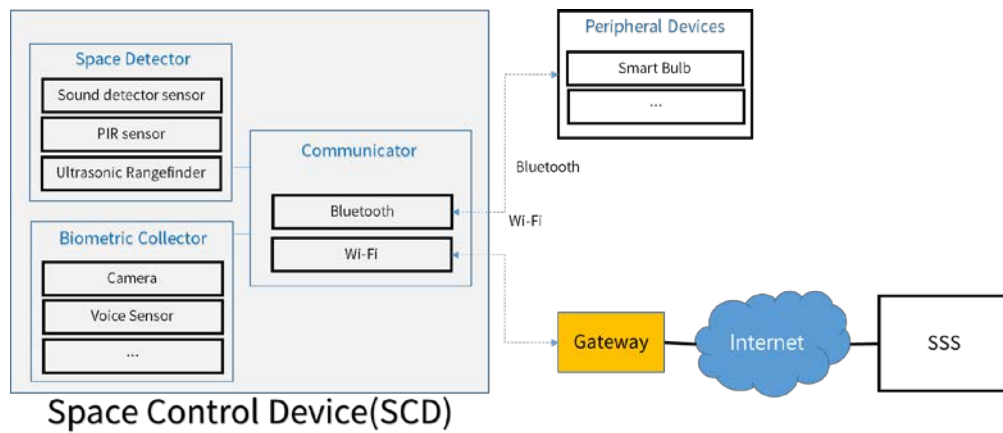


Figure 4. SCD Structure

Figure 6 illustrates an example of SCD operation, using detection sensors of sound and infrared, and camera for face picture.

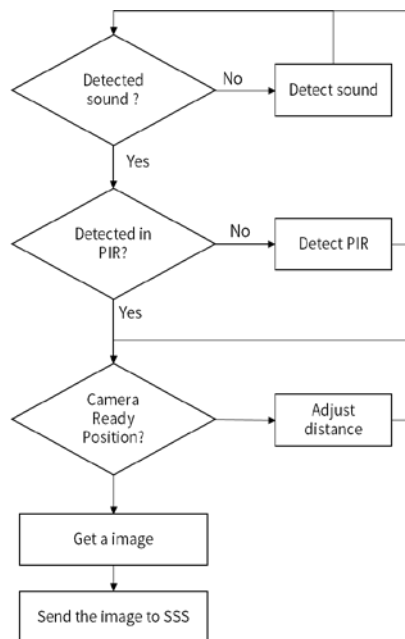


Figure 5. SCD Operation

### 3.2. Space Security Server (SSS)

Main roles of SSS is the server to analyze bio-metric information, and manage data base, control overall system. A single SSS exists in overall ISS system and communicates with SCD in application layer. Figure 6 shows six parts composed of SS; Database Manager, Bio-metric Analyzer, Device Manager, System Controller, and Communicator.

Database Manager is responsible for map management between each unit space and permitted group people. Each unit space has its unique location information and people group list with access right of the place.

Bio-metric Analyzer plays a role to analyze the bio-metric information to proceed certification process.

Typically, this process requires high-performance computing capability. We can consider clouding computing [12] for cost-effective method

Communicator in SSS has a role to communicate with SCD in application layer. Figure 6 shows an example using HTTP protocol.

Device Manager is for control of peripheral device from SSS, while System Controller deals with overall system control.

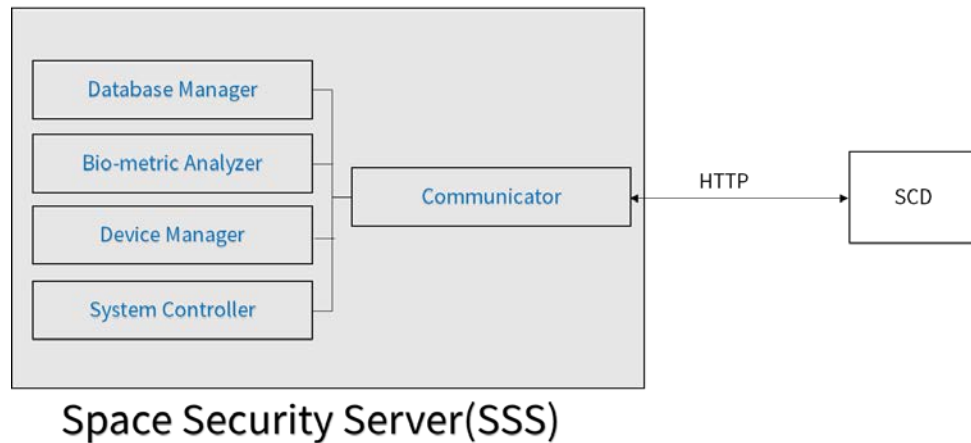


Figure 6. SSS Structure

Figure 7 illustrates an example of SSS operation for face recognition. SSS extracts a face image from the data sent from SCD and compares with the stored images of permitted group. By the result of the comparison, SSS sends SCD the feedback of 'permitted', or the feedback of 'not-permitted'.

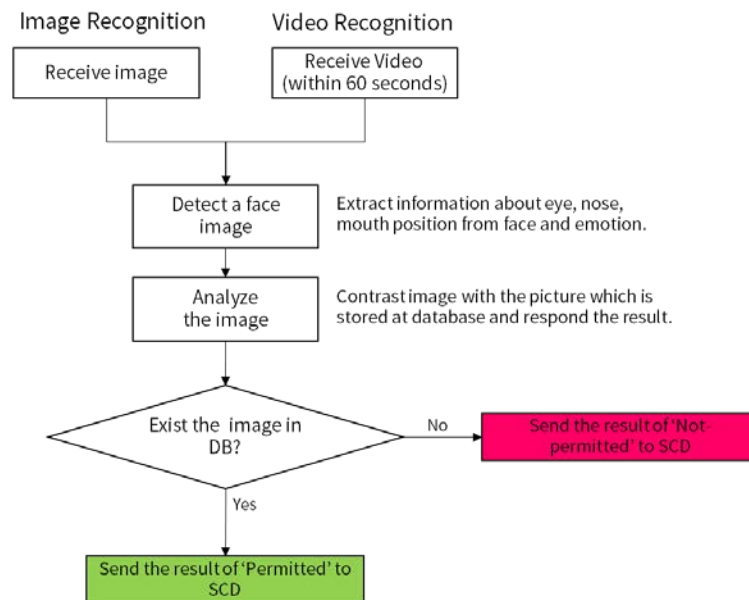


Figure 7. Face Recognition in SSS

### 3.3. Network and Connectivity

Network and Connectivity in ISS can be classified into local area link and wide area link. Local area networking is carried out within a unit space. In ISS system, we use Bluetooth and Wi-Fi connectivity for

the local interface to control and manage devices and sensors around the unit space coordinated by a SCD.

Smart bulb is operated by SCD via Bluetooth link and distance between SCD and smart bulbs should've at most 10 meters. For longer wireless link, Wi-Fi is used and provides service coverage up to around 50 meters in indoor. In addition, Wi-Fi is only a communication link to connected SCD to external network via a gateway [14]. Once Wi-Fi connection is established, SCD can communicate with SSS in external network using HTTP protocol in application layer.

### 3.4. Peripheral Devices

SSS or SCD can represent in intuitive way the result of a target certification in a unit space through the peripheral devices, which they can control. With smart bulbs as peripheral devices, if SSS judges a human as not-permitted person, SCD or SSS can makes alarming beam by turning on smart bulb with red color so that the space is recognized as an intruded zone.

### 3.5. System Evaluation

Performance of ISS System is measured in terms of security reliability and implementation complexity. Assume that the number of unit space in ISS is  $n$ ,  $P_o$  is overall security reliability, and  $P_{(s)i}$  is security reliability of  $SCD_i$ . Accordingly, although the security reliability of SCD is relatively low due to low-end device capability, overall security reliability can be achieved by combing multiple SCDs as the following equation is shown.

$$P_o = \prod_{i=1}^n P_{(s)i}$$

In addition, since IoT connectivity provides flexibility in combining multiple bio-metric certifications, the reliability in SCD can be improved with more than one bio-metric information.

In the aspects of implementation complexity, as the number of SCDs easily increase and SSS can be constructed using cloud solution. There is no serious working cost to extend service area compared with the existing method.

## 4. Conclusion

The term of security is generally used to protect from potential harms or to minimize any risks in many areas including computing and building management. When we look back current mega trends of IoT-based convergence in every area, we needs wide range of security concept and solution since we can expose potential harms on more connection of things over on-line and off-line situation. It is thus useful to understand space security management in a fundamental way.

We have proposed a new concept of IoT-based space security. In the comparison with the traditional methods such as door lock, real-time surveillance system, the space security scheme is to provide easy deployment and higher security level according to adding the number of unit space for protection. In addition, this scheme allows creative reaction by using other IoT devices according to the result of real-time detection of a given space. Space security system can trigger step-by-step alarming system to an intruder who has entered a space. On the other hand, a permitted person in a location enriches context-aware guides such as mood-lights, and automatic control of around devices, which the space security system can provide.

The most interesting benefit of the scheme is scalable structure attached to a physical location in terms of unit space dimension. Since the unit space basic management requires a simple IoT device to manage the unit space, it naturally gives low cost construction customized to a requirement of a target in terms of security level, size of overall space, and alarm representation. The over security level is getting higher as the number of unit space is added, which means that overall security can guaranteed in spite of relatively low of security level in a unit space. In addition, we can choose specific bio-metrics among iris, face, pam print, voice, walking pattern, etc, and measure overall security level by combining the results from unit spaces

Several areas remains for further works. One of interesting topics will be to explore more insights on deciding values in terms dimension of a unit space, and the number of unit spaces in overall service area.



Space security concept is not limited to a human target. If we assume a things or object (device) being placed in a space, we can find new applications in more creative way.

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## Labs and Classes: An IoT Design and Implementation

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### Abstract

Smart devices can automatically connect to the Internet and form an intelligent network called Internet of Things (IoT). In this paper, the focus is on the application of IoT in the Smart Educational Environment. We are introducing a system which we implemented to control some class and lab activities in the University with Arduino Ethernet web server and android smart phone. The system architecture deployed at the university gateways and users smart devices. A prototype implementation and performance evaluation results are also presented.

**Keywords:** *Internet of things, smart univeristy, remote controlled, smart labs and classes automation, Android smartphone, Arduino*

## 1. Introduction

We live in an era where billions of computers are interconnected. Computers with many different digital devices and other physical objects becomes seamlessly connected to each other and be able to communicate with little or no human intervention. These interconnected objects are called smart devices, and this concept is called Internet of Things (IoT). IoTs can be described as connecting everyday objects like smart-phones, Internet TVs, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves [1]. Building IoTs has advanced significantly in the last couple of years since it has added a new dimension to the world of information and communication technologies. According to [2], it is expected that the number of devices connected to the Internet will accumulate from 100.4 million in 2011 to 2.1 billion by the year 2021, growing at a rate of 36% per year. In the year 2011, 80% machine to machine (M2M) connections were made over mobile networks such as 2G and 3G and it is predicted that by 2021, this ratio will increase to 93% since the cost related with M2M over mobile networks are generally cheaper than fixed networks as illustrated in Fig. 1 [3].

IoT technology has been applied to create a new concept and wide development space for smart homes to provide intelligence, comfort and to improve the quality of life. However, applying IoT in different environmental areas like education is very rare. The smart classroom concept has appeared in the literature as Internet based distance education system or as intelligent environment equipped with an assembly of many different types of hardware and software modules [4]. In the process of everyday teaching, lecturers are usually trying to find out if the students (or more general the auditorium) were satisfied with the lecture, which part of a lecture was interesting, which presentation techniques and approaches were more and effective than the others. Previous studies have shown that approximately after 10 minutes students' attention begins to decrease. At the end of a lecture, students remember 70% of the information presented in the first ten and only 20% of the last ten minutes [5].



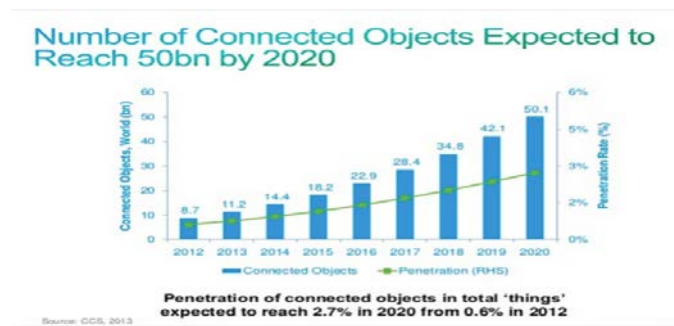


Fig. 1 Internet of things – 50bn connected devices [3]

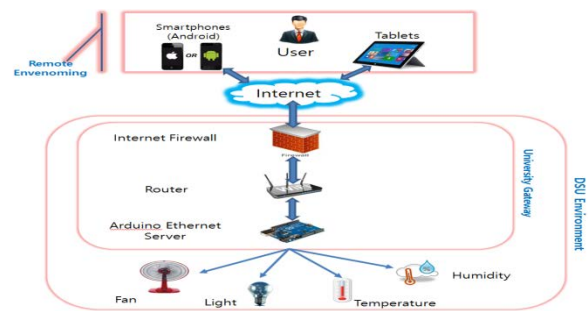


Fig.2 Overview of University UbiquitousClasses and Labs Architecture

In our work, we are taking IoT to another level, to educational environment by introducing a system which we are implementing to control some class and lab activities in Dongseo University with Arduino Ethernet web server and android smart phone.

## 2. Research Motivation

In our opinion, a system or framework that reduces the consumption of energy when it is not needed is required whether in case of traditional or economical light bulbs, air conditioner, computers and other devices.

The main research gap here can be summarized as following:

- Less research has been done in applying IoT in education.
- High cost of electricity and energy is one of the main concerns of universities top management.
- With University as a case study, managing and monitoring devices in the university such as lightings, air condition, security and computers are still done manually and can't be controlled remotely.
- Inefficient resource management.

The next section presents our proposed solution.

## 3. Our Proposed work

In this work, we address the potential of using IoT to build a smart ubiquitous labs and classes in University. To demonstrate the feasibility and effectiveness of this system, devices such as light switches, power plug, temperature sensor and current sensor are integrated with the proposed class and lab control system.

In our work we are taking IoT to another level, to educational environment inside the universities where higher education may soon see smart sensors embedded in the school control of class/lab Lighting, Temperature, Lab door locks, seminar projectors, fans, computers, and other systems, to provide more convenience, comfort, power saving and security. Real time, actionable data will help schools to know exactly when to service equipment and achievesavings from the most optimal utilization of facilities and energy. Smart doors and security cameras know when to open, shut, lock and monitor movement through a space. We are applying it in real scenario at University.

Ubiquitous Labs and Classes System is undeniably a resource which can make the university environment automated. Students, lecturers and stuff can control the premises electrical devices via these university automation devices and set up controlling actions through Mobile. So, with this solution, the users will not be worried about the devices energy consumption anymore and will save time, money (long run), self-maintenance, security, and makes life easier.

### 3.1 Work Description and Architecture

This section describes the proposed architecture and design of flexible and low cost university controlling and monitoring system. The architecture is divided into three layers: University Environment, University Gateway and

Remote Environment (see Fig.2). Remote Environment represents authorized users who can access the system on their Smart phone app using the Internet via Wi-Fi and 3G/4G network. University Environment consists of Gateway and a hardware interface module. The primary function of the university Gateway for the proposed architecture is to provide data translation services between the Internets. The main component of the university Gateway is a micro Web - server based on Arduino Ethernet. The main task of the server is to manage, control and monitor system components, that enables hardware interface modules to successfully execute their assigned task using actuators and to report server with triggered events via sensors. Hardware interface modules are directly interfaced with sensors and actuators through wires. It has the capabilities to control energy management systems like lightings, power plugs, air conditioning systems and security systems such as door locks, and gate. For monitoring university environment the system supports sensors such as temperature and humidity. Fig. 3 and 4 represents the temperature measurement and light detection in client 1 and client 2 respectively.

#### 4. System Implementation

Software of the proposed U-system is divided into two parts: server application software and microcontroller firmware. The server application software is a library implementation of a micro Web-server running on Arduino Uno using the Ethernet shield. This Ethernet shield has the capability to be used both, as a client or a server. To successfully communicate between remote user and the university gateway, configuration stage and sensor/actuator control stage layers have been implemented on the Arduino Uno. The <Ethernet.h> libraries are used to receive data on Arduino Uno and creates output messages in JavaScript Object Notation (JSON) format.

There are two classes of Web services: Simple Object Access Protocol (SOAP) and Representational State Transfer (REST). RESTful is a much more lightweight mechanism than SOAP offering functionality similar to SOAP based Web services.

Therefore, in our work we used the RESTful based Web service utilizing standard operation such as GET and POST requests that return JavaScript Object Notation (JSON) responses to communicate between the remote user and the micro Web server. JSON is a lightweight data-interchange format. It is easy for human beings to read and write. It is also simpler for machines to parse and generate messages than using XML. For example, to turn ON the light, an HTTP POST request is sent to the resource of the server.

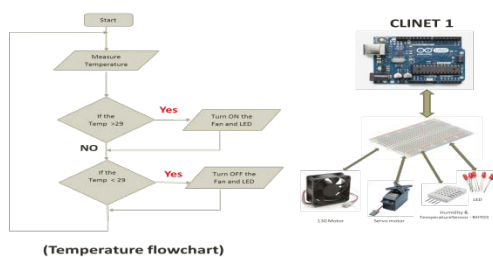


Fig.3 U-Smart System Client-1 temperature.

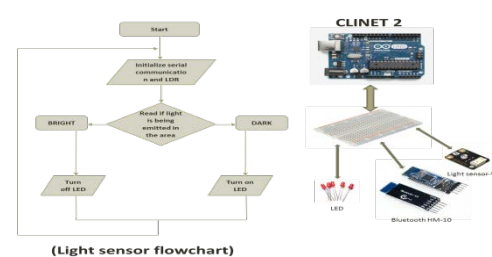


Fig.4U-Smart System Client-2 Light sensor.

##### 4.1. Other Details:

We developed and implemented the application in JAVA programming language using the Android Software Development Kit (SDK) as shown in Fig.5. We used The Blue Octopus variant features as a dedicated authentication server as well as the support of MQTT protocol. We used Raspberry Pi 2 Model as our gateway to communicate with the Mobius server. The complete architecture is shown in Fig. 6.

#### 5. Prototype Results

We used Arduino Uno as an end device, MySQL as a backend database, Sensors (Temperature Sensor, Humidity Sensor, Motion Sensor, and Light Sensor), Actuators (LED, Fan, Relays, and Breadboard). The fig. 7 and 8 represent the server and client output respectively.



Figure 5. U-Smart Class developed prototype.

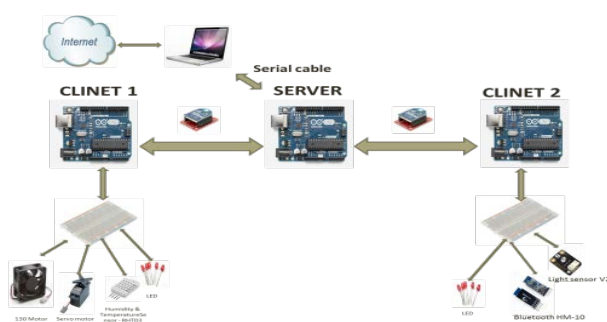


Figure 6. U-Smart System Server-Client Prototype Architecture.

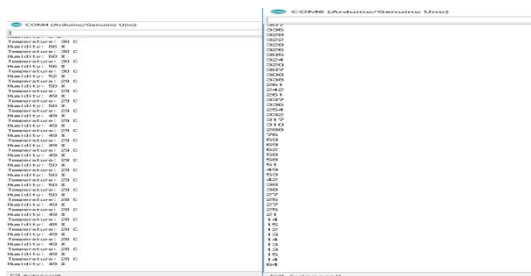


Figure 7. U-Smart System Client to Client Temperature Output.

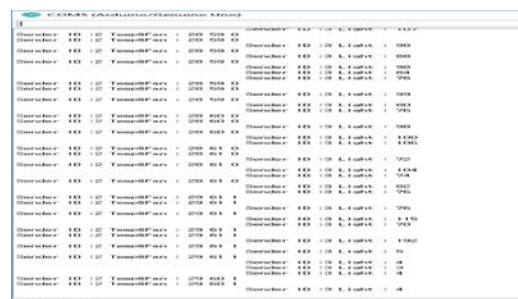


Figure 8. U-Smart System Server Output.

## 6. Conclusion

Successful integration of the Internet of Things into the education system is required and starts slowly in much nuanced ways. Some universities and schools may use it to save money or harness data. Ubiquitous Labs and Classes System is undeniably a resource which can make the university environment automated. Students, lecturers and staff can control the premises electrical devices via these university automation devices and set up controlling actions through Mobile. So, with this solution, the users are not worried about the devices energy consumption anymore and save time, money (long run), self-maintenance, security, and makes life easier.

## Acknowledgment

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## General study of Secure E-commerce Logistics Distribution

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### Abstract

E-commerce logistics distribution refers to the enterprise adopts networked computer technology and advanced management methods. The activities and processes are passed to the user and according to the user's order requirements, which it conducts a series of record, sorting, and determines the quantity of goods according to the agreed time and place. This new type of logistics distribution model has brought about tremendous changes in the field of circulation. This paper presented a General study of E-commerce logistics distribution.

**Keywords:** *e-mcommerce, e-commerce logistic, e-commerce logistic distribution.*

### 1. Introduction

In the traditional logistics distribution, there are unreasonable factors such as low automation, untimely information reception, and low network level, which hinders the efficiency of logistics distribution. The logistics distribution under e-commerce is a new logistics distribution mode that can shorten the distribution cycle, optimize the service quality and improve the competitiveness of enterprises by combining information network technology and logistics distribution in an open network environment. This kind of distribution mode is conducive to the improvement of logistics distribution efficiency. Logistics distribution under the e-commerce environment has many characteristics such as a large number of customers, relatively small customer demand, obvious customer dispersibility, and time requirements.

The rapid development of [1] information, communication, and network technologies has accelerated the pace of economic globalization and integration. because of the rapid life cycle, competition of enterprises is increasing where the personalization and diversification of customer needs becoming more and more obvious. It is difficult for traditional business models to cope with changing market demands. Therefore, the business model of the company must be fast conform to these changes. E-commerce is generally based on an open Internet environment, browsers/servers and other applications. For instance, buyers and sellers do not meet each other and carry out various business activities. However, E-commerce can be divided into broad e-commerce and narrow sense E-commerce. Using electronic services to achieve business, generalized e-commerce can be done through the intranet, extranet, and electronic tools for instance, Internet that share information between companies, suppliers and customers. Narrow e-commerce is to complete various trading activities through computer networks. E-commerce system consists of six Composition: e-commerce customers, online store, certification center, online banking, logistics, and network system. Logistics refers to the physical movement of a physical entity from a supplier to a demander. It is created by a series.

The composition of economic activity of time value and spatial value. Including order processing, purchase purchase, purchase warehousing, inventoryManagement, distribution replenishment, distribution processing, distribution operations, financial operations and many other basic activities. Logistics system is a system that controls raw materials, finished goods, finished goods, and information [2].



## 2. Main service functions of logistics

The main service functions of logistics are reflected in the following aspects:

- 1) Transportation function.
- 2) Custody function.
- 3) Delivery function.
- 4) Loading and unloading function.
- 5) Packaging function.
- 6) Logistics processing function.
- 7) Information processing function.

Distribution is a form of logistics. From the perspective of the way of circulation of goods, logistics and distribution is a modern. The way goods are circulated the whole process of logistics and distribution includes the following basic steps:

- 1) Formation of logistics orders: Customers submit orders via network devices such as the Internet, and customer service centers receive

The customer's order is sorted and summarized, and the personnel are arranged to pick up the goods.

- 2) Prepare the goods: The preparation for the distribution is to collect the items to be distributed from various distribution points. There is a distribution center for stock distribution.

- 3) Sorting and distribution: The sorting and distribution process can be divided into several separate processes, including the outbound document review nuclear, outbound information processing, picking, distribution, and outbound inspection.

- 4) Processing and fitting: It is an extension of circulation processing activities, such as bulk filling operations and repackaging of finished goods. The purpose is to improve the level of logistics services and reduce logistics costs. The basic goal of logistics and distribution is to reduce logistics costs as much as possible while meeting the needs cut the costs [3].

## 2. Characteristics of E-commerce logistics distribution

E-commerce logistics and distribution is to meet the customer's satisfaction, and it is the basic goal of the enterprise to find ways to minimize the transportation cost during the operation [5][6]. Characteristics of E-commerce logistics distribution are a large number of customers, size of each customer's demand is relatively small, dispersion of customers is obvious, customer has high requirements for the timeliness of arrival of the goods, high customer service needs, and Suppliers strive to save costs. Fig.1.

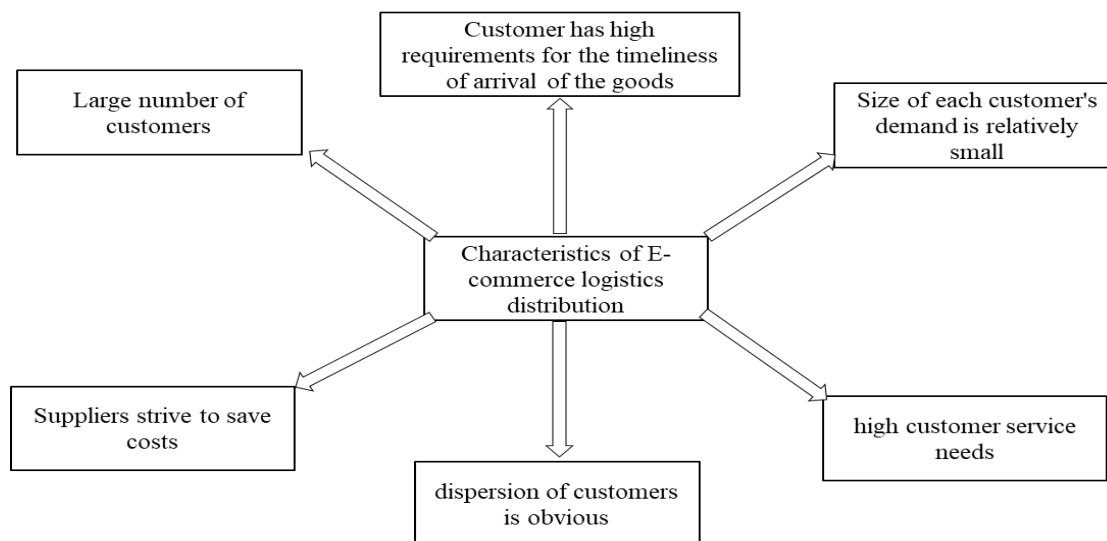


Fig. 1 Characteristics of E-commerce logistics distribution

### 3. Different types of E-commerce logistics distribution

In Fig. 2, third-party logistics refers to a form of logistics in which a professional enterprise other than the consignor and consignee related to the goods, that is, a third party, undertakes the logistics activities of the enterprise. The third-party logistics provider is defined as “a company that determines the return by contract and assumes all or part of the logistics activities of the owner. The service forms provided can be divided into operations-related services, management-related services, and both. There are three types of services, etc. Any form must be higher than the services provided by the past common carrier and contract carrier.

Constructed a third-party logistics and enterprise interest alliance: In summary, third-party logistics is a personalized series of logistics services provided by third-party logistics providers to users at specific prices for a specific period of time, and jointly builds alliances between enterprises.

First, third-party logistics is a contract-oriented set of services. Third-party logistics is different from traditional outsourcing. The outsourcing is limited to one or a series of decentralized logistics functions, such as transportation companies providing transportation services, warehousing companies providing warehousing services, and third-party logistics according to the requirements of the contract terms. It is not a temporary demand, providing versatile and even comprehensive logistics services. In accordance with international practice, the service provider charges 20% of the gross profit of the demand side during the contract period.

Second, third-party logistics is an alliance between enterprises. The third-party logistics companies share information fully, which requires the two parties to trust each other to achieve better results than the logistics activities alone. Moreover, from the perspective of the logistics service provider's charging principle, It is to share the risks and share the benefits; in addition, the relationship between the enterprises is not only one or two market transactions, but after the transaction has been maintained for a certain period of time, the transaction objects can be replaced with each other [4]. Take the behavior that maximizes the self-interest, and do not take the behavior that maximizes the common interest. Only in the logistics aspect, the contract is formed into an intermediate organization with equal advantages, risk sharing, two-way or multi-directional flow. Therefore, the enterprise There is a logistics alliance relationship.

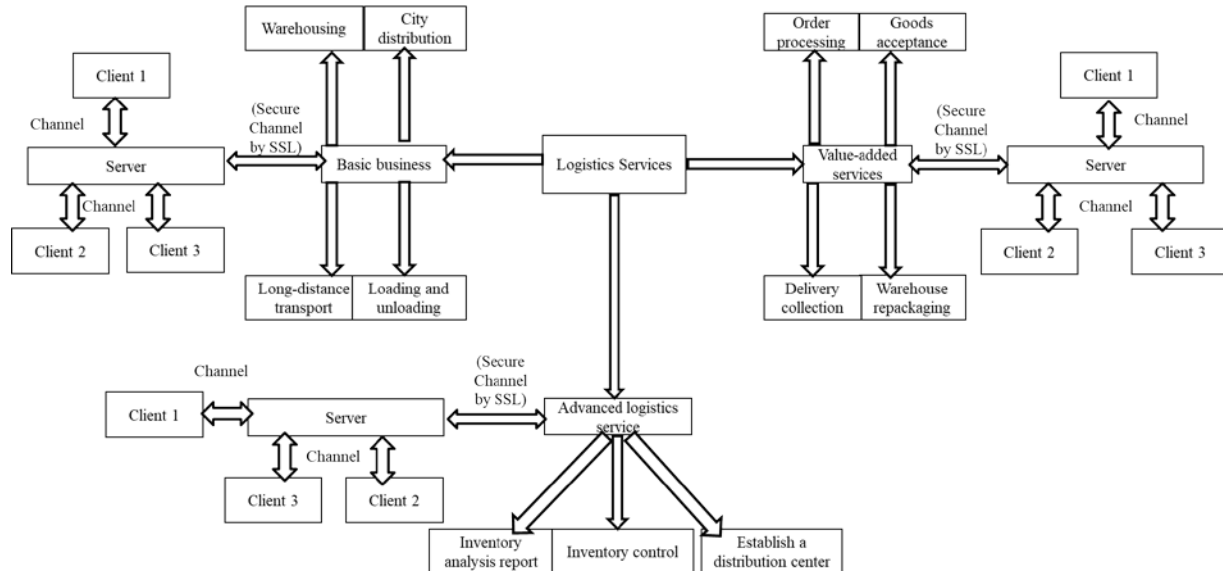


Fig. 2 Secure E-commerce logistics distribution

Saving costs is equal to creating profits: The demand for high-quality logistics services by SMEs is very urgent. Especially in foreign trade, small and medium-sized foreign trade enterprises have been striving to find safe, efficient and low-cost logistics services. A single enterprise is limited to its own business scale. In the process of using third-party logistics, it does not reduce the cost for the enterprise. Similarly, because of the low profit, the logistics demand of small and medium-sized enterprises is not attractive to third-party logistics companies. The total logistics demand of SMEs is huge, but they are scattered. If a large number of SME logistics needs can be integrated and packaged, and then connected to third-party logistics, it can save a lot of costs and create huge profits, and

promote the overall development of the logistics industry service level. So who is going to integrate these huge but scattered logistics needs? B2B e-commerce platform is increasingly equipped with this integration capability. Users on the platform will have logistics service needs as long as there is a transaction, and the platform will classify the data. Organize the package and open the data to third-party logistics. SMEs get the most cost-effective logistics services through the B2B e-commerce platform, and third-party logistics gains huge profits due to long-term continuous large-scale demand. The B2B platform thus gains user stickiness and expands the platform advantage.

Third-party logistics is an important form of logistics specialization. When the logistics industry develops to a certain stage, third-party logistics will inevitably occur, and there is a very close correlation between the third-party logistics market share and the logistics industry. At present, China's logistics level is still in its infancy, and both third-party logistics companies and B2B e-commerce platforms will have great potential to participate in them, and they will certainly face these huge challenges.

IBUonline Global Business Alliance: It has become an important network channel for global buyer procurement and suppliers and service providers. He has utilized the world's most advanced open cloud computing technology and has opened up a combination of third-party and upstream and downstream supply chain services including logistics, ports and information. The platform not only accurately matches and matches the purchase data of international buyers with the production data of the production enterprises, but also optimizes and integrates the information, finance, logistics, port and other services between upstream and downstream on the platform and conducts one-stop operation. Online trading solves problems such as market, order trading, service and supply chain.

Secure Sockets layer (SSL), provide the security when we transmit the information on the internet. However, when the client use the browser, SSL will establish secure link among the client and the server browser. Encrypt messages among the web server and the web browsers we use the Secure Sockets layer (SSL) where it encrypt the data packets of the Transport layer. One of the large problems of SSL is that dealer can stock the sensitive data of the cardholder where the protocol does not deny the non-repudiation due to the client authentication optional.

#### 4. Conclusion

E-commerce logistics and distribution is to meet the customer's satisfaction, and it is the basic goal of the enterprise to find ways to minimize the transportation cost during the operation. In this paper we perused the concept of Main service functions of logistics, general study of E-commerce logistics distribution. Different types of E-commerce logistics distribution. Therefore, the future work would consider the issues and challenges of E-commerce logistics and distribution

#### Acknowledgment

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## Survey on Digital Signature algorithms

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### Abstract

Digital signature is a method to provide integrity and authenticity to the digital data signature. In this paper we discuss different types of digital signatures. There are three algorithms that are suitable for digital signature generation under the DSS standard. First one is RSA algorithm second is the ElGamal algorithm, and the third is Elliptic Curve Digital Signature Algorithm (ECDSA). This paper discusses the cryptography including different types of digital signatures based on the kind of key and a few algorithms of Digital Signature RSA, ElGamal, and ECDSA.

**Keywords:** *Digital Signature algorithms, elgamal, RSA, ECDSA*

## 1. Introduction

Digital signatures are fundamental in today's modern world to verify the sender of a document's identity. A digital signature is performing in the computer as a string of binary. Signature is computer utilizes a set of principles and parameters (algorithm) such that identification of the person signing the document as well as the authenticity of the data can be confirmed.

There are three algorithms that are suitable for digital signature generation under the DSS standard. First one is RSA algorithm second is the ElGamal algorithm, and the third is Elliptic Curve Digital Signature Algorithm (ECDSA) [2]. The hash function is a standard used in the generation signature process. It is used to get a compressed version of the data that is called a message digest. To generate the digitally signed message this message digest then put into the digital signature algorithm. Also hash function is used in the verification process. Hash function used in the DSS standard is particular in the Secure Hash Standard (SHS) [1], which are the specifications for the Secure Hash Algorithm (SHA). The SHA is based on principles similar to those used by Professor Ronald L. Rivest of MIT when designing the MD4 message digest algorithm and is closely modeled after that algorithm. When a message of any length < 264 bits is input, the SHA produces a 160-bit output (message digest). Signing the message digest rather than the message often improves the efficiency of the process because the message digest is usually much smaller in size than the message.

## 2. Simple digital signature algorithm

The public key is used in the signature verification process. The public key need not be kept secret, but its integrity must be maintained. Anyone can verify a correctly signed message using the public key.

Signing Process by Sender: First a message digest (MD) is generated. A message digest is a "summary of the message that is going to be transmitted," and created by a set of hashing algorithms that were agreed to by both parties. The hashing algorithm ensures the integrity of a message by producing a completely different hash value (MD) when a single piece of the message changes. An MD encrypted with a sender's private key and an encrypted message digest is created, which is called a digital signature (DS). A digital signature is enclosed with the message and sent to the receiver (Fig. 1).

**Signature Verification Process by Receiver:** Using the sender's public key, a receiver decrypts the digital signature to obtain the message digest generated by the sender. Using the same hashing algorithm, the receiver calculates the MD of the received message. The acquired MD value is compared with the sender's MD value. If they are identical, then the message is not altered and the originality is assured. At this phase, if decrypting the message using the sender's public key [5] results in faulty message digests, then the message has been changed and cannot be trusted. However, it is clearly shown that the integrity of the message is maintained but not the privacy, since the message is sent plainly.

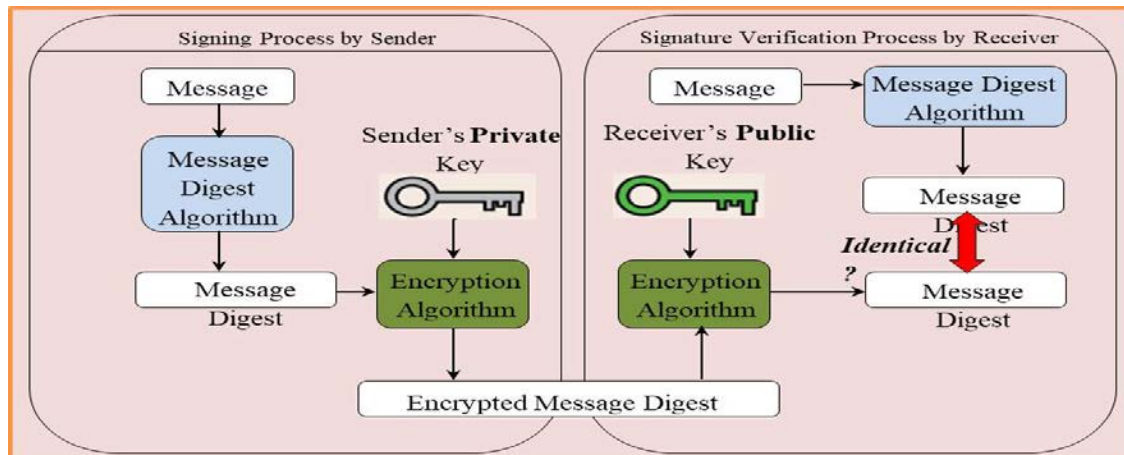


Fig. 1 Simple digital signature algorithm

This may be suited to a situation where confidentiality is not an issue. In order to ensure confidentiality in communication, the message should be encrypted. Basically, a digital signature scheme typically consists of three algorithms, namely key generation, signing and signature-verifying algorithms. The techniques are varied, and these systems are categorized based on their mathematical problems. Generally, public key systems are grouped into three main classes which are based on integer factorization (i.e. RSA), discrete logarithm (i.e. DSA), and elliptic curve discrete logarithm (i.e. ECDSA). The security degrees of all the techniques are based on the hardness of mathematical problems.

### 3. Digital Signature Algorithm (DSA)

The DSA can be viewed as a variant of the ElGamal signature scheme[3]. Its security is based on the intractability of the discrete logarithm problem in prime-order subgroups of  $Z_b^*$ .

**DSA domain parameter generation.** Domain parameters are generated for each entity in a particular security domain. (See also the note below on secure generation of parameters.)

Select a 160-bit prime  $D$  and a 1024-bit prime  $b$  with property that  $D \mid b-1$ .

(Select a generator  $g$  of the unique cyclic group of order  $D$  in  $Z_b^*$ .) Select an element  $h \in Z_b^*$  and compute  $g = h^{(b-1)/D} \bmod b$  (Repeat until  $g \neq 1$ .)

Domain parameters are  $b$ ,  $D$  and  $g$ ;

**DSA Key Pair Generation.** Each entity  $A$  in the domain with domain parameters  $(b, D, g)$  does the following:

Select random or pseudorandom integer  $x$  such that  $1 \leq x \leq D-1$ .

Compute  $y = gx \bmod b$ .

$A$ 's public key is  $y$ ;  $A$ 's private key is  $x$ .

**DSA Signature Generation.** To sign a message  $m$ ,  $A$  does the following:

Select a random or pseudorandom integer  $k$ ,  $1 \leq k \leq D-1$ .

Compute  $X = gk \bmod b$  and  $r = X \bmod D$ . If  $r=0$  then go to step 1.

Compute  $k^{-1} \bmod D$ .

Compute  $e = \text{SHA-1}(m)$ ; Compute  $s = k^{-1}\{e + xr\} \bmod D$ . If  $s=0$  then go to step 1.

$A$ 's signature for the message  $m$  is  $(r, s)$ .

DSA Signature Verification. To verify A's signature (r,s) on m. B obtains authentic copies A's domain parameters (b, D, g) and public key y and does the following:

Verify that r and s are integers in the interval  $[1, D-1]$ .

Compute  $e = \text{SHA-1}(m)$ ; Compute  $w = s^{-1} \bmod D$ .

Compute  $u_1 = ew \bmod D$  and  $u_2 = rw \bmod D$ .

Compute  $X = g^{u_1} y^{u_2} \bmod b$  and  $v = X \bmod D$ .

Accept the signature if and only if  $v=r$ .

#### 4. Digital Signature Algorithm (RSA)

RSA is a public-key cryptosystem that gets its name from its inventors – Rivest, Shamir and Adleman and was developed in 1977[4]. It has since withstood years of extensive cryptanalysis. It is used for electronic commerce and many other secure communications over the Internet. RSA is a Block cipher in which the plain text and cipher text are integers between 0 and  $n - 1$  for some integer  $n$ . RSA gets its security from the difficulty of factoring large numbers.

Working of RSA: Select 2 random large prime numbers  $b$  and  $D$  of almost equal length. Compute their product  $n = bD$ . The Euler's Totient function  $\phi(n)$  is computed, i.e.  $\phi(n) = (b - 1)(D - 1)$ . We then choose two keys  $a$  and  $b$  such that,  $a.b \equiv 1 \pmod{\phi(n)}$ . One of the keys say  $a$  is made public while the other key  $b$  is kept a secret. At this point, we no more require  $b$ ,  $D$  and  $\phi(n)$ . We can discard these values. If we have a message  $M$ , encryption of  $M$  is  $C = Ma \bmod n$ ,  $C$  is the resultant cipher text. Decryption of  $C$  is achieved by  $M' = Cb \bmod n$ .

Consider  $M' = Mab \bmod n = Mk\phi(n) + 1 \bmod n$  (Since  $a.b \equiv 1 \pmod{\phi(n)}$ )  $\Rightarrow M' = M \cdot Mk\phi(n) \bmod n = M \bmod n$  (It can be proved that  $x\phi(n) \equiv 1 \pmod{n}$ )

Hence we see that  $M = M'$ . Thus we have achieved efficient encryption and decryption using RSA.

#### 5. Elliptic Curve Digital Signature Algorithm (ECDSA)

ECDSA Key Generation. The user A follows these steps where  $p$  is a large prime:

Select a random integer  $d \in [1, S - 1]$ .

Compute  $D = d \times b$ .

The public and private keys of the user A are  $D$  and  $d$ , respectively.

The other parties can check if the public key is valid by;

Checking that  $D \neq 0$ .

Checking that  $x_D$  and  $y_D$  are properly represented elements of  $FD$ .

Checking that  $D$  is on the elliptic curve defined by  $a$  and  $b$ .

Checking that  $s_D = D$ .

If any of these checks fail the public key  $D$  is invalid, otherwise  $D$  is valid. The following procedure describes how to generate the signature.

ECDSA Signature Generation

Select a pseudorandom integer  $k \in [1, s - 1]$ .

Compute  $k \times B = (x_1, y_1)$  and  $r = x_1 \bmod s$ .

If  $x_1 \in GF(2k)$ , it is assumed that  $x_1$  is represented as a binary number.

If  $r = 0$  then go to Step 1. Compute  $k^{-1} \bmod s$ .

Compute  $s = k^{-1}(H(m) + d \cdot r) \bmod s$ .

Here  $H$  is the secure hash algorithm SHA-1.

If  $s = 0$  go to Step 1.

The signature for the message  $m$  is the pair of integers  $(r, s)$ .

ECDSA Signature Verification

Verify that  $r$  and  $s$  are integers in the interval  $[1, s-1]$ .

Compute  $c = s^{-1} \bmod s$  and  $H(m)$ .

Compute  $u_1 = H(m) \cdot c \bmod s$  and  $u_2 = r \cdot c \bmod s$ .

Compute  $u_1 \times B + u_2 \times D = (x_0, y_0)$  and  $v = x_0 \bmod s$

Accept the signature if  $v = r$ .

ElGamal Digital Signature

El Gamal Key Generation



The prime  $b$ , a generator  $g$  of field  $Z_b^*$ ,  $A$ 's private key  $d_A$  is a random integer from the interval  $[1; b-1]$  and her public key is  $y_A = g^{d_A} \bmod b$ .

## 6. El Gamal Signature Generation

Select a random integer  $k$  from interval  $[1; b-1]$ , satisfying  $\gcd(k; b-1) = 1$ ;

Compute  $k^{-1} \bmod (b-1)$ ; Compute  $r = g^k \bmod b$ ;

Compute  $s = k^{-1} \{h(m) - d_A r\} \bmod (b-1)$ .  $h$  is the hash function:  $\{0; 1\} \rightarrow Z_b$ .

$(r; s)$  is  $A$ 's signature of message  $m$ .

El Gamal Signature Verification

Verify that  $1 \leq r \leq b-1$ ; Compute  $v_1 = y_A^r g^k \bmod b$ ;

Compute  $h(m)$  and  $v_2 = gh(m)$ ; Accept if and only if  $v_1 = v_2$ .

Scour Digital Signature; Scour Key Generation

Primes  $d, b$ , satisfying  $d \mid (b-1)$ , the generator  $\alpha$  of the unique cyclic subgroup of  $Z_b^*$  (satisfying  $\exists u \in Z_b^*, \alpha = u^{(b-1)/d} \bmod b$ , but  $\alpha \neq 1$ ).  $A$ 's private key  $d_A$  is a random integer from the interval  $[1; d-1]$ , and her public key is  $y_A = \alpha^{d_A} \bmod b$ ; Schnorr Signature Generation

Select a random integer  $k$  from interval  $[1; d-1]$ ;

Compute  $r = \alpha^k \bmod b$ ,  $e = h(m \parallel r)$  and  $s = d_A e + k \bmod d$ .  $h$  is the hash function  $\{0; 1\} \rightarrow Z_d$ .  $(s; e)$  is  $A$ 's signature of message  $m$ .

Schnorr Signature Verification

Compute  $v = \alpha s y_A^{-e} \bmod b$  and  $e' = h(m \parallel v)$ ;

Accept if and only if  $e = e'$ ;

## 7. Conclusion

The DSA was proposed in August 1991 by the U.S. National Institute of Standards and Technology (NIST) and was specified in a U.S. Government Federal Information Processing Standard (FIPS 186) called the Digital Signature Standard (DSS). In this paper we perused the concept of Cryptography including different types of digital signatures based on the kind of key and a few algorithms first one is RSA algorithm, second is the ElGamal algorithm, and the third is Elliptic Curve Digital Signature Algorithm (ECDSA). Future work would consider the Comparison of Security Levels for RSA algorithm, ElGamal algorithm, and Elliptic Curve Digital Signature Algorithm.

## Acknowledgment

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## General Study of Digital Signature Schemes

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### Abstract

Digital signatures are fundamental in today's modern world to verify the sender of a document's identity. Digital signature is performing in the computer as a string of binary. Signature is computer utilizes a set of principles and parameters such that identification and authenticity of the data can be confirm. The main objective of this work is to have general information about digital signature schemes.

**Keywords:** *Digital Signature schemes, DSA, ECDSA, RSA*

### 1. Introduction

The signature is created by the use of a private key. Only to the user is known the private key. The signature is verified makes use of a public key which match to the private key. Every user has one public key and one private key pair. Public keys are known by everyone, and can be used to verify the user signature. However private key is not shared, private key is used in generation signature, which is done only by the user [1].

Digital signatures used to reveal unauthorized amendment to data. However, the recipient of a digitally signed document in proves to a third party that the document was indeed signed by the human who it is assumed to be signed. This is recognized as nonrepudiation, because the human who signed the document cannot refuse the signature at a later time. We can use Digital signature algorithm in electronic funds transfer, e-mails, data storage, electronic data interchange, software distribution, and just about any application that would need to assure the integrity and originality of data [2].

#### The Digital Signature Algorithm (DSA):

DSA is specified in DSS. The specification includes criteria for the generation of domain parameters, for the generation of public and private key pairs, and for the generation and verification of digital signatures.

#### The RSA Digital Signature Algorithm:

RSADSA is specified in American National Standard (ANS) X9.31 and Public Key Cryptography Standard (PKCS) #1. FIPS 186-4 approves the use of implementations of either or both of these standards and specifies additional requirements.

#### The Elliptic Curve Digital Signature Algorithm (ECDSA):

ECDSA is specified in ANS X9.62. FIPS 186-4 approves the use of ECDSA and specifies additional requirements. Recommended elliptic curves for Federal Government use are provided herein.

The public key is used in the signature verification process. The public key need not be kept secret, but its integrity must be maintained. Anyone can verify a correctly signed message using the public key [3].

For both the signature generation and verification processes, the message (i.e., the signed data) is converted to a fixed-length representation of the message by means of an approved hash function. Both the original message and the digital signature are made available to a verifier (Fig. 1).

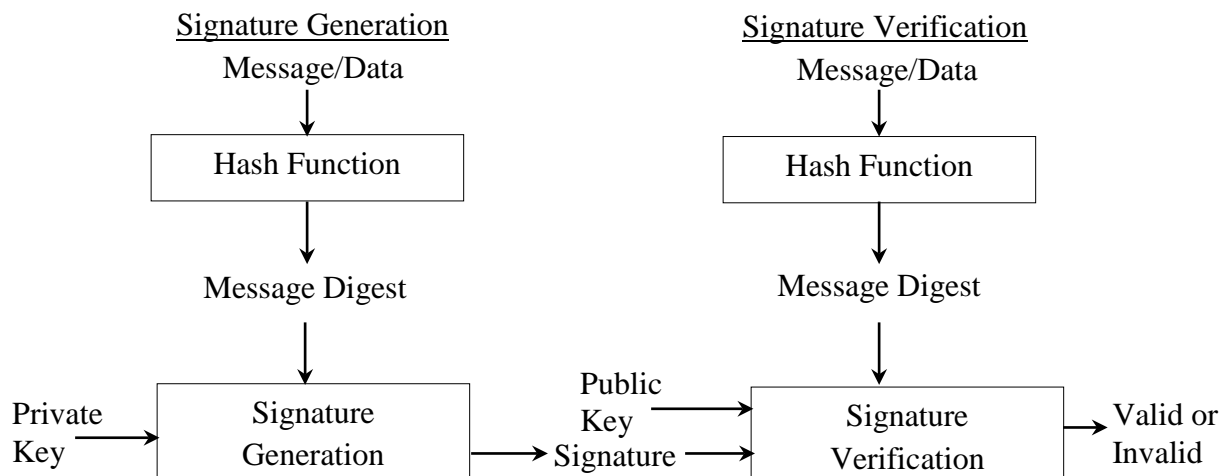


Fig. 1 Digital Signature Processes [5]

## 2. Applications of digital signatures

Digital signatures can supply assertion of the evidence to exporter, identity, and status of an electronic document and acknowledging informed approval of the site by a signatory [4].

**Integrity:** There are status where is a need for dependability where the message has not been changed during transmission. However, if a message is digitally signed, any modification in the message after signature will abrogate the Digital Digital signatur.

**Authentication:** to authenticate the origin of message, we can use digital signatures. For instance, Alice will sends Bob the encrypted message digest. In order for Bob to authenticate the signature he should apply the same hash function as Alice to the message she sent to him. He will also decrypt the encrypted message using Alice is public key and compares the two. If the two are the same then he has successfully authenticated the signature. If the two are not match then either an error happen through transmission or someone was trying to impersonate Alice. However, valid signature display that the message was sent by the ownership user, when the digital signature of the ownership is constrained to a particular user.

**Non-repudiation:** here the information that we may have received can be definitely attributed to somebody and there is no way that they can take it back. They definitely said what is that we have in this message right here.

## 3. Different types of digital signatures

- Digital Signatures with appendix: Require the message as input to the verification
- Digital signatures with message recovery: A priori knowledge of the message is not required for the verification algorithm
- Digital signatures based on RSA:Includes the features of both Digital Signatures with appendix and Digital signatures with message recovery
- Blind signature schemes: Allows sender A to remain anonymous so that spending patterns cannot be monitored

## 4. Comparison of Security Levels

An elliptic curve, defined modulo a prime  $p$ , is the set of solutions  $(x, y)$  to an equation of the form:

$$y^2 = x^3 + ax + b \pmod{p}$$

For two numbers  $a$  and  $b$ .

If  $(x,y)$  satisfies the above equation

then  $P=(x,y)$  is a point on the elliptic curve.

In fact, an elliptic curve can also be defined over the finite field consisting of  $2^m$  elements. Such a representation offers extra efficiency in the operation of the ECC.

Using some particularly deep mathematics, it is possible to define the “addition” of two points on the elliptic curve.

Suppose  $P$  and  $Q$  are both points on the curve, then  $P + Q$  will always be a different point on the curve. The elliptic curve discrete logarithm problem can be stated as follows. Fix a prime  $p$  and an elliptic curve.  $xP$  represents the point  $P$  added to itself  $x$  times. Suppose  $Q$  is a multiple of  $P$ , so that  $Q = xP$  for some  $x$ . Then the elliptic curve discrete logarithm problem is to determine  $x$  given  $P$  and  $Q$ .

Fig. 2 compares the time required to break the ECC with the time required to break RSA or DSA for various modulus sizes using the best general algorithm known. The values are computed in MIPS years. A MIPS year represents a computing time of one year on a machine capable of performing one million instructions per second. As a benchmark, it is generally accepted that  $10^{12}$  MIPS years represents reasonable security at this time, since this would require most of the computing power on the planet to work for a considerable amount of time.

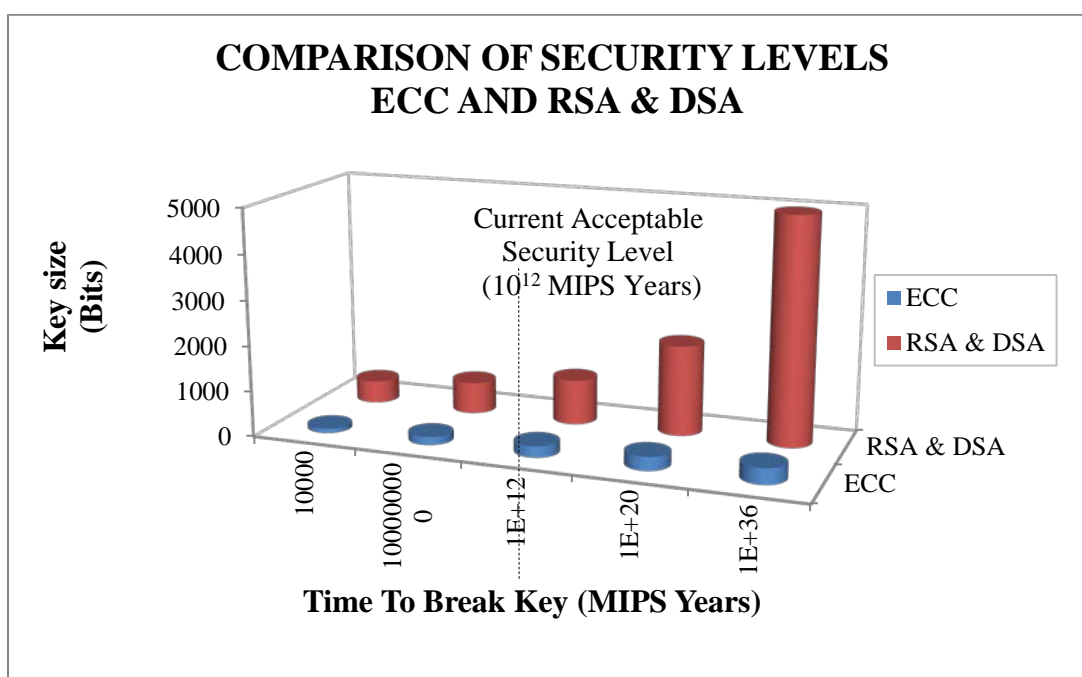


Fig. 2 Comparison of Security Levels

Therefore, from the figure, we see that to achieve reasonable security, RSA and DSA should employ a 1024-bit modulus, while a 160-bit modulus should be sufficient for the ECC. Not only can it be seen that the ECC requires a much smaller modulus than RSA or DSA, but also that the security gap between the systems grows as the key size increases. For example, 300-bit ECC is a great deal more secure than 2000 bit RSA or DSA.

#### 4. Conclusion

Digital signatures are fundamental in today's modern world to verify the sender of a document's identity. In this paper we perused the concept of general information about Digital Signature Processes digital signatures applications, different types of digital signature with the Comparison of Security Levels. Electronic digital signature (EDS) has eliminated most of the problems inherent in the signature on a paper document; however the future work would consider the proof of identity of who sent the document and confirmation of the authenticity of the document.

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## **Analysis of the functionality and aesthetic value based on the design of color in animation**

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### **Abstract**

In order to enhance the attraction and get the resonance of audiences, animation works usually need to rely on the scientific application of color, that is, to use color to describe a variety of storylines, thus interpreting role conflict. The application of color in animation design also requires careful design and effective artistic treatment under the influence of subjective will. The main purpose of this artistic treatment is to effectively serve animated stories, image of characters and so on. In the whole field of animation design, color plays an important role that can not be ignored. In animation works, the animated characters is also the main way to show the role performance. Therefore, the functionality and aesthetic value of color need to be paid attention to in this link, only in this way can we achieve the richness of animation. For this reason, this article will conduct a detailed analysis focusing on the functionality and aesthetic value of design color in animation.

***Keywords-Animation; Design color; functionality; Aesthetic value***

### **1. Introduction**

Color is an important way to express everything in the world. It is not only an important reflection mode of light, but also a key component of visual elements. Animation can achieve intuitive representation of animated characters and imagined worlds through effective application of color. Therefore, to a certain extent, color can give the animation more complete expressive power. As a new visual art, animation should realize the display of function and aesthetic value with the help of color, which has a very important positive impact on the artistic value of animation works. From here we see that the application of color in animation design is also very important. This article will take the animation design color as the main research object, and further study its functionality and aesthetic value, hoping to provide effective help for the development of animation design color field.

### **2. functionality of color in animation design**

Under the background of the development and promotion of various technical levels in the current society, animation technology has also been greatly improved and developed, so the presentation of animated films is often very rich, the use of color itself has a strong functionality. After practical research, its functionality is mainly reflected in the following points.

#### **2.1. Improve the visual effect of animation**

Animation is a typical visual art, so the visual effect is also very important. For example, Mickey Mouse, the earliest animation in Disney animation, can only show people black-and-white works because of the limitations of playing technology and animation technology at that time, while black and white color can



only show the character's movement and expression, and can not show the best visual effect for people<sup>[1]</sup>. Until 1935, the appearance of the world's first color animated film “Flowers and Trees” not only gave people a more intuitive and stronger visual impact, but also brought a great impact on the use of color.

## **2.2. Exert the dynamic effect of animation**

The dynamic effects of animation to be displayed not only by lines, but also by color. Only in this way can we adjust the color saturation, the way of using color and so on, eventually bring visual differences to the audience and strengthen the visual impression in connection with life, which is also the special effect of color on animation. Many animations use color position changes to construct dynamic lenses, such as Japanese animations often use meteor tracks to reflect the disappearance of characters<sup>[2]</sup>. In three-dimensional animation, the dynamic effect sketched out by color is often more significant, such as the current children's favorite “Frozen”, whose pictures take white, blue and purple as the basic tones of the animation, thus expressing the state of flying with the wind by color. Among them, Princess Elsa's cloak is expressed with a certain sense of transparency of the lake green, this way can not only show the transparency of the cloak, but also to a large extent enhance the princess's noble status and enrich the personality of animated characters.

## **2.3. Effectively communicate the animated emotion**

In the process of color application, emotion also needs to be expressed. Show the emotional changes of characters through flexible colors in the animation, so that the audience can more intuitively perceive the character's emotional direction under the influence of color<sup>[3]</sup>. For example, in “Tom and Jerry”, when Tom encountered an unhappy event or was plotted by Jerry, the background will change to a dull color, thus expressing the character's emotions. But if something pleasant happens, the background color will also change, such as the blue sky or clear seawater can reflect the main character's happiness. In addition, color can also express the fixed emotional state of the characters themselves. For example, in the “Super Three”, the setting of the characters is closely related to the original, and the elements of opera are also strong, such as Guan Yu's red face shows his good faith, virtue and patriotism<sup>[4]</sup>.

## **2.4. Enrich the meaning of animation**

We know that color can achieve effective expression of emotion. Taking animation as the main unit, the color tone used in the whole animation can also represent the emotion of the whole animation, and part of the tone changes can realize the expression of the emotional transformation of animation. For example, the animation “Snow White and the Seven Dwarfs” in 1937, as the impact of the First World War has not been completely calmed, the Second World War was spreading wantonly. Although people continued to live, the overall mood and atmosphere was still heavy. Through the bold use of warm tones and natural colors, this animation not only conveyed a sense of tranquility, but also reflected people's belief in the triumph of evil.

## **3. The aesthetic value of color in animation design**

Animation with color only can not reflect the aesthetic value of the animation, and is also lacking in vitality, animation can be more vivid only by providing corresponding emotion and life for animation. The aesthetic value of color in animation design can also be studied from the following aspects.

### **3.1. It has a significant effect on style positioning**

The value of style positioning is mainly reflected in the following links: First of all, the age span of the current audience of animations are often relatively large, the theme or style preference of different audience groups also has a great difference, among them, color also has a very significant difference in style positioning. For younger children, animation with higher color saturation can be chosen, because the richness of color has a more direct reflection on the children's brain. This simple way of using color also plays a very important role in the daily color teaching of parents<sup>[5]</sup>. For teenagers, thematic animation also

can use natural colors and rich colors, this way can not only improve the exquisite degree of animation itself, but also play a very important role in the enhancement of the degree of affection for teenagers. The adult group pays more attention to the sense of picture in animation, and has more meticulous requirements for the use and collocation of color, so it needs to spend more time to explore the details of color knowledge. Secondly, the color usage habits can achieve accurate positioning for the aesthetic style of animators themselves. For example, Hayao Miyazaki's works in Japanese cartoons can intuitively reflect his personal style. Among them, the coloring method of celluloid in Japanese cartoons is also a link with strong style characteristics, while the cartoons in Europe and America prefer to be realistic or exaggerated, and has more striking style characteristics.<sup>[6]</sup>

### **3.2. It has a significant aesthetic value for the shaping of roles**

Color often reflects a greater value in the link of role shaping, the most prominent is the reflection of personality, the use of different colors can achieve the embodiment of different characters, and foil the atmosphere. Only under the influence of relevant atmosphere can the roles show more remarkable vitality. For example, in the animation "Monkey King: Hero is Back", there is a scene of Monkey King wearing a purple gold crown with phoenix wings and a golden armor, majestic standing on the cliff, red cape waving behind himself, which formed a more obvious contrast with the cold color of the sky. comprehensively displayed the heroic image of Great Sage Equalling Heaven. Complete atmosphere also better showed the esthetic attitude for the hero, this is an important manifestation under the influence of color.

### **3.3. There is an aesthetic expression of film's meaning**

A film with depth will not simply think about the surface in the link of color selection, but embody the aesthetic thinking of animators in a more profound way. For example, in the animation "Spirited Away", the colors are mainly white and silver, so as to reflect the character's calm personality, this way can more fully express the purity and simplicity of the protagonist in the animation world outlook.

## **4. Relevant countermeasures for improving the functionality and aesthetic performance of color in animation design**

### **4.1. Scientifically research and explore the color matching**

In the design link, the green design concept also has the very vital significance, which is also a design idea playing the impetus role to the human development. In the link of color effectiveness, the integrativeness of green is stronger, and the integration of green in blue often shows beautiful scenery, the integration of green in yellow often reflects positive images<sup>[7]</sup>. Generally speaking, the main purpose of setting the background color is to show the theme, which is also closely related to the emotions between the characters. In this context, the inner world of the characters will change under the background of the work. It should be noted that the background color can not be changed at will, but should be changed under the effect of the theme, only in this way can the work be full of vitality.

### **4.2. Construct the animation scene space**

As a special form of language, the expression of color is also more intense. The design of animation scene also belongs to the art of space construction, which needs to play a more important role in the role playing. In the process of animation design, the most frequent usage mode is to highlight the scene space with the help of color and tone. For example, gray as the main keynote of the scene design, which requires the use of large areas of white and gray, this way can certainly expand the scene space. Although the color used in this way is relatively simple, but it can bring people a stronger visual contrast, and enhance the sense of level of the picture itself and sense of space.

### 4.3. Highlight the artistic effects of stories

Some animation scenes are relatively stimulating, especially in the use of lens language is more complex, it often brings a stronger visual impact in this way. There are also some animations more emphasis on atmosphere and effectiveness, so this special artistic style can also bring special visual effects to the audience<sup>[8]</sup>. For example, in the animation “The Incredibles”, the link of animated characters’ design adopted a very exaggerated way because there were many fighting pictures and chasing pictures and the way of lens expression was complex, which has brought obvious difficulties for visual display. If the traditional way still be used to express animation, it will affect the difficulty of expressing the force of character modeling, and even restrict the expression of animation technology. Therefore, in this context, enhancing the application of 3D technology can not only enhance the reality of animation, but also improve the role modeling, the functional and aesthetic performance of animation color.

## 5. Conclusion

In conclusion, the scientific application of color in film and television animation can not only improve the animation effect and visual effect, but also have a very important positive impact on the emotional transformation of characters in animation. In the course of the development of China's animation industry over the years, the various technical levels have been significantly improved, The animation works such as “Monkey King: Hero is Back”, “The moon of Qin dynasty” have realized the promotion and development of production level and artistic appreciation ability. Under the background of the continuous development of society, people's demands for animation color are bound to increase greatly, so we need to pay more attention to color design in future work, only in this way can we constantly explore the artistic charm of animation design color itself. As a brand-new visual art, animation should display its functional and aesthetic value with the help of color, which has a very important positive impact on the artistic value of animation works. Therefore, we hope this study will be of great help to the animation design industry.

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# Cinematic Space and Mise-En-Scène Focusing on Hitchcock's Movies

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## Abstract

Spatial narrative is one of the basic dimensions of the artistic expression of film, and it is also an artistic technique that highlights the narrative function of contemporary film creation. Spatial narrative is different from writing narrative, using space lens and picture to show the unique aesthetic characteristics of the film and enhance the spatial expression of the film.

**Keywords-***Spatial narrative; mise-en-scène; shots; film*

## 1. Introduction

From the perspective of narratological research, the characteristics of time are obvious, and it is also an important manifestation of the linear distribution of the causal relationship and logical development of events. Engels proposed that “the basic form of any existence is a combination of time and space, and the two are inseparable”. With the development of narrative media, spatial narratology has received more and more attention and application. As a narrative carrier, the film is also a combination of time and space to organize film narrative. The most basic unit of the film itself is the lens, and the lens relies on the time dimension in the process of recording images. But from the narrative function of the lens, the conversion of the lens is also an important way of spatial narrative techniques. In recent years, with the development of spatial narrative research, especially the arrival of the Internet era, the spatial narrative research and artistic expression of movies have become an important connotation of film appreciation.

## 2. Theoretical Research on Spatial Narration

The space narrative theory originated from the field of literature. Joseph Frank first proposed the “space form” theory in *Space Forms in Modern Novels*, and formalized the spatial form of literature as a metaphorical representation of text time series and plot change. Similarly, in his research, he also analyzed the creative methods of “terminating time flow and highlighting space” in modern literature, and proposed concepts such as “space form”, “physical space” and “psychological space”, enriching literature [1]. The birth and development of the film and the use of spatial elements have become an important means of film narrative art. In *Movies as Art*, Rudolf Einingham used the spatial narrative of the film as “the projection of the three-dimensional plane” and pointed out that the spatial elements of the film occupy an important position in the performance of the entire film [2]. Marcel Maldan put forward in his book *Movie Language* that “Movie is the first art that can guarantee a complete control of space”, and expounded the unique performance of Montage in “space modeling” from the space expression of film narrative [3]. Louis Garnett conducted an in-depth analysis of the narrative techniques of space in *Understanding the Movie*, using spatial research as the basic element of film scene scheduling, and grasping the spatial narrative effect of the film in the study of “distance mode” [4].

Domestic scholars have also carried out comprehensive explorations on the study of film space narrative art. Such as Zhou Chuanji, Cui Junyan, Shao Mujun and others, through the translation of western film works, opened a window for us to understand the theory of film space narrative. In recent years, with the continuous expansion of film narratology research, there have been some achievements in the field of film space and film space narrative. For example, Li Xianjie's *On the Space and*

*Narrativeness of Picture Style in Film Narration*, starting from the study of Picture Style, which is the most basic composition of the film, makes a dialectical analysis of the space, time and vision of the narrative, and puts forward the non-storytelling works which show the instability, juxtaposition and image of the composition pattern from the space level [5]. It is an important part of static drawing. In the new century, the research on film space narrative ushered in a new climax. Professional journals such as *Contemporary Film* and *Movie Art* also opened up related topics. For example, in Huang Dequan's *On the Narrative Space of Movies*, the narrative space is an important form of the story of the film story. It also proposes that “a hypothetical world”, “intuitive audiovisual lens” and “composite space” are the basic features of the narrative space of the film [6]. Hai Kuo and Luo Wei divided the film space art into four dimensions: historical space, geospatial, spiritual space and virtual space in the *Paradigm of Film Narrative Space Culture Research* [7]. In *Space Narrative of the Film*, Jiao Yongqin divides the film space narrative into three levels, one is the internality of space, the other is the limitation of space, and the third is the internal and external permeability of space [8]. In *The Space Revolution of Film Narrative and the Regional Paradox of Chinese Film*, Li Daoxin explores the space art of film from a philosophical perspective, and believes that contemporary Hollywood movies have been dominated by spatial narrative [9].

### 3. Taking Hitchcock Film as an Example to Analyze Movie Space

As a master of suspense movies, Hitchcock has formed his own unique image style with his excellent film space building ability and scene scheduling ability. In his films, space is not just a scene of film narrative, but also has created the film atmosphere, showing the character's psychology and other rich features. The environment is the cornerstone of the story, and it has an indelible effect on determining the overall atmosphere of the film and highlighting the tone of the film. The arrangement of the props, the size of the house, the position of the characters, and the internal objects of the light control by arranging the line of sight, Hitchcock can evoke the panic and fear that people feel uneasy. The method of expressing the mental and spiritual world of the characters through the external film space greatly extends the functions of Hitchcock movies.

The locations of the storyline in the Hitchcock movie can be roughly divided into two categories. One is a small room, such as the hotel in *Psycho*, *Jamaica Inn*, the boat in *Lifeboat*, the courtyard in *Rear Window*, *Dial M for Murder*, and the castle in *Rebecca*. Another kind of public places, although the space is large, but the density of personnel is very high, such as the railway station in *North by Northwest* and the hotel under the Capitol Hill, such scenes are easy to cause confusion and promote the plot. The first is suitable for creating a climate of terror, while the latter is also suitable for creating tension and panic, which can be said to have the same effect.

The reason for this is that Hitchcock needs a unique atmosphere in the film space, because they have two characteristics: First, the scene is in a relatively closed space, when people are in a narrow space, it is easy to produce a sense of depression, reasonable lighting can use this feeling and magnify it. Secondly, there are shelters in narrow scenes, such as walls, curtains, frosted glass and so on. During this period of panic, people could not control it completely. And in the shelter of things, the audience cannot have an intuitive understanding, which is easy to let the audience produce a suspense and fear of the unknown.

In addition to the overall space setting, Hitchcock often uses some local scenes to set up in a small space to achieve a certain suspense effect.

#### 3.1. Background setting

The background of Hitchcock's movies often begins in densely populated cities. When the protagonist falls into trouble in the legal and modern cities, he avoids disaster and solves problems in sparsely populated and civilized places.

In *Psycho*, the film begins with a vision that tells the story of Phoenix, Arizona. Then the camera gradually pushes through the windows of an apartment, and the camera passes through the window to guide the viewer to peep into Mary and Sam's entanglement (e.g., “Fig. 1”). Not only satisfies the viewer's voyeurism, but also introduces the first scene of the film, a cheap hotel rental room. There are things that can't be said in public, so director Hitchcock set up an apartment at the beginning of the film. Mary wanted to marry Sam, but Sam was in debt and had to pay for his ex-wife's living. Monetary pressure prevented Sam and Mary from getting married in public. They had to sneak into the apartment and meet

privately. This paved the way for the heroine Mary to steal the company's \$40,000.



Fig. 1 Mary and Sam are intimate in front of the window

In *North by Northwest*, although the hero is a successful advertiser in modern civilization, he is like a fish in water in urban life, but through his fear and awe of his mother, we know that he is still a little child. When the known world collapses in his life, the experience he faces is what makes him really grow up. In this film, Sanhill was suspected of murder. Hitchcock took a slap in the face of the United Nations building. The United Nations was the defender of the world order, but now it has become a spoiled spy. At the beginning of the film, Sanhill was the owner of the company that gave orders. Hitchcock used the medium shot with the camera to describe his arrogant action. At this time, however, he lost his confidence. Like a headless fly, Hitchcock used his overhead telephoto lens to highlight his smallness, isolation, and confusion.

### 3.2. Scene setting

Environment is the cornerstone of the story, which plays an indelible role in determining the film's neat atmosphere and setting off the tone of the film.

In *Psycho* and *Rebecca*, the setting of the space environment is very similar. In *Psycho*, the location of the motel is set on a highway away from the main road with few people. The film tells us that the hotel has no occupants, suggesting that Mary is going to be left alone.

The motel owner Bates's cottage is on a hillside (e.g., "Fig. 2"). This retro-style country cottage is like a miniature version of the ancient castle, plus only one room with lights, revealing a horrible atmosphere. The use of a telephoto lens makes the scene only exist in the picture and compresses the surrounding space, giving a feeling of desolateness. The dark clouds in the sky slowly drift, as if this is the habitat of ancient vampires, increased the terror atmosphere of the film.



Fig. 2 The Bates Motel

The second scene shows that Mary drives the car to the audience's gaze on the road, making it farther and farther away from the audience. The distant horizon shows the sunset light, the sky is about to be covered by dark clouds, giving people a feeling that Mary gradually sailed into the dark abyss, the audience could not predict what was going to happen, which undoubtedly increased the horror of the film.

In *Rebecca*, the woman marries Maxim and lives in a secluded Mandalay manor in the suburbs, suggesting that the woman is in a helpless situation. She will fight alone with the outside forces, and



Mandalay manor is filled with the shadow of her predecessor Mrs. Dewinter Rebecca. Portraits of the house, R-embroidered pillow towels, handkerchiefs, envelopes, and Mrs. Denvers, who worshipped Rebecca so much. The dead Rebecca filled the heroine's life like a ghost, which made the audience tense up for the heroine all the time.

The setting of indoor scenes is an important part of Hitchcock's aesthetics. Hitchcock can evoke uneasy panic and fear in the setting of props, the size of the house, the location of the characters, and in the light-controlled interior of the objects guided by the arrangement of sight.

In *Psycho*, Mary's desk sits in the corner of the wall(e.g., "Fig. 3") and is not spacious on either side, in contrast to her colleagues' apparent superiority to Mary in office space and camera position. The dialogue between colleagues and Cassidy and Marie involved in marriage further paved the way for Marie's motives. And Arizona is in the southwestern part of the United States, the air is hot, in Cassidy and Mary's conversation to learn that Mary's workplace environment is bad, and the boss can enjoy the air conditioning alone.



Fig. 3 Mary's desk sits in the corner of the wall

In the scene of Mary's bathing(e.g., "Fig. 4"), the shower curtain played a crucial role as a shelter, so that there was no loophole in the plot. If there is no shower curtain, Mary will feel the proximity of the killer during the bathing process, so that the film is not suspenseful. The appearance of the shower curtain as an obstruction not only obscures Mary's view, but also keeps Mary in a relatively closed space, so that the murderer will not be found before opening the shower curtain, increasing the sense of oppression. The audience can clearly see the figure behind the shower curtain, making the audience feel nervous in advance.



Fig. 4 The scene of Mary's bathing

### 3.3. Props setting

In *Psycho*, Hitchcock shakes two shots while Mary escapes. In the used-car market, Hitchcock uses a newspaper buffet, a policeman standing across the street, baggage in the trunk of the car, and an ambiguous conversation with the salesman to push the suspense through the calm and safe scene until it reaches its climax. In a daytime and open space, it creates a dangerous effect. This kind of insertion of "props" in the film space will not make the plot out of the main line, but to prop up the whole car sales process of the story rhythm, so that the audience remain tense.

Bates' own bedroom is decorated with rag dolls, rabbits, and ancient phonographs. These scenes show that Bates is immersed in his own world. He is still a child, his mother is still alive, and he has not killed

his mother. All of this reflects Bates's distorted psychology, and also allows the audience to peek into the distorted spiritual world of Bates with Lyra's sight.

#### 4. Conclusion

Through the preliminary exploration of Hitchcock's film space settings, we have a more comprehensive and intuitive understanding of Hitchcock's film space settings, fully affirmed the great role of its space settings in the film. We find that the space setting of Hitchcock's films plays an important role in the narrative of the film, the atmosphere of the foil, and the characterization of the characters' psychology, so that the overall artistic effect of the film has been improved qualitatively.

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# **A Study of Korea Urban Regeneration from the Perspective of Feminist Geography**

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## **Abstract**

The paper combines the theories of feminist geography and urban regeneration to propose the concept of “feminist urban renaissance” according to the current situation of Korea, in the hope of offering a new perspective for the future development of Asian metropolises. It will demonstrate the guiding significance of feminism for the urban development from theory and practice: Firstly, the related domestic and foreign research achievements of feminist geography and urban regeneration are theoretically sorted out to unveil the important significance of combined research of feminist geography and urban regeneration from multiple dimensions such as an analysis of historical development of existing findings and theories cross-over, etc. Then the enforce ability of “feminist urban renaissance” is explored from the concrete practice of urban regeneration in Korea, to illumine the direction for the forthcoming development of urban construction in Korea.

**Keywords-** *Urban Regeneration; Feminist Geography; Korea*

## **1. Introduction**

The post-modernist design thoughts have also increasingly leaded the attention of the scholars in the humanity domain to the study based on gender perspective. The gender acts as the natural property of an individual's status, and is more a social relation mapping social reform, social inequality and opposition to privilege. The feminism started to develop in Asia later than in the western developed countries, and the females still encounter various social problems in current urban production and daily life, especially in the Asian countries represented by Korea, China and Japan, the deep-seated patriarchy has always been imposing ethical restrictions on women. Even though theoretically the feminist geographers have already pointed out the existence of male-dominance thinking in the urban planning domain [1], while the authorities have also introduced various urban design measures caring for females, yet in practice the Asian women are still unable to counterbalance the masculinity pervading various public service facilities and public spaces, and are frequently treated unfairly in some or other ways. This has become a kind of "seemingly normal" daily experience [2]. These practical problems in Korea ask for correcting, perfecting and improving the existing cognition and related practices from theoretical investigation and instituting of public policies, etc.

Another important standpoint of this paper is that inviting the females to return to urban space serves as a valuable approach to current urban development problems. The urban regeneration just makes practicing the theory of feminist geography possible. Especially in Korea, the future of "feminism urban renaissance" has turned up, which, however, requires our attitude of adequate attention, to correct, perfect and improve the existing cognition and related practices from multiple aspects such as theoretical investigation, instituting of public policies, and urban planning, etc. Only really enjoying the urban space can get feminism down to earth from ideal.

## 2. Feminist geography

The geographers have also set foot in this domain depending on their unique overall characteristics and powerful spatial analysis ability while the scholars of history, sociology and anthropology, etc. are closely watching feminism. Influenced and driven by postmodernist and neomarxist geographers like David Harvey, Henri Lefebvre, Edward W. Soja, et al., the research on geographic elements distribution, a traditional geographical research sector, has also begun to turn to profoundly researching into the equality of resources allocation, gender-based difference, the social system and structural mechanism behind the elements distribution and allocation. The geography experienced a sociocultural turn in the 1980s, leading to the turn of the perspective of spatial research, i.e. the turn from production in space to the production of space. In lieu of the material space, the social space became an important object of research for social and cultural geography. Fueled by the real context of female movement in western world, gender as a keyword for social and cultural research naturally became correlated with the research on social space, leading to gradual rise of feminist geography which is as shown in Fig. 1 below.

The feminist geography is mainly influenced by three geographical thoughts: humanistic geography, structuralism geography and postmodernism geography [3]. The humanistic geography supplies a good many materials to feminist geography in the aspect of females' affective experience and identification, and the structuralism geography supports feminist geography from the functions and role of gender elements in the spatial structural relationship, while postmodernism geography forms the direct source of feminist geography from the aspects of "de-androcentrism" and the shaping action of females on space and place, etc.

Table 1. The Relation Between Females and Space in Feminist Geography

Space type	Exploration in terms of feminist geography
Body space	Interaction between females' subjective emotion and objective geographical environment, the relation between female body and townscape
Home space	Shaping of home space by females and restriction or encouragement of home space for females
Work space	The influence of gender ratio and structure on social politics, economy and culture
Public space	"Plurality and tolerance of females advocate "de-androcentrism" in the urban space

## 3. Progress of Korean urban regeneration

Since the 21st century, the focus of Korean urban regeneration has gradually shifted from economic rehabilitation in central urban zone to the environmental improvement in urban settlement. Korean Special Law on Urban Regeneration enacted in June 2013 classifies urban regeneration into two types: Economic basis type and neighboring regenerated type, with the latter being promoted by Korea for majority of urban regeneration projects. Korea in 2015 further classified the neighboring regenerated cities into type of urban central street (commercially comprehensive function) and type of general neighboring (pure residential function). In July 2017, Korea's new deal on urban regeneration divides the urban regeneration into five categories according to the area size of urban regenerated regions: Adding the type of community restoration and type of community reorganization support to the original classification. The concrete characteristics of the five types are as shown in Table 2[4] and Table 3 below.

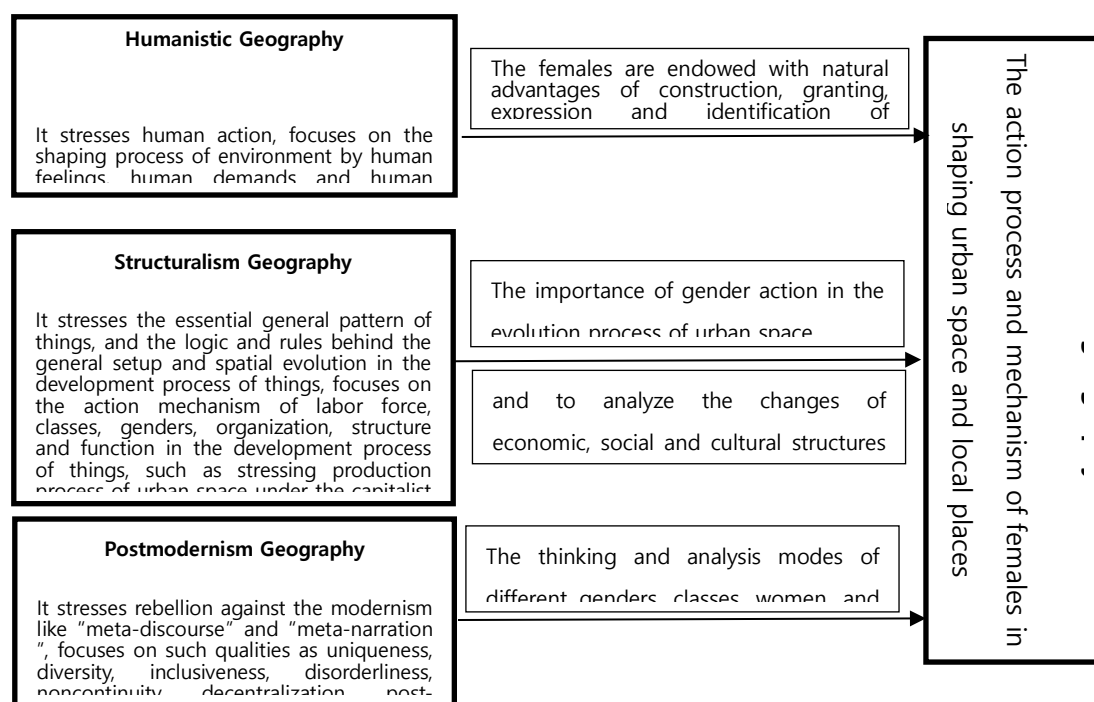


Fig. 1 Theoretical Sources of Feminist Geography

Table 2. Development of Korean classification of urban regeneration types

Time	2013	2015	2017
Policy name	Special Law on Urban Regeneration	National urban regeneration Policy for 2014-2023	New deal on urban regeneration
Classification of urban regeneration types	Economic basis type Neighboring regenerated type	Economic basis type Urban central street type General neighboring type	Economic basis type Urban central street type General neighboring type Community restoration type Community reorganization support type
Focus of rebuilding	Business district	Business district and residential district	Residential district

Table 3. Characteristics of Korean urban regeneration types

Type	Characteristics	Area
Economic basis type	Located in urban subway stations, shopping malls, harbors, etc., Promoting economic recovery, Combining facilities rectification and industry development, Promoting urban employment.	500,000m <sup>2</sup>
Urban central street type	Helping the declining and old central urban business zones to regain economic vitality.	200,000m <sup>2</sup>
General neighboring type	Restoring the old and bad residential zone	100,000-150,000m <sup>2</sup>

Community reorganization support type	Improving the living environment for residents in low-rise and densely populated districts	50,000-100,000m <sup>2</sup>
Community restoration type	Improving the neighborhood in small low-rise and densely populated districts	Below 50,000m <sup>2</sup>

## 4. Combination of feminist geography and urban regeneration

### 4.1. Necessity of cross-over study

As will be readily seen from the Korean policies and laws on urban regeneration promulgated in recent years, Korea has shifted the focus of urban regeneration projects to amelioration of residential environment and life quality from restoration of economic vitality and promotion of business development, which increasingly refined the regional scope involved in the urban regeneration projects. It can be found from the area size change in classification of urban regeneration types by the Korean government in the short four-year span from 2013 to 2017 that the Korean urban regeneration had begun to trend to the "microcosmic" from the "macroscopic", while the female hypersensitivity to the "microcosmic" just claims attention from urban regeneration. So it is necessary and pressing to conduct a cross-over study on feminist geography and urban regeneration for the current Korea.

### 4.2. Possibility of theory and practice

The cross-over study of feminist geography and urban regeneration theory is mainly embodied in two dimensions of time and space. In terms of time, the early preparation by western feminist civil rights movement and the social aging due to Korea's low birth rate both highlighted the emergent need for current Korea to boost economy via the knowledge and skills of female population, especially inviting the women with children in Korea to return to social work will help to optimize the structure of the labor force for the whole society. In terms of space, to invite the females to return entails guaranteeing their rights in material space and social space, while the spatial types involved in urban regeneration happen to coincide with the spatial types delved into by the feminist geographers, with the two's logical relation as shown in Fig.2. The dual possibilities of time and space both demonstrate that the feminist geography can direct and provide a new perspective for Korean urban regeneration, which in turn can offer the stage of development and practice for feminist geography.

## 5. Conclusion

In summary, feminist geography and urban regeneration both focus on how to evoke interaction between females and cities, which new perspective can spark new vigor for the cities. Thus, this research suggests Korea should develop "feminist urban renaissance" from political, economic and cultural aspects, etc. This is the best perspective of thinking to solve the problems in Korean urban development and a social problem urgently claiming attention. With dual properties of simultaneous development of theory and practice, it can both deepen the theory of urban regeneration and provide a stage for practice for the females.

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