Dear Colleagues and Friends

It is my distinct pleasure to welcome everyone to Tsukuba Global Science Week (TGSW) 2017, now for the 8th year running.

The history of the University of Tsukuba extends back 145 years when it was founded by the Meiji government as the first institution of higher education and premier normal school. A little over forty years ago in October 1973, our university relocated from Tokyo to Tsukuba City where it was reborn as a comprehensive institution of higher education.

Since its establishment, the University of Tsukuba has aimed for interdisciplinary education and research and to be a university open to society and the world. In accordance with these principles, we are delighted to host TGSW which gathers together a number of participants not only from a diverse range of academic fields but also from many different countries. What started out as an event focused on a single academic discipline, TGSW now offers sessions from a wide variety of fields ranging from the hard sciences to the humanities with prominent researchers from more than 30 different countries.

TGSW is a showcase of world class researches carried out by our faculty members jointly with fellow scientists throughout the globe, including those associated with
public and quasi-public institutions based in Tsukuba Science City and our partner universities outside Japan. But TGSW is more than that. The radical transformation of a globalized society has brought about a range of global challenges – food crisis, energy issues, environmental risks, never-ending wars, poverty, and the list goes on. These could be solved only by trans-border collaboration for innovation, so that the greater community of scientists, regardless of their areas of specialty, citizenship, ethnicity, gender, faith, and world views, must get together and collaborate closely. TGSW can serve as an invaluable forum for exchanging views on how to meet those challenges in a way that defies all kinds of traditionally conceived barriers.

The scope of TGSW is indeed broad and far-reaching. By bringing together internationally renowned researchers and aspiring young researchers and students based in Tsukuba and much beyond, it covers a whole range of topics, promoting lively exchanges, regardless of borders and disciplines. It also serves as an ideal international networking opportunity for trans-disciplinary, trans-organizational and trans-border collaborations.

Building on last year’s theme Innovation and Collaboration among Industry, Government and University, we have decided on the theme of Science for Social Innovations this year to explore the question of how the “sciences,” as widely understood to involve not just the hard sciences but also the social and human sciences, may offer innovative solutions to global challenges.

I would like to thank all of you for your participation and hope that the range of sessions on offer will set off meaningful dialogues among yourselves. The continuing success of this conference means that planning can proceed with confidence for the event next year.
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Building on last year's theme “Innovation and Collaboration among Industry, Government and University,” we have decided on the theme of “Science for Social Innovations” this year to explore the question of how the “sciences,” as widely understood to involve not just the hard sciences but also the social and human sciences, may offer innovative solutions to global challenges.

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PART 1 Keynote Session
Keynote Session

Trend and Future Vision of Virtual Reality in E-commerce

Cécilia Lejeune
The Rakuten Institute of Technology in Paris, France

Cécilia Lejeune is Research Engineer at the Rakuten Institute of Technology in Paris, France. She is a developer specialised in Human Computer Interfaces and Virtual Reality, and she seeks to imagine the future uses and technologies for Rakuten members in their daily life. She designed and is currently leading the development of a prototype of shopping in Virtual Reality: the Rakuten Virtual Boutique. Her experience in the immersive technologies area gives her the background to propose innovative interactions and to contribute to the democratization of virtual reality. She is also co-founder and former president of the Virtual Association, the first Parisian non-profit organization dedicated to sharing knowledge and create events for its strong community around virtual and augmented reality topics.

Abstract
In this session, we will review current trends around virtual reality for the e-commerce area. We will share our experience of market acceptability and reception to immersive shopping experiences. And finally we will talk about user expectations and how current technology can commit to those. Based on two case-study projects we conducted in our research group, we will see how we designed virtual reality experiences for real world customers and what we learned from that.
"Large Space" and "CHILDHOOD" Developed in Empowerment Informatics Program

Hikaru Takatori
University of Tsukuba

Hikaru Takatori received his B.S. Engineering degrees from the University of Tsukuba, Japan, in 2014 and is now a student in its Ph.D. Empowerment Informatics Program. His research interests include computer graphics, immersive display, and interactive virtual reality experiences.

Abstract
The Ph.D. Program in Empowerment Informatics (EMP program) is funded as part of Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) Program for Leading Graduate Schools. In this session, we will talk about a device and interactive arts that are being developed while taking advantage of the systems and equipment of the EMP program. We will introduce the development of the world's largest virtual reality system, the “Large Space,” which is installed in the Empowerment Studio, and will describe the artworks implemented within this VR system as usage examples. In addition, we will explain about the “CHILDHOOD project,” which is developed using the EMP program’s grant system.
PART 2 Poster Session
Associated Design System for Individual Physical Feature

Yinkai MA,¹ Hiroya IGARASHI²
¹ Graduate School of Art and Design, University of Tsukuba
² Faculty of Art and Design, University of Tsukuba

ABSTRACT

The popularization of 3D printers and laser cutters brought the revolution to the manufacturing industry. This trend enabled private customized production design according to users' needs. However, the design method of the customized production so far requires a long time and expensive service cost in the design process. Meanwhile, consumers can easily purchase Mass Products at lower prices in the Net Age that it cannot be said the superiority from the viewpoint of customization. It is considered necessary to develop a customization service method suitable for the manufacturing of open innovation, one of the challenges is to reduce redesign costs to the utmost and to avoid duplicated design activities. In order to cut the customization service to zero cost, this study proposed a method which eliminates the repeating routines in the design phase. Therefore, a support system which took up a bicycle as an example of customization service was proposed. The system captures the physical information of user merely by camera and generates the customized 3D data of an artifact usable in a 3D printer immediately. In this paper, a process for developing prototype system has been proposed. The cost has been took up as the evaluation of the execution result of the prototype system. Reference to Bioracer 5000 as the conventional customized service system, the prototype system has been evaluated from two aspects of weight reduction of facility and simplification of service. The conclusion is that the prototype system realized the cost reduction of customization service to a great extent.

1. INTRODUCTION

Current society is a product manufacturing and consuming society based on mass production that consumers can select and consume their preferred ones produced at the factory. The concept of product design, which was the mass production-oriented manufacturing in the premise is to collect and analyze information, such as the size and hobbies of consumers, to build a production line based on a prototype model for re-production.

Meanwhile, due to the popularization of 3D printers and laser cutters, the manufacturing of open innovation that shaping with various materials has become possible. Especially in the bicycle manufacturing industry, that bicycle parts made by 3D printers are popular in bicycle DIY. This trend enabled private customized production design according to users' needs.

For example, a number of companies provide customization services to design a personal bicycle in the DIY industry of bicycles. One of them is a bicycle design system called Bioracer that calculates the position of a bicycle by the body size of the consumers and the trajectories of the knees. However, the design method of the customized production so far requires a long time and expensive service cost in the design process.
Meanwhile, consumers can easily purchase Mass Products at lower prices in the Net age that it cannot be said the superiority from the viewpoint of customization.

It is considered necessary to develop a customization service method suitable for the manufacturing of open innovation to solve this problem. One of the challenges is to reduce redesign costs to the utmost and to avoid duplicated design activities. In order to cut the customization service to zero cost, this study proposed a method which eliminates the repeating routine in the design phase.

2. METHOD

An automation customization service system for bicycle had been picked up as an example of customization services. The system captures the user's physical information merely by a camera, and the design of bicycle 3D model that used in 3D printing can be generated immediately.

In this paper, a process for developing prototype system has been proposed. The cost has been took up as the evaluation of the execution result of the prototype system. The research of user satisfaction is a future task. Reference to Bioracer 5000 as the conventional customized service system, a cost-less method has been proposed and a prototype system has been developed.

The following describes the process of Bioracer 5000. At first, measure the user's body size data and calculate the theoretical position of the bicycle based on that data. After that, the fine adjustment of the calculated position is performed based the data from the user used the electric position simulator. Finally, the result of the position by electric position simulator would be took a perform fitting on a real bicycle and provide the recommended position of the bicycle according to the physical characteristics of the user.

The automation customization service system was proposed that based on these process but the cost was reduced. Just took capture by a camera at the shop or home, a 3D model of bicycle would be generated immediately. The 3D model of bicycle fits to a customized designed position like the recommended position of Bioracer 5000.

2.1 Sample Preparation

The proposed system creates a virtual skeleton by measuring individual body features at first. The process is automatically completed in real time and corresponds to the theoretical position process of Bioracer 5000.

A 3D camera "Kinect" has been used to track the body features of user. The positions of 25 joints on whole body like "Ankles""Shoulders" have been tracked as a virtual skeleton and makes to a real world coordinate form. The distance of the joint point would be calculated as the real world Skeleton Distance.

A hierarchical standard human body 3D model combined by 110 thousand polygons has been prepared and 25 joints of the human body on the corresponding skeleton has been placed. Also, in order to produce the movement of feet naturally, "RootLeft" and "RootRight" of the corresponding joints at the feet has been added and the total number of joints was become 27. A height 170.9 cm and weight 65.5 kg twenties male had been choice as a sample that distance of the 27 joint points was made in this model.

The joint points on the hierarchical standard human body 3D model would be transformed with the Skeleton Distance data from the virtual skeleton by 3D camera and a
human body 3D model that can embody an individual characteristic can be generated by this transform.

The deforming program was introduced on the left side of the model, and was not introduced on right side shown on Fig.1. The deformation of 3D human body model with a subject height 180.5 cm, especially the deformation of the left foot can be indicated.

![Figure 1: The deformation of human body model](image1.png)

The proposed system generated 3D model of bicycle by the deformation on a bicycle 3D model conforming the standard human body 3D model instead of creating a recommended position on the electric position simulator.

The bicycle 3D model had been prepared in seven types like "Mountain Bicycle""Triathlon Bicycle" and the animations of posture riding these bicycles had been made. These bicycle 3D models had been made in hierarchy and can be deformed according to movement of the Parts Point joints such as "PedalLeft""HandlebarLeft".

When the system starts up, the animation of posture riding the bicycle would be played and the positions of saddle, both pedals and both Handlebars would move to be in accordance with the positions of both hands, both feet, buttocks. The positions of other parts would be calculated based on the positions above and finish the deformation in real time.

The effect of the deformation is shown on the Fig.2. The left model is a bicycle 3D model before deformation and the right model is a deformed bicycle 3D model with a subject whose height was 180.5cm.

![Figure 2: The deformation of the bicycle 3D model](image2.png)

2.2 Experimental Procedure

A prototype system has been implemented with the processes proposed above. The prototype system consists of one personal computer and one 3D camera and the 3D camera should be put on a height about 1m desk.

The system was activated by pressing the "Start" button on the execution interface. User stand on the ground at a distance of 1.5 m to 2.5 m in front of the camera and his body features was be captured by the system in real time. Pressed the "pause" button if it is stable, the bicycle 3D model was generated in the system.
Running experiments with random background were taken 20 times, the average time consumption was 50 seconds by the whole process from starting up the system to generating the 3D model of the bicycle.

During the experiment of the length of upper arm measurement, the disparity of the data measured by system and by measurement tool can be within 0.6 cm.

3. RESULTS AND DISCUSSION

The cost of the fitting service of the conventional system is 5000 yen and one hour, but it is become free service and 1 minute by the propose system. Due to miniaturization and simplification of the main body of equipment, the cost such as the use section of shop, maintenance of facilities, workload of staff, can be reduced in a large extent (Table 1). The disparity of the measured data is maintained within 0.6 cm, can be approved within the pardon range of embodying the body features.

<table>
<thead>
<tr>
<th>Main Body</th>
<th>Used Space</th>
<th>Place Restriction</th>
<th>Measure Error</th>
<th>Cost of time</th>
<th>Cost of money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioracer 5000</td>
<td>Complexity</td>
<td>0.5m * 2 m</td>
<td>The Shop</td>
<td>None</td>
<td>1 hour</td>
</tr>
<tr>
<td>Proposed System</td>
<td>Simple</td>
<td>0.5m * 1.5 m</td>
<td>None</td>
<td>0.6 cm</td>
<td>50 seconds</td>
</tr>
</tbody>
</table>

And regarding the simplification of service, the operation of the proposed system became very easy. The guidance of the staff is unnecessary, the consumer's physical strength and language communication can be reduce. Consumers can see bicycle shaping intuitively and decide whether to buy a bicycle more easily. It is concluded that the cost reduction of the customization service was realized to a large extent in the proposed system through above.

4. CONCLUSIONS

In this paper, a process for developing prototype system has been proposed and the cost has been took up as the evaluation of the execution result of the prototype system. By the running experiments has been taken on the prototype system and the conclusion is that the proposed system realized the cost reduction of customization service to a great extent.

ACKNOWLEDGEMENTS

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Address: Yinkai MA, Graduate School of Art and Design, University of Tsukuba 2-1-1 Amakubo, Tsukuba, Ibaraki, 305-0005, JAPAN E-mails: mayinkai529918@163.com
The Most Significant Feature of ‘Swing’ as Motion-Emotion Understanding

Yang LIU, 1 Hiroya IGARASHI2
1School of Art and Design, University of Tsukuba
2Faculty of Art and Design, University of Tsukuba

ABSTRACT

In this research, we focused on one of the most common form of movement in the design of motion-emotion understanding interface: Swing. Many researches described how the features of swing may affect emotional information. Our interest lies on which feature of swing affect most significantly in the design of motion-emotion understanding interface. Experiments were conducted to find the most significant feature of swing. Physical variables as max angle ($\lambda$), frequency ($f$) and speed change($\lambda$) were selected and investigated. The results indicated frequency ($f$) is verified as the most significant feature. It has observable effect on both the valence and arousal of emotions. High frequency can be regarded as positive, intensive emotions while low frequency be decoded as negative, calm emotions.

1. INTRODUCTION

Generally, in the field of identifying the movement-emotion relationship, Tek-Jin Nam et al. concluded emotion-movement relationship framework (Figure 1) based on Russell’s emotion circumplex model. According to this framework, fast and open movement represent for excited and happy emotions, slow and disconnected movement are suitable for expressing oppressed and sad emotions.

Figure 1: (a) Russell’s circumplex model of emotions, (b) Nam et al. emotion-movement relationship framework

Nevertheless, as stated by Ibáñez, the more realistic and complex an approach to show emotions is, the more difficult to maintain its consistency. On the contrary, by using more iconic, more abstract and simpler approaches, it will presumably be easier to maintain its consistency, as the features will be more easily understandable and users’ expectations will be smaller. Hence, the motion involved in this studies is located as one of the most basic physical form of movement, the swing of a solid stick.

From the view of mechanism, swing needs only one joint, it performs periodically, it occurs only in two dimensions, these advantages make it easy to be applied in mechanical
configuration. For analysis swing’s physical feature, simple pendulum is one typical kind of swing form. The differential equation which represents the movement of a simple pendulum is

$$\frac{d^2\theta}{dt^2} + \frac{g}{l} \sin \theta = 0 \quad \text{Eq. 1}$$

where \(g\) is acceleration due to gravity, \(l\) is the length of the pendulum, \(\theta\) is the angular displacement, and \(t\) is the time to complete one period. Similarly, in this study, our model for the features of swing is described in terms of max angle variable (\(A\)), frequency variable (\(f\)) and speed change variable (\(\lambda\)). From relevant researches, no evidence shows the length of swing affects the meaning of emotion, so in this study, the length variable is ignored.

For the mechanical configuration of a stick’s wave, a full angle of less than 90° is applied most commonly. So the range of swing’s max angle in this study is settled less than 45°. In this range, 30° is settled as the ‘large’ swing’s max angle for the reasons that a full angle of 60° is the angle that can be reached easiest. In order to easily controlled in stimuli software, the ‘small’ swing’s max angle is settled as 10°. Evidences form medical and human image recognition shows the most common frequency of hand wave is one time a second, and it is regarded as relatively high speed. So the ‘high’ frequency in this study is settled as 1 Hz and the ‘low’ frequency is settled as 0.5 Hz. In addition, the most common form of speed change is from simple pendulum. As the gravity coefficient remains the same in certain local area, the speed changes trigonometrically. It matches the description of ‘smooth change in speed and no acute peak of change’ in the studies of motion-emotion understanding. On the contrary, due to the unchanged torque provided by mechanical motivation, the velocity retains the same and changes instantly at the end. This form of speed change matches the description of ‘steep peak of change’. These two basic forms in speed change are described visually in Figure 2.

![Figure 2: Two basic form of speed change patterns](image)

2. METHOD

A sample of 15 participants, between the age of 21 and 32 (mean age = 25.6, SD = 3.27), was individually involved in Experiment 1. They were either asked by mail to watch a set of 8 pieces of videos and fill in the questionnaires, or invited to the department. Based on the selected variables from prior researches, the combination of large/small max angle variable (\(A\)), high/low frequency variable (\(f\)) and smooth/sharp speed change coefficient variable (\(\lambda\)) are made as the motion samples, making up 8 pieces of videos. Each video is 360x360 in resolution, showing complete periods of the swinging stick (Figure 3).
The questionnaires were aimed to grade valence and arousal of emotions in the negative-positive and calm-intensive dimensions. For each video, the grades of valence and arousal of emotions were scored from -3 to 3. In order to verify whether frequency affects the understanding of emotions independently and investigate the effects of frequency changing, Experiment 2 was arranged separately after Experiment 1.

Another sample of 15 participants, between the age of 22 and 34 (mean age = 27.2, SD = 4.06), were individually involved in Experiment 2. They were either asked by mail or social network to watch the another set of videos and fill in the questionnaires, or invited to the department. Participants graded the range of both arousal and valence of emotions they decoded from the different frequencies shown in the 4 pieces of videos. The sequence of videos was randomly played. From related studies in human-vision recognition, a 10 Hz range of oscillation is usually regarded as the limitation of human’s eyes. Since 0 Hz cannot be regarded as movement, we selected a very small value represent the extreme low frequency. The 4 pieces of videos shown to participants differ in only frequency, as 0.5 Hz, 3 Hz, 6 Hz, 9 Hz.

3. RESULTS AND DISCUSSION

In Experiment 1, Independent-samples $t$-test was performed to analyze the significances of specific impacts of max angle, frequency and speed change on valence and arousal respectively. For max angle, there were significant differences (sig=0.004, 0.01) in both valence and arousal aspects, which might reveal a heterogeneity for each. However, in terms of the impacts, a non-significant result for each (p=0.175, 0.25 individually) suggested that no statistical significance was found. For frequency, $p$ values of valence and arousal (0.041, 0.009) from the $F$-test and $p$ values of valence and arousal (0.004, 0.01) from the $t$-test are smaller than 0.05. Hence, the analysis shows differences in frequency affects valence and arousal significantly for both valence and arousal. For speed change, there is no significant evidence shows whether or not does speed changing affect valence and arousal (Figure 4).
As the relationship between frequency and valence and arousal were measured individually, and a log regressive relation has been found respectively. Since their $R^2$ are larger than 0.80 (0.9994 and 0.9733), the results in Experiment 2 support the outcomes from Experiment 1. For both valence ad arousal, low frequency can be decoded as negative, calm emotions and high frequency can be regarded as positive, intensive emotions. This results also indicated frequency as the most significant feature of swing can affect the emotion understanding individually (Figure 5).

![Figure 5: (a)Mean scores of valence; (b)Mean score of arousal](image)

### 4. CONCLUSIONS

Swing is used to show active and deactive of emotion, also it has been applied to show the pleasant or unpleasant emotions. Experiments were conducted to find the most significant feature of swing that usually applied in the design. Physical variables as max angle ($A$), frequency ($f$) and speed change coefficient variable ($\lambda$) were discussed and investigated in order to figure out the significance. As results from the experiments, frequency ($f$) is verified as a significant effect on both the valence and arousal of emotions. High frequency can be regarded as positive, intensive emotions while low frequency can be decoded as negative, calm emotions. Furthermore, we investigated among the human-observable range of frequency in additional experiment. The results support our findings. What’s more, both cross points emerge near 1 Hz. The results in this study support the investigation in relevant researches. For future researches, the movement-emotion relationship needs to be further refined with more physical variables, such as rhythms, durations, etc. Meanwhile, more movement in various forms need to be investigated to better understand the relationship between abstract movement characters and specific dimensions of emotions.

### REFERENCES


Address: Yang LIU, School of Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN E-mails: cyange.liu@gmail.com
On the Evaluation of a Huggable Interface to Mediate Remote Affective Communication

Eleuda NUNEZ,1 Shinichi KOYAMA,2 Kenji SUZUKI,3 Hiroya IGARASHI2
1 School of Art and Design, University of Tsukuba
2 Faculty of Art and Design, University of Tsukuba
3 Faculty of Systems and Information Engineering, University of Tsukuba

ABSTRACT
In the context of computer-mediated remote communication, the effect of touch-based messages has been studied as a way to transfer affective information. Based on this potential we developed Macaron, a huggable interface designed to mediate human-human remote communication of affective messages. The evaluation is divided into two separated studies. The first one aims to explore the huggable aspect of Macaron. The second one explores the perception of Macaron as a communication device. The results provide some insights on the role of Macaron from the user’s perspective.

1. INTRODUCTION
People have the necessity to keep healthy and strong social relationships. Motivated by this, different studies in Human-Computer interaction (HCI) explores the way technology can affect and augment human relationships for those people geographically separated. Current communication devices commonly support the exchange of information via text, audio or video. The future communication devices should also include the sense of touch. By touch, humans convey different affective messages and enhance verbal or auditory communication (Van Erp and Toet, 2015: 1).

Based on this potential, different studies worked on exploring communication devices that support touch-based interaction (Larsson, 2014:2). Typically, these technologies are designed in the shape of wearable devices, tangible objects or robotic devices. Among the different tangible gestures, hugs contain a high affective connotation.

On this report, we introduced Macaron, a huggable interface designed to mediate human-human remote communication of affective messages. Our product was designed with the appearance of cushion, and it is composed of three characteristics: 1) Sensing of tangible affective cues, 2) Convey the message to the users using colored lights patterns and 3) Connectivity between two or more devices. The evaluation is divided into two separated studies. The first one aims to explore the huggable aspect of Macaron. The second one explores the user’s perception of Macaron as a communication device. This methodology aims to involve the users in the design process. The results provide some insights of the role of Macaron as a mediator of remote human-human communication.

2. SYSTEM OVERVIEW
Macaron has a simple and round appearance (Figure 1A). It is broadly composed of three elements: sensing, feedback, and communication. The sensing part involves the design of a sensor able to distinguish hugs; feedback is made with LED and vibration patterns and communication is managed by a server connected via Bluetooth with Macaron (Figure 2).
Figure 1: (A) Macaron works with a paired-devices configuration, (B) Sensors are contained in a plastic sphere placed in the center of a rounded cushion, (C) Macaron lights up with different colored lights patterns to convey messages to the user.

The hardware design was proposed by (Sugiura et al., 2011:3) and it is an array of photo reflective sensors used to sense the deformation of a soft cushion where the plastic case is embedded (Figure 1B). Macaron is made of a modified cushion, which was emptied leaving only the fabric-made case, and then re-filled using the proposed granulated filling material necessary to facilitate the detection of the cushion deformation. In our implementation, we used six photo reflective sensors distributed around a plastic sphere of 8.5cm of diameter. Inside the sphere we included the circuit: a board with an Arduino mini pro 5V, a SparkFun Bluetooth module, a vibration motor, the socket for the LED strap (Neopixel, 30 LED), a charging circuit with a lithium battery (1400mAh), a 3.3V regulator, an ON/OFF switch and a micro USB connector for charging the battery. The plastic case has a hole to the USB connector and switch (Figure 1B), and from which the LED strap connects to its socket. The LED strap is placed around the circumference of the cushion (Figure 1C).

Figure 2: Illustration of Macaron concept: two people living in different places can communicate affective messages mediated by Macaron.

The server client configuration allows to connect multiple clients, and the communication among them is managed by a server. Figure 2 illustrates a scenario of two users geographically separated, using Macaron to communicate affective messages driven by hugs. The color for hug detection is red, and for message notification is blue.

3. EXPERIMENT: HUGGABLE ASPECT OF MACARON

3.1 Procedure

This product should support natural hug-driven interaction. Different aspects, like appearance, shape, size, texture or softness, can directly influence on the user’s feeling of the product. Macaron was designed with a minimum amount of rigid elements: the circuit encapsulated in a small hard core, and the flexible LED strap around the cushion (Figure 1B). Moreover, it looks like a typical cushion to evoke a feeling of being huggable. To evaluate the user’s perception, we asked 16 participants (average age 29.3, 6 females and
10 males) to give their impressions. Participants were asked to sit in front of a desk and hold Macaron. Then they were asked to perform different tangible gestures. Among these gestures, there were included 12 hug instructions. After the participants finished this test, they were asked to answer a short questionnaire about the experience. The questionnaire included three items to evaluate the huggable aspect of Macaron: Q1) I consider this product is huggable, Q2) I consider it is appealing to be hugged, and Q3) I consider it as huggable as a common pillow. Participants used a 5-points scale to give their answers.

3.2 Results
The left side of Figure 3 shows one participant during a session, hugging Macaron after being instructed. On the right side is summarized the results from the questionnaire (n=16): Q1 avg=4.88 and SD=0.34, Q2 avg=4.38 and SD=0.5, Q3 avg=4.38 and SD=0.72.

4. ONLINE SURVEY: PRODUCT REACTION

4.1 Procedure
Macaron is an unconventional communication device, and it is important to understand participant's impressions. We used an online questionnaire using the system provided on http://www.soscisurvey.com. Participants were invited to answer via email, to avoid repeated answers. 35 participants (average age 27.66, 13 females and 22 males) completed the questionnaire. The nationalities were: 28 Latin Americans, 4 Europeans, and 3 Asians. The questionnaire had three steps. On step 1 participants are instructed to watch a video of a person communicating by Macaron. On the video, a person is interacting with Macaron by hugging it and observing the colored light patterns. The video is followed by two statements that each participant rated by a 5-point scale: 1) I perceived the communication partner to be human and, 2) I perceived the communication partner to be a machine. Following this, on step 2 it is introduced a new video showing each function of Macaron. The video displayed a person interacting with Macaron together with a script explaining the meaning of each type of feedback supported by Macaron. On step 3 participants watched the first video again and answered the same two statements from step 1. The stimuli video displayed on step 1 and 3 showed a fully functional Macaron.

Even though participants were told that the person of the video was communicating by Macaron, we try to investigate if there is a difference in the perception of Macaron as a communication device, before and after being instructed the function and concept of the product. With this, we aim to answer: comparing the condition before and after instruction, can the participants perceive that the person in the video is communicating with a human partner?
4.2 Results

Figure 4 shows the result of the online questionnaire. Before watching the instruction video, more participants tended to perceive that the person in the video is communicating with a machine. On the contrary, the communication partner was perceived as human rather than machine after the instruction video. To test the statistical significance, two-factor repeated measures ANOVA was applied. As a result, the main effect of watching instruction video (\(p<.01, F(1,34)=7.61, \eta^2=.183\)) and the interaction of two factors (\(p<.001, F(1,34)=29.8, \eta^2=.467\)) were confirmed. There are also significant differences between two answers (perceived as human/machine) in both before (\(p<.05\)) and after (\(p<.05\)) watching the instruction video by t-test.

![Figure 4: Perception of Macaron before and after being instructed its functions](image)

5. DISCUSSIONS AND CONCLUSIONS

We developed this prototype based on the theoretical need of inclusion of touch-based messages in remote communication as a way to increase affectivity. The result from the first experiment showed that based on the three selected items, Macaron was felt highly huggable, even comparable with a typical cushion. The approach using a minimal rigid core combined with the appearance of a daily life product helped to create a good feeling for the users when they were asked to manipulate Macaron. The results from the online questionnaire showed that even if Macaron does not look like a common communication device, participants could understand its role of mediator. With instruction, the tendency showed that the person in the video was communicating with a human partner. From this, we understood it is possible for the users to perceive Macaron as a communication device, based on the current interaction rule.

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Address: Eleuda NUNEZ, School of Art and Design, University of Tsukuba
1–1–1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN
E-mails: eleuda@ai.iit.tsukuba.ac.jp
Sentiments, Attitudes and Behaviours in the Context of Sustainable Design

Xanat VARGAS-MEZA, Toshimasa YAMANAKA

1 School of Human Comprehensive Sciences, University of Tsukuba
2 Faculty of Art and Design, University of Tsukuba

ABSTRACT

Semantic analyses (which included graphical symbols) explored the relationship between sentiments, attitudes and behaviours in YouTube videos about sustainable design. Comments on top videos in English and Spanish were analysed to find most frequent words, co-occurrence between words and topics. Results showed topics like energy and architecture, with notions of system, community, integral knowledge and a focus on problem solving in both languages. The English data set frequently showed words related to future, technology and cities in a male-centered world. In contrast, the Spanish top words versed on communication, cordiality, animal welfare, materials and a slightly more balanced gender presence. Graphical representations for arousal (!) were the most frequently found in both data sets, followed by communication, and calculations related representations. Also, happiness emoticons were the most frequent. There was a constant mention of economic and social barriers in the adoption of sustainable design, in contrast with former studies which have discussed lack of time and apparent benefits in adopting such methodologies.

1. INTRODUCTION

Social Networking Sites are services that store personal data in order to facilitate communication and information sharing between the users. In such services, inbound groups wield more influence on attitudes, norms, behaviour and decisions than outsiders (Cialdini, 2001), which enables the study of community behavior without relying on self-reports. In the case of online videos, weak positivity is the most common sentiment in related comments, while negativity is associated with the densest discussions (Thelwall et al., 2012). In contrast with semantic analysis software, sentiment analysis software has focused on emoticons, which tend to emphasize the emotion reflected in words. Some studies propose a universal meaning for emoticons (Gruzd, 2013), while others state the opposite (Park et al., 2013). Nevertheless, the importance of context in the emoticons meaning might be relevant (Kelly, 2015), while only a few studies incorporate other graphical representations to the sentiment analysis (Novak et al., 2015).

At a global level and specifically in developing countries, there is a lack of in depth knowledge of attitudes and sentiment among sustainable designers, academics and other stakeholders. Pro environmental behaviours that involve the design process are largely unknown. Also, the study of negative emotions which might be more relevant to prompt behavioral changes (Ahn, 2010) is being neglected in favor of positive emotions. Therefore, this study explores: a) Behaviours, attitudes and feelings related to Sustainable Design expressed by YouTube communities in English and Spanish; and b) Contextual factors related to environmental behaviours, attitudes and feelings.
2. METHOD

2.1 Description of the Datasets

We considered YouTube videos in English and Spanish from a previous study on Sustainable Design related social networks (Vargas and Yamanaka, 2016). In the case of English, comments from most commented videos with at least 8,000 views and degree centrality equal or higher than one were extracted with YouTube Data Tools (Rieder, 2015); while in the case of the Spanish video dataset, comments from the most commented videos with a degree centrality equal or higher than one were extracted. Comments were revised to discard other languages and spam; thus, 13,957 comments from 163 English videos and 1,351 comments from 147 Spanish videos were considered for analysis.

2.2 Semantic Analysis

Semantic relationships represented by concepts are analysed through keywords (Sowa, 1987). ConText software (Diesner, 2014) calculated word frequencies, word co-occurrences and topic modeling. Relevant words were classified under a basic scheme of subjects/nouns, adjectives/emotion/cognitive related words, verbs, direct objects/topics, time/place related words, graphical symbols, and measures. Next, semantic networks for the top frequent words were drawn with Gephi (Bastian, 2009). As software can only interpret alphanumeric characters accurately, identifiers were assigned to each special character and graphic representation to incorporate them to the analysis. For example, the emoticon “☺” was substituted with “gsgrin38”. Also, several identifiers were assigned to polysemic symbols like “*” and “-”.

3. RESULTS AND DISCUSSION

Table 1 shows top keywords in terms of frequency. It is noted that expressivity and communication are greater in the Spanish words.

<table>
<thead>
<tr>
<th>English Word</th>
<th>Freq.</th>
<th>Category</th>
<th>Subcategory</th>
<th>Spanish Word</th>
<th>Freq.</th>
<th>Category</th>
<th>Subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td>you</td>
<td>8880</td>
<td>1</td>
<td>pronoun</td>
<td>gsexcl (!)</td>
<td>706</td>
<td>6</td>
<td>symbol</td>
</tr>
<tr>
<td>I</td>
<td>8872</td>
<td>1</td>
<td>pronoun</td>
<td>no</td>
<td>463</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>gsexcl (!)</td>
<td>4769</td>
<td>6</td>
<td>symbol</td>
<td>gracias</td>
<td>258</td>
<td>2</td>
<td>emotion_gral</td>
</tr>
<tr>
<td>not</td>
<td>3964</td>
<td>2</td>
<td>negative</td>
<td>sí</td>
<td>250</td>
<td>2</td>
<td>emotion_gral</td>
</tr>
<tr>
<td>have</td>
<td>3890</td>
<td>3</td>
<td>connector</td>
<td>pudo</td>
<td>179</td>
<td>3</td>
<td>connector</td>
</tr>
<tr>
<td>we</td>
<td>3742</td>
<td>1</td>
<td>pronoun</td>
<td>video</td>
<td>166</td>
<td>4</td>
<td>unnatural</td>
</tr>
<tr>
<td>people</td>
<td>2944</td>
<td>1</td>
<td>noun</td>
<td>casa</td>
<td>164</td>
<td>5</td>
<td>place</td>
</tr>
<tr>
<td>they</td>
<td>2837</td>
<td>1</td>
<td>pronoun</td>
<td>mi</td>
<td>163</td>
<td>1</td>
<td>pronoun</td>
</tr>
<tr>
<td>will</td>
<td>2802</td>
<td>3</td>
<td>connector</td>
<td>su</td>
<td>161</td>
<td>1</td>
<td>pronoun</td>
</tr>
<tr>
<td>he</td>
<td>2733</td>
<td>1</td>
<td>pronoun</td>
<td>youtube</td>
<td>147</td>
<td>5</td>
<td>place</td>
</tr>
<tr>
<td>like</td>
<td>2423</td>
<td>2</td>
<td>cognitive</td>
<td>hola</td>
<td>141</td>
<td>2</td>
<td>emotion_gral</td>
</tr>
<tr>
<td>would</td>
<td>2394</td>
<td>3</td>
<td>connector</td>
<td>saludo</td>
<td>140</td>
<td>4</td>
<td>unnatural</td>
</tr>
</tbody>
</table>
While top English words included terms related to science and holistic discussions ranging from politics and economics to art, Spanish words were more focused on design applications. Concepts connected to design in English included intelligence, personal and value; while in Spanish, cheap, social and vertical were important notions. Beauty was not particularly relevant in terms of design. As for the conceptualization of designers, the second network in Figure 1 shows that architects were connected to other creative, science, management and government related professionals, while designers were not connected to business or government in the case of English. The first network shows place related words in Spanish, revealing the importance of micro locality for this network (such as villages, towns, gardens, etc.). Representations for arousal (!) and communication were the most frequently found in both datasets, followed by calculations and money representations, which suggests a frequent mention of the economical barrier in the adoption of pro environmental behaviours. Emoticon representations of happiness were the most frequently found. However, anger related emoticons were the second most frequent in Spanish, while in the case of English, it was neutral (awe, doubt) related emoticons.

Figure 1. Selections of places in Spanish networks and nouns in English network.
4. CONCLUSIONS

The economical and social barriers for the adoption of sustainable design were the most frequently mentioned. In the case of English, some notions of ecophobia and the apparent lack of sustainable design’s effect were present, while in the case of Spanish, lack of resources and contextual information were present. Overall, the inclusion of graphical representations in the analyses contributed to the understanding of written expression particularly in the case of the Spanish dataset, which is considerably smaller than the English dataset. Semantic network analysis proved useful to explore relationships between attitudes, emotions and behaviours related to creative endeavours. Also, the role of some negative emotions in the rejection/adoptions of sustainable design (fear in English and anger in Spanish) was uncovered. However, further analysis focused on sentiment would be useful to deepen the understanding of the interplay of such attitudes, emotions and behaviours in written communication.

ACKNOWLEDGEMENTS

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Address: Professor Toshimasa YAMANAKA, Faculty of Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN

E-mail: tvam@geijutsu.tsukuba.ac.jp, kt_designbox@yahoo.com
Influence of Road Surface Design on Vehicles’ Speed: Experiment Using Driving Simulator for Implementation of Shared Space

Takuma OZAKI, Sari YAMAMOTO, Makoto ITOH, Masayuki KAWAMOTO
1 Master’s Program in Art and Design, University of Tsukuba
2 Faculty of Art and Design, University of Tsukuba
3 Faculty of Engineering, Information and Systems, University of Tsukuba
4 Headquarters for International Industry-University Collaboration, University of Tsukuba

ABSTRACT

We studied the influence of road surface design on vehicle speed with the aim of implementing Shared Space on Japanese roads. We created 16 road designs and subjects indicated what they felt was an appropriate speed on each road design using a driving simulator. Results of the experiments show that diagonal intersection patterns have the strongest deceleration effect, and horizontal lines along driving direction have the strongest acceleration effect.

1. INTRODUCTION

Japan is one of the most rapidly aging societies in the world, and a new transportation system is therefore necessary to meet changing societal needs in the future. We focus on “Shared Space” as a concept that can meet these needs. Shared Space is an urban design approach in which motor vehicles, pedestrians, and bicycles share the road space. The concept was developed by Hans Monderman, a traffic engineer in the Netherlands. Shared Space has become popular in the EU and other regions, but it has never been popular in Japan. To implement Shared Space, we should design road spaces from various viewpoints. Among these, we focus on vehicle deceleration in this research. The purpose of this research is to reveal the influence of road surface design on vehicles’ speed and the design elements that can cause drivers to decelerate.

2. METHOD

We used the “UC-win/Road Ver.10 DS” driving simulator to examine designs that would influence vehicle deceleration, specifically road pavement design. Subjects watched the monitor, which simulated driving on roads of various designs (Figure 1).
The experimenter gradually accelerated the driving speed, and the subjects raised their hands when the speed reached their favorability. If the speed was too high, the subject could decelerate by instructing the experimenter. Only the experimenter could see the speed indicator. We therefore determined participants’ preferred speed for each design.

3. ROAD DESIGNS

We created 16 road design patterns (Table 1). The road design patterns presented design elements that possibly influence velocity perception such as angle, brightness, and size of the patterns, or different pavement materials.

Table 1. Road designs used in the experiment

<table>
<thead>
<tr>
<th>Image</th>
<th>No.</th>
<th>Design Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>asphalt, center line 6 meters wide</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>asphalt, center line 4 meters wide</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>asphalt, no line 6 meters wide</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>asphalt, no line 4 meters wide</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>asphalt horizontal lines along driving direction 6 meters wide</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>asphalt vertical lines along driving direction 6 meters wide</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>asphalt diagonal intersection pattern 6 meters wide</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>interlocking block horizontal lines along driving direction 6 meters wide</td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>interlocking block vertical lines along driving direction 6 meters wide</td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>diagonal intersection pattern 6 meters wide</td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>diagonal intersection pattern (low contrast) 6 meters wide</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>diagonal intersection pattern 6 meters wide</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>diagonal intersection pattern (large size) 6 meters wide</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>diagonal intersection pattern (small size) 6 meters wide</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>asphalt, high trees 6 meters wide</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>asphalt, low trees 6 meters wide</td>
</tr>
</tbody>
</table>

4. EXPERIMENT DETAILS

4.1 Subjects

The subjects were 30 people who had driver’s licenses. They were divided into three age groups of 10 people: those in their 20s, those aged 45–55, and those aged 65–75 (Table 2).

Table 2. Subjects

<table>
<thead>
<tr>
<th></th>
<th>20s</th>
<th>45–55</th>
<th>65–75</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
</tr>
</tbody>
</table>
4.2 Date and Place
Date: March 10, 2017 – April 7, 2017
Place: Empowerment Studio, University of Tsukuba, Tsukuba, Japan.

4.3 Experimental Procedure
1. Subjects fill in the factsheet (age, sex, eyesight, years of driving experience)
2. Experimenters explain the experiment
3. Several test drives on Road A (white line on the center of the asphalt surface)
4. Main experiment (one drive on each of the roads; roads are presented in random order)
5. Subjects write impression of the experiment

5. RESULTS
There was one outlier in the experiment data, so we analyzed 29 subjects’ data except for those of subject No. 10 (male aged 65–75). Figure 2 shows the averages of all subjects’ and each generation’s driving speeds. The driving speed becomes lower towards the right. Therefore, the leftmost design has the strongest acceleration effect, and the rightmost design has the strongest deceleration effect.

Figure 2: Average driving speeds
Road E (horizontal lines along the driving direction on asphalt surface, as shown in Figure 3) had the strongest acceleration effect, and Road J (diagonal intersection patterns on interlocking blocks, as shown in Figure 4) had the strongest deceleration effect. The average driving speed on Road E was 75.2 km/h, and on Road J was 44.7 km/h. Diagonal intersection patterns highlight the perception of driving speed and have a high deceleration effect. Horizontal lines parallel to the driving direction weaken the perception of driving speed and have a high acceleration effect.
Table 3 shows the difference that each design element had on vehicle speed. It shows that line direction and pattern size have significant effects on driving speed (p<0.01). In the case of roads with the same patterns and different pavement materials, such as E and H, F and I, and G and J, the speed on interlocking road was lower than that on asphalt road, though these show no significant differences. The youngest and oldest subjects showed a higher speed tendency, and the middle-aged subjects showed a lower speed tendency.

**Table 3: Differences in driving speed according to design element**

<table>
<thead>
<tr>
<th>Design element</th>
<th>Roads</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road width</td>
<td>A⇔B</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>C⇔D</td>
<td>0.24</td>
</tr>
<tr>
<td>Center line</td>
<td>A⇔C</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>B⇔D</td>
<td>0.09</td>
</tr>
<tr>
<td>Line direction</td>
<td>E⇔F</td>
<td>0.00 **</td>
</tr>
<tr>
<td></td>
<td>F⇔G</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>E⇔G</td>
<td>0.00 **</td>
</tr>
<tr>
<td></td>
<td>H⇔I</td>
<td>0.00 **</td>
</tr>
<tr>
<td></td>
<td>I⇔J</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>H⇔J</td>
<td>0.00 **</td>
</tr>
<tr>
<td>Pattern contrast</td>
<td>J⇔K</td>
<td>0.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design element</th>
<th>Roads</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern angle</td>
<td>J⇔L</td>
<td>0.03 *</td>
</tr>
<tr>
<td>Pattern size</td>
<td>J⇔M</td>
<td>0.01 **</td>
</tr>
<tr>
<td></td>
<td>J⇔N</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>M⇔N</td>
<td>0.01 *</td>
</tr>
<tr>
<td>Pavement material</td>
<td>E⇔H</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>F⇔I</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>G⇔J</td>
<td>0.48</td>
</tr>
<tr>
<td>Trees</td>
<td>C⇔O</td>
<td>0.04 *</td>
</tr>
<tr>
<td></td>
<td>C⇔P</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>O⇔P</td>
<td>0.39</td>
</tr>
</tbody>
</table>

T-test *: p<0.05; **: p<0.01; -: n.s.

6. CONCLUSIONS

This study revealed that road design influences driving speed. Diagonal intersection patterns have a high deceleration effect. Design elements such as line direction, pattern size, and road surface significantly influence driving speed.

In future research, we will clarify design elements and effects that create safe road spaces, and conduct a demonstration to show how Shared Space can be implemented.

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Address: Takuma OZAKI, Master’s Program in Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8574, JAPAN
E-mail: ozaki.tf@gmail.com
Investigation on the Monitoring of Brick Structure in Yokosuka City

Risako FUKAMI,1 Toshiya MATSUI,1 Mayumi KAWAMOTO2
1 World Heritage Studies, University of Tsukuba
2 Board of Education, Yokosuka City

ABSTRACT

Brick structures in Yokosuka City are precious cultural properties to study on brick masonry, method of production at the time and its transition. These things and brilliance created by bricks prove that it has artistic, historic and archaeological value. However, many brick structures in Yokosuka City suffer from surface deterioration; for example, salt weathering and crack caused by environmental changes and changes in utilization. There is a possibility that the deterioration becomes harmful to keep them for next generation. The purpose of this investigation is to reveal progress and causes of deterioration in brick structures by monitoring. We measured that: 1) behavior of temperature and relative humidity in brick structures; 2) amount of collapsed brick at Sarushima, one of the islands as Tokyo Bay Fortress in Yokosuka City in June 2017. Moreover, brick debris which obtained monthly were analyzed by using XRD to identify salts in brick debris. As a result, amount of collapsed brick has increased at all spots in July that relative humidity was higher than June. Salt weathering is considered one of the factors to bring about the collapse of the brick because Calcite (CaCO$_3$) and Gypsum (CaCO$_4$ · 2H$_2$O) were detected from brick debris. Finally, we consider the next step method of monitoring based on previous measurement results to find out the possibility of other causes of deterioration.

1. INTRODUCTION

The Many brick structures in Yokosuka City were made as Tokyo Bay Fortress in Meiji period to defend a capital and built a lot of batteries and coast-batteries there by Meiji government. Yokosuka City was the center of Tokyo Bay Fortress because it was at the entrance to the bay and thus a lot of sites of batteries and military facilities have survived as a national historical site in Yokosuka City. The production of bricks has started in Yokosuka City during the early Meiji period, therefore Yokosuka City has early Japanese bricks and it is one of the important places for history of Japanese bricks. For example, Sarushima is one of the islands as Tokyo Bay Fortress in Yokosuka City (Figure 1). It was built from 1881 to 1884. There are Flemish bond and Dutch bond in Sarushima, and it
show the changes of brick masonry in Japan. However, many brick structures in Sarushima suffer from surface deterioration; for example, salt weathering (Figure 2). Salt weathering brings about collapse of bricks. One of the drivers that cause salt weathering is environment in brick structures.

We investigate temperature and relative humidity in brick structures at Sarushima and analyze it what kind of salts exist in brick debris. Our result show that collapse of bricks is caused by some salts, environmental conditions such as temperature and relative humidity.

![Figure 1: Brick structure in Sarushima](image1.jpg)

2. METHODS

Investigation on monitoring was carried out in 3 places such as d3 spot, f1-2 spot, and f1-3 spot from June 5 through June 29, and June 29 through August 2, 2017 in Sarushima (Figure 3). Behavior of temperature and humidity were measured by HOBO U23 Pro v2 Temperature/Relative Humidity data logger which was set to be measured every 30 minutes. Amount of collapsed brick was measured by tray containers set on brick walls and weighed it every one month. The number of trays which were set is 2 at d3 spot, 3 at f1-2 spot, and 1 at f1-3 spot. Brick debris which obtained monthly were analyzed by using X-ray diffractometer (Bruker AXS, NEW D8 ADVANCE) to identify salts in brick debris. The X-ray target was Cu, the tube voltage was 40 kV and the tube current was 40 mA.

![Figure 2: Salt weathering](image2.jpg)  
![Figure 3: Measurement spots in Sarushima](image3.jpg)
3. RESULT AND DISCUSSION

Result of investigation on the monitoring over about 2 months, environment in the brick structures in Sarushima is very high humidity. The average of relative humidity at each spot is from 94% up to 100%. In addition, the average of relative humidity in July is higher than that in June at all spots (Table 1).

Table 1. Summary of the results of temperature and relative humidity from monitoring

<table>
<thead>
<tr>
<th></th>
<th>f1-2</th>
<th>f1-3</th>
<th>d3</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>19.66 ± 0.72</td>
<td>21.71 ± 1.12</td>
<td>18.91 ± 1.23</td>
</tr>
<tr>
<td>July</td>
<td>19.49 ± 0.57</td>
<td>23.88 ± 1.94</td>
<td>18.81 ± 3.23</td>
</tr>
</tbody>
</table>

The environment in brick structures is high humidity, although amount of collapsed brick increase in July. Amount of collapsed brick of July 4 times larger than that of June at d3 spot, and 4.8 times larger than that of June at f1-3 spot (Figure 4).

![Figure 4: Monthly amount of collapsed brick](image)

Results of XRD, Calcite (CaCO₃) was detected from brick debris at d3 spot, and Gypsum (CaCO₄ • 2H₂O) was detected from brick debris at f1-2, and f1-3 spot. Both Calcite and Gypsum are poor solubility, and it is reported that these salts tend to form and separate in a high relative humidity environment. Moreover, it is reported that collapse of bricks is caused when humidity rises again, then salts in bricks deliquesce, because salts on the surface of bricks become heavy by absorbing moisture in the air, and it cause collapse of bricks. Therefore, amount of collapsed brick has increased even if Sarushima in July. Salt weathering is one of the drivers that induce the collapse of bricks, but amount in the f1-2 spot was larger than f1-3 spot despite Gypsum has been detected in f1-2 spot as well as f1-3 spot, thus it will be considered that the influence of vibration by tourists and the wind is other driver cause the collapse of bricks.
4. CONCLUSIONS

The surface of the bricks in Sarushima has been observed damage by salt weathering that cause collapse of the bricks. Investigation on monitoring has been carried out to ascertain relationship of environment and amount of collapsed brick in Sarushima. As a result, amount of collapsed brick has increased at all spots in July that relative humidity was higher than June. Salt weathering is considered one of the factors to bring about the collapse of the brick because Calcite \((\text{CaCO}_3)\) and Gypsum \((\text{CaCO}_4 \cdot 2\text{H}_2\text{O})\) were detected from brick debris. It is necessary that the change of amount of collapsed brick with the change of temperature and relative humidity, and the change of kind of salts detect on the surface of the bricks are observed over a year. Moreover, it will be considered that not only salt weather, but also the influence of vibration by tourists and the wind is other driver cause the collapse of bricks. Therefore, investigation on monitoring relating to these cases is needed anew.

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We would like to thank Yokosuka City for giving them brick samples, and supporting our investigation in Sarushima.

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Effectiveness and Limitation of the Mitigated Act on Facilitation of Reconstruction of Condominiums

Osamu KATO
Faculty of Art and design, University of Tsukuba

ABSTRACT
This is study on the mitigation of partly revised Act on Facilitation of Reconstruction of Condominiums for promoting to rebuild old condominiums which have been designed by old seismic code before 1981. The revision is to rebuild the existing non-confirmed condominiums in form as large as existing. Through four analyses, the effectiveness and limitation of act’s mitigation to permit additional height and floor area ratio were clarified as follows; i) applicable ratio to the mitigation was not high, but the mitigation was effective to rebuild condominium as large as before, ii) the effectiveness was considered to be limited strongly by restrictions of north oblique line limit in Height Control District and sun-shadow regulation, iii) to realize promotion of condominiums rebuilding, these restrictions should be considered to mitigate in flexible way while keeping quality of life environment.

1. INTRODUCTION
The rebuilding old buildings are high priority task since the old buildings the building permission of which was applied before June 1st 1981 have been designed by the old seismic code of structure. However, the rebuilding condominiums has not progressed well yet, because the forming of unit owner’s agreements to rebuild is usually difficult. The number of rebuilt condominiums in Japan are 232 (as of April 2016), this means only 0.6% of the condominiums designed by old seismic code. The fact that 90% of the rebuilt condominiums have made floor area larger than before is worthy of note. Selling the additional floor can reduce owner’s economic load for construction. To promote rebuilding old condominiums, in 2014 Japanese government partly revised Act on Facilitation of Reconstruction of Condominiums (hereinafter called AFRC) to permit the additional floor area ratio only for rebuilding old condominiums which can satisfy the conditions such as minimum the site area, the front road width and length of site facing to front road. The revision also eases the restriction of absolute height in the Height-Control-Zone (hereinafter call HCZ). But, other restrictions such as sun-shadow regulation are excluded from the mitigation. Condominiums in Japan began to spread rapidly after the enforcement of Act on Building Ownership, etc. in 1962. After the drastic urban changes of high economic growth, the building form restrictions has been strengthened due to life environment improvement. Especially, north oblique line limit in HCZ enforced in 1973 and sun-shadow regulation enforced in 1976 are the strongest restrictions which excluded from the mitigation. Condominiums built before the strengthening are the probable existing non-conformed buildings. Hence, the effectiveness of AFRC’s mitigation is considered to have limitation. Based on the above understandings, this study aims to clarify the effectiveness and limitation of AFRC’s mitigation through analyses 1) ~ 4) of samples explained in next chapter.

1 Web-site of Condominium’s Revitalization Council has listed samples of all rebuilt condominiums, and shows detailed building data before and after rebuilding. (http://m-saisei.info/tatekae/index.html)
According to the research of Tokyo Kantei Co., Ltd., 38,662 condominiums designed by the old seismic code exist in Japan (as of Sept. 2011). (https://www.kantei.ne.jp/report/69TR_zenkoku.pdf)
2. METHOD

The research subjects are the existing old condominiums built until 1981 and located in Minato-ku, Tokyo. According to Survey Results of Condominiums in Tokyo (as of August 1st 2011) by Bureau of Urban Development in Tokyo Metropolitan Government, in Minato-ku there are the second most number of existing old condominiums. In addition, the ratio of old condominiums in all condominiums is the highest in Tokyo wards, this means that one of 2.7 condominiums is designed by old seismic code.

2.1 Sample Preparation

Firstly, the samples are collected from the Real Estate Information Network System (hereinafter called REINS) which is online information service only for real estate agents, and big-data of trading history including dwelling of condominium2. Through screening, 549 samples in Minato-ku are found. Secondary, the building data, such as number of stories, total floor area and site area, are obtained from copies of real estate register. Thirdly, information of the building restrictions on site, such as use district, building coverage ratio, floor area ratio, north oblique line limit in HCZ, sun-shadow regulation, are obtained from urban planning map in Minato-ku. Fourthly, the front road widths of site which affect reduction of floor area ratio are confirmed on the road ledger maps. AFRC’s application defines the minimum front road width. Fifthly, the exclusions of samples are considered. 3 samples on the progressed urban development area are excluded. In addition, 11 samples the floor area of which is more than one million sqm that is maximum defined by AFRC’s application are excluded. According to above data collecting, 535 samples are prepared for this study. For analyses material, the list of building data and restrictions on site of samples is compiled.

2.2 Analysis Procedure

Analysis 1) is simple numerical statement of applicable samples which are the existing non-confirmed buildings by the absolute height limit in HCZ and/or restriction of floor area ratio, and which are applicable to AFRC’s mitigation. Analysis 2) is a simulation of rebuilding planning according to the design guideline of AFRC’s mitigation to clarify the possibility that rebuilt condominium can be as large as existing in exchange of making public open space on the site3. Analysis 3) is also simple numerical statement of samples which are existing non-confirmed form, applicable to AFRC’s conditions, and located in the strengthened restrictions area of north oblique line limit in HCZ and/or the sun-shadow regulation. Analysis 4) is one-way ANOVA of the samples the sites of which are in the north oblique line limit in HCZ and the sun-shadow regulation4. The criterion variables are the number of stories and floor area, the explanatory variable is building year. The criterion variables are defined as bellow to avoid influence of different Use Districts. The hypothesis is that condominiums probably became smaller after the enforcement of strengthened restrictions. Analysis of the transition of criterion variables before and after the enforcement is considered to clarify that the strengthening limits building form strongly.

Criterion variables of one-way ANOVA

<table>
<thead>
<tr>
<th>Number of stories:</th>
<th>[(Floor ratio / Building coverage ratio) - Existing number of stories]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor area:</td>
<td>[Maximum floor area ratio – used existing floor area ratio]</td>
</tr>
</tbody>
</table>

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2 The REINS data used in this study is the history from May 1990 to June 2015.
3 Mitigation of floor area ratio and height limit is allowed in exchange of making public open space. See design guidelines of Minato-ku (https://www.city.minato.tokyo.jp/mansyontatekaetatekae.html).
4 One-way ANOVA is done by JMP, SAS Institute Inc.
The results of analyses 1) and 2) are considered to confirm effectiveness of AFRC’s mitigation, on the other hand, the results of 3) and 4) are considered to indicate its limitation.

3. RESULTS AND DISCUSSION

The results of analyses are shown below (Figure 1).

3.1 Results of Analyses 1) and 2): Effectiveness of AFRC’s Mitigation.

Results of analysis 1): The number of existing non-confirmed condominiums by the restrictions of height limit in HCZ and/or floor area ratio was 114 samples (21.3% of 535). The number of applicable existing non-confirmed buildings to AFRC’s mitigation was 67 samples (58.8% of 114). The reasons why other 47 samples couldn’t apply were non-sufficiency of the minimum site area (24 samples), width of front road (22 samples) and length of site facing to front road (1 sample).

Results of analysis 2): As the result of simulation of rebuilding above applicable 67 samples by using AFRC’s mitigation, 3 samples became lower than before, but other 64 (95.5% of 67) samples could be rebuilt as large as existing height and floor area.

58.8% application ratio to AFRC’s mitigation is not so high. The conditions of minimum site area and width of front road are hard for some condominiums to apply AFRC’s mitigation. However, AFRC’s mitigation is very effective to rebuild as large as existing.

3.2 Results of Analyses 3) and 4): Limitation of AFRC’s Mitigation.

Results of analysis 3): The number of samples of existing non-confirmed buildings, which could rebuild as large as before by using AFRC’s mitigation, and which located in the restriction area of north oblique line limit in HCZ and/or the sun-shadow regulation, was 54 samples (84.4% of 64).

Result of analysis 4): The results of one-way ANOVA were shown below (Figure 2 and 3). There were significant differences between number of stories and building years, and also between floor area and building year. After around 1974-1975 when the restrictions strengthening had been enforced, the number of stories and floor area started to decreased.

The effectiveness of AFRC’s mitigation to rebuild condominiums as large as existing is probably restrictive, since applicable 84.4% (54 of 64) samples to AFRC’s mitigation are located in restriction area of north oblique line limit in HCZ and the sun-shadow regulation. If the strengthened restrictions rejected any additional height and floor area for rebuilding, the success ratio to rebuild condominiums as large as existing were only 8.8% (10 of 114).
To promote rebuilding of condominiums, the mitigation of north oblique line limit in HCZ and the sun-shadow regulation should be considered in flexible way while keeping good life environment.

4. CONCLUSIONS

This study clarified the effectiveness and limitation of AFRC’s mitigation to rebuild condominiums as large as existing through four analyses. Conclusions are as follows,

i) The application ratio of AFRC’s mitigation to existing non-confirmed samples is 58.8% which is not so high. However, the mitigation is very effective to rebuild existing non-confirmed condominiums as large as existing.

ii) The effectiveness of AFRC’s mitigation to rebuild condominiums as large as existing is probably restrictive, since a lot of old condominiums are located in the strengthened restrictions area of north oblique line limit in HCZ and the sun-shadow regulation.

iii) To promote rebuilding of condominiums, the mitigation of the strengthened restrictions should be considered in flexible way while keeping good life environment.

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Address: Asst. Prof. Osamu KATO, Faculty of Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN E-mails: o-kato@geijutsu.tsukuba.ac.jp
Interactive Support for Art Appreciation Through Touch: Based on a Viewpoint of the Sculptor

Shinji MIYASAKA,1 Kozue HANDA,2
1 Tokyo University and Graduate School of Social Welfare
2 Meiji Gakuin University

ABSTRACT

In general, Art and Design is intended to be mainly appreciated in the vision, and there is almost no opportunity for the viewer to touch the work. However, from the author’s experience of support for art appreciation it is inferred that tactile sense contributes to the understanding of the work.

This research aims to explore the method of interactive support for art appreciation through touch from a viewpoint of sculptor based on an experiment of sculpture appreciation for the visually impaired. In the experiment, 40 people with visual impairment participated, and compared viewing without support to appreciation accompanied by interactive support. The interactive support was carried out by a method based on the viewpoint of the experience of the first author's sculpture production.

Haptic viewing makes it difficult to grasp the whole figure as compared with visual appreciation, so it takes time. In addition, in viewing alone, there were scenes where subjects were unable to solve the uncertain factors about the statue and could not proceed with appreciation, and cases where grasping of the object became the goal of appreciation. However, with interactive support, there were some utterances that means not only the physical characteristics of works but also the creative images. As a result of the appreciation experiment of this research, it was confirmed that appreciation based on tactile sense is sufficiently meaningful in viewing with appropriate support.

1. INTRODUCTION

In visually impaired education, tactile observation is called "Syokusatsu" in Japanese, and it is important to nurture students' ability to touch up. In some cases, "Syokusatsu" is expressed as "Seeing with Hand", and non-visual images are formed by actively moving both hands and repeating the observation of the whole and parts. Handling of arts and crafts and art education in the special support school is in accordance with the curriculum guidelines of the normal school, students are also carried out creative activities in daily lessons. However, opportunities for art appreciation activities are limited, and in general visually impaired people’s viewing experience is not sufficient compared to sighted people.

Authors have been engaged in production of sculptures conscious of materials and tactile sensations, and practice of support for art appreciation through touch mainly by visually impaired people. Through these activities, we came up with the hypothesis that "accumulation of tactile experiences will contribute to improving the ability to see art works." In order to deepen the consideration to this hypothesis, we aimed to show one direction about the way of interactive support in tactile art appreciation based on a viewpoint of sculptor.

And we also believe that this research can also contribute to improving the environment of art appreciation for visually impaired people in the future.
2. METHOD

Sculpture appreciation experiments were conducted from January to March in 2012. In the experiment. The First Author gave support to each viewer during their second phase of appreciation and the Second Author was in charge of the designing and managing whole experiments.

In the experiment of appreciation, 40 people with visual impairment gained cooperation. And we practiced sculpture appreciation by subject alone and interactive viewing with supporter, and conducted comparative analysis. We prepared three sculptures for viewing and recorded the images of subjects' viewing about each work. Then, we analyzed the movement of the subjects at the time of appreciation and analyzed utterance protocols.

In support of interactive viewing, the first author came to support with particular attention to the following three points.

- viewer's pace
- viewer's level
- Avoidance of words that directly indicate answers

The above is based on experience as a sculptor, and it is conscious of differentiation from the audio guide by the fixed form explanation. The viewing experiment was conducted in the flow shown in Figure 1.

2.1 Sample Preparation

Visually impaired people who participated in the experiment were 40 male and female from 16 years old to 67 years old, and the average age was 27.2 years. More than half of the subjects experienced art appreciation through touch less than 5 times.

As works to appreciate, we prepared three bronze sculptures (Figure2-A, B, C). All the works are subjects of animals, each size can be hugged and it is a size suitable for viewing by touch. The creators of works A, B and C are Chozan Sato, Saburo Yoshida, the First Author, and Sato and Yoshida are historically acclaimed sculptors. On the other hand, the sculpture of the first author is a work exhibited at the 39th NICCHOTEN EXHIBITION, that is, each sculpture work can be evaluated as having certain artistic value. Each work has its character in its expression, and although these works were casted in bronze, the prototype work was made of different materials. "Hogyu" is Wood Carving, "Hidamari" is Modeling, "Waiting Wind" is made by Plaster-direct-attachment, and the bronze surface can see the difference in each texture.
2.2 Experimental Procedure

The authors investigated the experiences of subjects' appreciation and degree of disability in advance question papers. Then next, we conducted three stage viewing practices, and followed-up interviewed the subjects after viewing. Appreciation practice was conducted in a form in which subjects uttered what they felt or thought during appreciation, and we recorded the situation with images. The timing to finish the appreciation was left to the subject. In Preliminary practice, we prepared a sculpture made of wood with a giraffe as a motif and carried out a preliminary exercise of subject's utterance. After that, sculpture appreciations without support were done for three works (Figure 2-A, B, C). Supporter (the First Author) observed the state that subjects, assumed the level of appreciation from hand movement and utterance situation, and planned for appropriate interactive support. After the subjects finished appreciating themselves, Interactive viewing accompanied by supporters at the same works, was done.

This experiment was conducted based on the ethical review of the Graduate School of Comprehensive Human Sciences, University of Tsukuba. The Application of ethical review was submitted by Professor Hiroshi Dairoku and Kozeu Handa (the Second Author).

3. RESULTS AND DISCUSSION

It was confirmed by observation that the non-visual touching appreciation tended to flow as follows (Figure 3-1,2,3,4,5).

1. Exploring the outline of the image and grasping the scale of the work
2. Grasping physical characteristics such as hardness and weight
3. Focusing on characteristic forms, and seeking motif of statue
4. Forecasting on composition of the work, and Understanding the overall
5. Focusing on distinctive art expression, and seeking expression intent

Subjects tended to satisfy and finish appreciation by recognizing what is represented as a motif or by understanding of the overall. It was the main purpose to appreciate viewing by themselves, and there were a few utterances leading to expression intention. The following elements were used as clues in planning:

- Frequency of appearance of surface perceptions (texture) in utterance
- Frequency of appearance of aesthetic sensations and art images in utterance
- Emotional ups and downs appearing in the facial expression and voice tones
- Changes in the speed of motion of hands and fingers
- Length of time to think at specific points with hands stopping
The length of viewing time with supporter was longer than without supporter in any of the works (Table 1). In addition, according to the follow-up interview, it was confirmed that most subjects felt that art appreciation was deepened by Interactive Support.

In viewing with interactive support, there were some utterances that means not only the physical characteristics of works but also the creative images. It was possible to consider that it is more advanced viewing. It was revealed that regarding the way of support, making viewers independent appreciation is the most important than providing knowledge and information. And also, it was suggested that there is recognition that can only be obtained within the process of tactile appreciation.

<table>
<thead>
<tr>
<th>Time for viewing</th>
<th>without support</th>
<th>with interactive support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - A</td>
<td>07 : 15</td>
<td>12 : 37</td>
</tr>
<tr>
<td>1 - B</td>
<td>06 : 30</td>
<td>09 : 07</td>
</tr>
<tr>
<td>1 - C</td>
<td>05 : 58</td>
<td>07 : 48</td>
</tr>
</tbody>
</table>

**Table 1: Outline of Experiment**

4. CONCLUSIONS

Appreciation should be done as well so that the creative activities are done self-directed and actively. Therefore, it is effective to try interactive support not only explains the appearance of the work but also empathizes with the viewer as the viewing progresses, conveys visual information that is difficult for the viewer alone to grasp, and tries a dialogue to obtain a multifaceted image.

Through this experiment, it became clear that in art appreciation through touch for the visually impaired, the interactive support will be a certain benefit of the viewer. In addition, it was able to confirm that they wanted support to clear only ambiguous places in their own viewing rather than the fixed form guide.

In the current situation in Japan, it is hard to say that the viewing environment is still well prepared, and training of supporters is a future task. We think that considering tactile appreciation not only as a viewing support for the visually impaired, but also a new viewpoint of art appreciation education.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to everyone who cooperated with the experiment and those who provided guidance and advice in this research.

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Address: Assoc. Prof. Shinji Miyasaka, Faculty of Pedology, Tokyo University of Social Welfare
4-23-1 Higashi-Ikebukuro, Toshima, Tokyo, 170-0013, JAPAN
E-mail: shmiyasa@ed.tokyo-fukushi.ac.jp
The Trend of the Cao Chang Di Art District as a Place of Contemporary Art

Lu ZHANG
Graduate School of Comprehensive Human Sciences, PhD Program in World Cultural Heritage Studies, University of Tsukuba

ABSTRACT
The Art Districts in China began in Beijing in the 1990s. They are the places where works of contemporary art are produced, exhibited and sold. Cao Chang Di Art District is an art community started by the spontaneous gathering of artists since the end of last century, and famous by Ai Weiwei, who set up his home and studio as a well-known artist in 2000. As art districts spread to the city area from northeast Beijing, Cao Chang Di Art District has relationships with other art districts, particularly the 798 Art District. The purpose of this paper is to reveal the change of the Cao Chang Di Art District, and to explore the features and positioning of the Art Districts in China, based on the view from the Chinese contemporary art perspective. The method of the study depends on literature search and field survey. The results show that: 1) the administrative structure offers basic services and they do not intervene in the exhibition contents or management of arts-related facilities, so that there is a comparatively free creation environment; 2) the creation of new concepts in art work generated by various genres is a main feature of Cao Chang Di Art District; 3) the attention of the society is low because the administrative sector has not enough power to consolidate public relations and large-scale art events. The Cao Chang Di Art District has an allotment of roles as a place of contemporary art on creation, experimentation, exhibition, sales and criticism.

1. INTRODUCTION
The Cao Chang Di Art District is located in the Cao Chang Di Village of the Cuigezhuang Township, Chaoyang District, Beijing. It is in the northeast in Beijing city and about 17 kilometers away from Tiananmen. Agriculture was the main industry formerly in this village, but urbanization developed rapidly in the 1990s. Laborers moved to Beijing from all over China, and villagers remodeled buildings and rented rooms to fit these migrant workers. The current population of the village is about 30,000, and 96% are migrant residents. Ai Weiwei, who was among the original members of Stars Art Group (XingXing, 星星画会), established a gallery named ‘China Art Archives & Warehouse’ in 1999-2000. With Ai Weiwei’s great influence, gray brick and the straight design are the main feature of the buildings of the Cao Chang Di Art District. Now, the Cao Chang Di Art District covers an area of about 199800 square meters, and it is intermingled with the residential part of the

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1 2014.1.6, 中国経済時報: 农民集体土地上的自主城鎮化
village. There are 53 galleries making an advance into the Cao Chang Di Art District2. The amount of tourists is small because of the few sightseeing facilities and the inconvenient public transportation. Persons interested in art are the main visitors.

2. METHODOLOGY

Literature research and field survey were the main methods used in this study. Literature research includes newspaper articles, publications of fine arts, and web articles. To grasp the use conditions and operation of art facilities, I interviewed an artist, a person involved in a gallery and an administrator in Cao Chang Di Art District by field survey. It is divided into 2 aspects: intervention of the administrative structure and the movement of contemporary art in Cao Cao Chang Di Art District.

2.1 The Trend of the Cao Cao Chang Di Art District

Cao Chang Di Art District development is divided into two periods: the early stage when it was established voluntarily by artists and the stage when it was developed by the traders.

2.1.1 Early Stage of Formation(1990s-2005)

Around 1995, after the Yuan Ming Yuan art village was dismissed, artists moved to the outskirts of Beijing. At that time, the Central Academy of Fine Art moved to “Er Chang”, which was close to the 798 Art District. A small number of academy of fine arts students and artists moved to the Cao Chang Di village, as well as many migrant residents. It is thought that the easiness for artists to move in, together with various factors, was the trigger for which the Cao Chang Di Art District formed in Cao Chang Di Village in the middle of the 1990s, although there is not any record about the artists who moved to Cao Chang Di Village. The district consolidated as an Art District when Ai Weiwei designed and established the “China Art Archives & Warehouse” gallery and the “Fake Studio” atelier on 1999. Because of Ai Weiwei’s international influence and the avant-garde exhibitions in his gallery, more and more artists moved to Cao Chang Di from 2002, and began to rent villager’s apartments and use them as ateliers. After that, around 2005, a professor from Peking University named Sun Liangang who was born in Cao Chang Di Village, through the village committee (administration), advanced the development of the village that had already begun.

2.1.2 Second-stage: the Formation of the Cao Chang Di Art District through the Development of Traders (2005–)

Sun Liangang established areas A, B, C and D in 2005. Different from Ai Weiwei’s “China Art Archives & Warehouse” style and new buildings, areas A, B, C have reconstructed buildings, most were from this village. There are few gray brick construction buildings like the style of Ai Weiwei’s atelier. At present, buildings for art related facilities are constructed in villages and basically followed Ai Weiwei’s design. It can be said that this is the main feature of the space of the Cao Chang Di Art District.

It is different from a township and a town, because the administrative body is a

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village, and there are no rights of land use and no business plan. Therefore, there are no organizations which unify and manage the whole art district. Because the administrative body does not participate in the management of art related facilities, basically including the exhibition contents, there is a free creation environment. The administrative structure of the Cao Chang Di Art District offers only collecting the rent and basic services of safety and health.

2.2. Chinese Contemporary Art in Cao Chang Di Art District

2.2.1 Activity of the Artists

With Ai Weiwei’s concept “The wealth of the Chinese mainland is put on a contemporary context as poetic caricature and tradition is overturned”\(^3\), experimental art activities are being performed in the Cao Chang Di Art District. Art related facilities mostly share this style, and it is thought that Ai Weiwei’s art concept and construction are related to this. For example, the shapes of the buildings aim at simplicity and minimalism “Replica like templates. Design is not important here…it can be said to be a minimalist works, showing some kind of control,” said by Ai Weiwei. Other artists are also challenging the possibility that the Chinese contemporary art is expressed by various forms, while having an interest in the Chinese society in the background. For example, a gallery named CCD Workstation, made a documentary film called "Private Memory Project,” which was the record from collected data of about 700 people in 4 years until 2012, targeted at the Chinese farmers who experienced the "three year famine". Persons with various viewpoints, not only artists, participated the experimental try of which it can be said: “a document of a private memory is built”\(^4\).

2.2.2 Art Event

There are two big events in the Cao Chang Di Art District, one is “Beijing Design Week” for the public, the other is “Three Shadows Photography Award” (preceded by the Cao Chang Di Photo Spring of 2009-2012) for the persons involved in art. From 2012, the Cao Chang Di Art District is one of the hubs of the Beijing Design Week, with exhibitions, design atelier openings and performed exhibitions. The Cao Chang Di Art District became a place where general citizens communicate with designers and artists by installation works made there. For example, in 2013, people who have physical disabilities used work for the furniture designer as a "canvas", and drew pictures on it. The special quality of the Cao Chang Di Art District as and "experiment" is also utilized in Beijing Design Week.

“The Three Shadows Photography Award” started in 2008. During 2009-2012, the Cao Chang Di Photo Spring event featured exhibitions and other art activities, focusing on photography and video. The Gallery “Three Shadows” sponsored it, and some other galleries participated. After 2012, the “Three Shadows Photography Award” became a big event here and also an important event in Chinese contemporary photography. The feature of this event emphasizes academics, communication with the photographers, the new discovery of a concept of photography and the support young

photographers. It provides a multi-cultural communication space in the Cao Chang Di Art District.

3. RESULTS AND DISCUSSION

Under the influence of Ai Weiwei’s advancement, the Cao Chang Di Art District had a unified architecture, and the “place” was inspired by the idea of criticizing Chinese politics and society. With interest in the social background of China and in the art institution as a place to try Chinese contemporary art in a variety of formats, artists came to the Cao Chang Di Art District, created new ideas in their works, and transmitted them in various genres of art works. Artists came from all over the world, forming a new perspective on China’s social environment and interacting with Chinese artists, so that an international cultural exchange place was born. The Cao Chang Di Village administrative organization, where the art district is located, has weak administrative powers and is indifferent to art, so that arts-related facility management is basically untouched. For this reason, the Cao Chang Di Art District is a relatively free creative environment. On the other hand, the village committee has no power to organize large-scale art events or do public relations events, so that the attention of the society and the spread to the general citizens are low. The Cao Chang Di Art District inherits the characteristics of "creation place", "experiment place", "exhibition place", "sales place", and "critical place", but as an "exchange place" and an "art business promotion place" it is not enough.

4. CONCLUSIONS

First of all, in China, the government policy and planning for the development of the culture of the country determine, on the promotion of Chinese contemporary art, that the government should approve and support. The major village industry with the cultural creative industry of Cao Chang Di Village need to get assistance from a senior government policy in the future. Secondly, it is necessary that art facilities cooperate, that an autonomy system in the art district is secured, and that support for artists’ creation is ensured, while holding events that spread contemporary art.

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Address: Lu ZHANG, PhD Program in World Cultural Heritage Studies, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN
E-mails: luzhangcampos@gmail.com

Mika HOSHI
Faculty of Art and design, University of Tsukuba

ABSTRACT
Since FY2013, when our project was selected under “Young Artist Development Project for Creation of Next-Generation Culture” by the Agency for Cultural Affairs of the Government of Japan, the University of Tsukuba has been hosting the “FINE ART/ UNIVERSITY SELECTION” exhibitions mainly at the Ibaraki Museum of Art. Our initiative intends to provide young artists mostly under 35 years of age, who are graduates of various fine art universities in Japan and other countries, with the place to display their works. In this year, the fifth exhibition in the series will be held at the same venue under this project.

With experiences and knowledge acquired in planning and operations of the past exhibitions, I undertake the research on “Fine Arts Management based on the inter-university network,” which is being built through the ongoing project.

In this presentation, I recap the project activities done in these four years, analyze the details and approach of Fine Arts Management based on the inter-university network, and summarize the results and future challenges.

1. INTRODUCTION
Young artists usually continue their artistic activities in economically difficult situations after graduation. What is called for in the current circumstance is an unprecedented level of supports in career development of young artists by having their works evaluate from wider perspectives, and by encouraging them to widen and deepen their knowledge through active exchanges with other young artists from home and abroad.

This research aims at building the framework that provide young artists with continuous supports in career development by leveraging the inter-university network, and at identifying effective programs and approaches.

2. METHOD

- Career development details and its approach are studied in each of three project areas, namely 1) exhibition, 2) events in conjunction with exhibitions, and 3) communications.
- The FINE ART exhibition executive committee, composed of five professors and myself from Faculty of Art and Design of the University of Tsukuba, discuss the most effective programs and approaches to formulate the project planning.
- Collect opinions on effective approaches for young artist development through surveys/
interviews with contact persons of participating fine art universities, and curators and other experts in the art arena. The collected opinions will be considered to improve and promote coming activities.

3. RESULTS AND DISCUSSION

Exhibitions have been successfully attracting the growing number of participants, and the committee have continuously made improvements in programs (Table1,2, Figure1,2). Firstly, in the fourth exhibition in FY2016, awards were given to the most excellent artists, which marked the first step to properly evaluate the entered works. Also in FY2016, “Upcoming Artist Selection FAUSS 2016” was started as a follow-up program to provide selected artists participated in past exhibitions with opportunities to exhibit their works to the public. This represents the platform to continuously support young artists for their artistic activities. The number of participating universities reached 54 in FY2016, quadrupled from the first exhibition. Although the majority of nominations were made by art departments in faculties of education initially, fine art universities increasingly participate in the exhibitions. This contributes to diversifying the entered works.

In these four years, a total of 372 young artists participated. Later some of them won awards in publicly-sponsored exhibitions, and are further expanding their activity sphere.

<table>
<thead>
<tr>
<th>Number of participating Universities</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>6</td>
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<td>16</td>
<td>19</td>
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<tr>
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<td>33</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Overseas</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>27</td>
<td>40</td>
<td>54</td>
<td>97</td>
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<table>
<thead>
<tr>
<th>Number of participating artists</th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Painting</td>
<td>23</td>
<td>42</td>
<td>48</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Print Art</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Sculpture</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>Calligraphy</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>70</td>
<td>78</td>
<td>116</td>
<td>100</td>
</tr>
</tbody>
</table>

| Overseas                             |        |        |        |        |        |
| Painting                             | 6      | 9      | 11     | 5      | 12     |
| Print Art                            | 5      | 5      | 5      | 2      | 2      |
| Sculpture                            | 2      | 1      | 2      | 2      | 4      |
| Calligraphy                          | 2      | 1      | 1      | 1      | 0      |
| Total                                | 15     | 16     | 19     | 10     | 18     |

| Total                                | 63     | 86     | 97     | 126    | 118    |

Table 1: Transition of the Number of Participating Universities and Artists FY2013-2017.

<table>
<thead>
<tr>
<th>Exhibition</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
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<tr>
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<table>
<thead>
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<th>Related Exhibition</th>
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<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
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<tr>
<td>“FINE ART UNIVERSITY SELECTION 2013-2014”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date:2014.3.6(Fri)-14(Fu)</td>
<td>Venue: Multi-purpose Hall of University Comprehensive Exchange Hall etc. in University of Tokushu</td>
<td></td>
<td></td>
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<tr>
<td>“FINE ART UNIVERSITY SELECTION 2015-2016”</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date:2015.3.3(Tue)-6(Sun)</td>
<td>Venue: Tsukuba Museum of Art, IBARAKI</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Date:2016.3.20(Tue)-25(Sun)</td>
<td>Venue: Tsukuba Museum of Art, IBARAKI</td>
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<table>
<thead>
<tr>
<th>Related event</th>
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<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keynote Lecture</td>
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<tr>
<td>Cross-cultural Encounter and Interaction</td>
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<tr>
<td>Artist Talk</td>
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</tbody>
</table>

Table 2: Transition of the Programs of the Exhibition FY2013-2017.
Figure 1: Participating Domestic Universities and Fiscal Year of their Participation.

Figure 2: Participating Overseas Universities and Fiscal Year of their Participation.
4. CONCLUSIONS

The fifth exhibition to be held in FY2017 has attracted 97 participating universities, achieving the increase by 1.8 times compared to the previous year (Table 1). In light of this great number of participants, the inter-university network has nearly completed. From this year, the exhibition is renewed under the name of “FINE ART UNIVERSIADE U-35.” “Universiade” is the concept created at the project inception, inspired by the international university sport event. Furthermore, this project was selected as a Tokyo 2020 accredited program. This will help the program truly grow into the global platform for artist development.

The committee expects the program to increasingly attract the participation from overseas. Based on the growing inter-university network, we will focus on designing the evaluation metrics for fine art works, which will grow into the global standard through collaborative examinations in the network. The network built among fine art universities will serve as the place to exchange information and opinions, as well as the field to practically use the evaluation metrics.

In future, the evaluation metrics are expected to be established as the jurying and evaluation criteria for artworks in conferring degrees in fine art universities.

ACKNOWLEDGEMENTS

I’d like to extend my deepest gratitude to the Agency of Cultural Affairs for selecting our project for five consecutive years, and staff in domestic and overseas universities, experts in the art arena, and FINE ART exhibition executive committee members for their immense cooperation and supports.

REFERENCES

Kei Ota, Terumi Hotokeyama, Mika Hoshi, Toru Iwasa, Ayumi Katayanagi, Yoshihiro Torigoe, Kaori Furuhashi, Ayako Moriya (Eds.), 2017, Report of “Young Artist Development Project for Creation of Next-Generation Culture” supported by the Agency for Cultural Affairs Government of Japan in FY2016, Creation of new fields of performance for young fine artists: Building ‘Fine Art Universiade’ infrastructure, FINE ART exhibition executive committee.

Address: Assistant Prof. Mika HOSHI, Faculty of Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN E-mails: hoshi.mika.kb@geijutsu.tsukuba.ac.jp
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Comparing the Role of Ships on the Columns of Trajan and Marcus Aurelius

SAKATA MICHIo
Chiba University of Commerce

ABSTRACT
The Roman Empire achieved the biggest territory from Britannia to the Euphrates in the age of Trajan. One reason of the success was, of course, the Roman military, which is composed of the garrison at Rome, the provincial Army, the Navy and so on. Among the military divisions, one of the most important, but quite unknown to us is the Roman Navy. In this presentation, roles of the Navy will be examined by researching iconographies of fleets and ships represented on the Columns of Trajan and Marcus Aurelius.

1. INTRODUCTION
It is no doubt that every historian or archaeologist would admit the importance of the Roman Navy in Ancient Rome. During the Punic Wars in the 3rd century B.C., the navy accounted for a third of the total Roman military and, during the imperial period, it occupied, in average, more than a tenth of it. This view was probably shared among the Romans in antiquity, as Cicero made a statement, in the first century B.C., that the Master of the sea must inevitably be the master of the empire.

Despite being one of the most important roman military divisions, roles and organizations of the Roman Navy are almost unknown to us for two reasons. First, no historical texts on the Roman Navy is handed down to us except Vegetius, who mentions Roman naval warfare, shipbuilding and the art of navigation in De re militari written probably in the fourth century A.D. Second, as Pitassi indicates, among the remains of many shipwrecks dated from 3rd century B.C. to 5th century A.D., none of them can be identified as warships. Only five river crafts found at Mainz and Ingolstadt are proposed possibly to be used as warship.

Although textual and archaeological evidences that we have are only a few, there is one important, but often overlooked source for understanding the naval force of the Roman army. It is iconographical sources. Especially, the Columns of Trajan and Marcus Aurelius may give us important information
on roles of the Roman Navy in war. Trajan’s Column was constructed to celebrate the victory in the Dacian wars in AD 113 and, on the relief of the column, the first Dacian war starts at the bottom and scenes move spirally up to the top where the second Dacian war ends. On the other hands, the column of Marcus Aurelius was constructed probably to celebrate a triumph for his German and Sarmatian when Marcus returned to Rome after a multiyear absence. The column of Marcus Aurelius shows us the Marcomannic wars between the Romans and the Germanic tribes from 166 to 180 A.D. The two column reliefs do include depictions of Roman Fleets and boats in war on the frontier.

In the Dacian and the Marcomannic wars, most of the Roman army probably departed from Italy by ship, as represented on the two columns. In addition, borders between the Romans and the Barbarians in the two wars were basically two rivers: the Danube and the Rheine, so it is likely that the Roman Navy may have important roles in the tactics of the Romans.

Previous studies only describe representations of ancient Roman fleets and they have not even classified what kind of ships were used there. Filippo Coarelli and Frank Lepper, who wrote books on the column of Trajan and Marcus Aurelius, merely give us descriptions of fleets and ships and no further examinations have not been done.

According to my preliminary research, 28 Roman ships are represented respectively on the Columns of Trajan and Marcus Aurelius. There is no Barbarian ships represented on both monuments. In this presentation, I would like to, first, classify depictions of warships on the Columns of Trajan and Marcus Aurelius respectively, then, compare roles of warships in the two columns.

2. DISCUSSION

There are mainly two kinds of ships depicted on the Column of Trajan. The first type is a small ship with an oar; the second type is a bireme, that is, a Roman warship having two tiers of oars on each side. Out of 28 ship images, 8 are represented as bireme, while 20 are depicted as small ship. The role in war seem different between the two kinds.

Small ships have two roles: transportation and bridge's base. First, some small ships are used to transport foods, drinks and, in one instance, horses and human beings. For example, in scene 2, two roman soldiers are
represented loading barrels in a ship and another ship already having been loaded bags. Second, they are represented as bridge. In scene 4-5, 8 small boats are connected with each other for Roman soldiers to be able to pass through from one shore to another.

On the other hands, there was one role for bireme. Biremes were used to transport Roman soldiers. In scene 79 represented three biremes departing from a port at night. In a bireme seen 8 rowing crew controlled by a man clad in cloak, probably Emperor Trajan. Given that rowing crews are the only representation on the bireme, its main role was to transport rowing crews, who are lower ranked Roman soldiers. Although biremes were probably used also as warship, no naval battles are represented on the column. It is also academically interesting to see that Emperor Trajan is represented, related to bireme, three times: twice on board and once before boarding. In all three scenes, the bireme related to Trajan have similar characteristics.

On the column of Marcus Aurelius, only one kind of ship is represented: small ship. All 28 representations look more or less same. Their roles are, as on the column of Trajan, two: transportation and bridge’s base. There are some scenes in which small ships transporting foods. In scene 2, a roman soldier is represented loading barrels in a ship. On the other hands, they are used in some scenes as bridge. In scene 3, nine small boats are connected with each other for Roman soldiers to be able to pass through. Some Researchers propose that the column of Marcus Aurelius was modeled after the Trajan’s Column, so it is no surprise that depictions of ships are quite similar between them.

By comparing depictions of ships on the two column, we can find especially two differences. First, only on the Column of Trajan, we can see bireme. Second, on the column of Trajan, there is no Roman soldiers wearing arms on a ship, while on the column of Marcus Aurelius, Roman soldiers always wear helmets, armors and spears on board.

3. CONCLUSION

In this presentation, depictions of ships on the Columns of Trajan and Marcus Aurelius are classified and compared. On the column of Trajan represented two kinds of ship: small ship and bireme. Small ships are mainly used for transportation and bridge’s base, while biremes are depicted with a lot of Roman soldiers on board. On the Column of Marcus Aurelius depicted only
small ships. They are, as on the column of Trajan, used for transportation and bridge's base.

**REFERENCES**


*Address: Dr. Michio Sakata, Chiba University of Commerce
Dainiwakabasou no.101, 3-17-7 Kyounan-tyou, Musashinoshi, Tokyo,1800023, JAPAN
E-mails: schoolrock78@gmail.com*
The Vanishing Goddess: A Transformation of a Symbolic National Image in Imperial Japan

Michiko HAYASHI
Faculty of Art and Design, University of Tsukuba

ABSTRACT
This presentation attempts to evaluate the visible Japanese national identity through the analysis of images of a representative goddess. The goddess, *Yamato-hime*, created in Meiji 35(1902), was depicted in various media, such as advertising posters, the pattern of kimono fabric, and, of course, in academic paintings, until the Pacific War. Since then, Japan has used no specific icon to personify the nation-state, whereas the United Kingdom has Britannia, France has Marianne, and Germany has Germania. Why has the Japanese goddess vanished? To answer this question, I begin by taking a closer look at the strategy the Meiji Government exerted to integrate the nation. In this presentation, my purpose is to clarify the direct and indirect involvement of *Naimu-shō*, the Department of the Interior, in the creation of modern images of the goddess. Furthermore, this presentation will argue the extinction of this visualized goddess was caused by the dissolution of *Naimu-shō* that GHQ/SCAP ordered in Shōwa 22 (1947).

1. INTRODUCTION
The purpose of this study is to clarify the historical context of the vanishing of the Goddess as a national icon after World War II, in spite of the fact that the image repeatedly appeared in fine art or commercial art during the Meiji, Taishō, and Shōwa eras.

The author already published a research paper about this goddess, *Yamato-hime*, and the representation of Japan’s national identity. (Hayashi,2016) *Yamato-hime* was a novel figure of a goddess that caricature cartoonist Rakuten Kitazawa had created to commemorate the Anglo-Japanese Alliance in 1902. (Figure. 1) The concept of *Yamato-hime* was imagined equal to the goddess Britannia. The outlook of *Yamato-hime* is evocative of an ancient goddess, and her hair style and dress follow the manners and customs of the *Jōko* period, the ancient time of Japan. As a visual equivalence with the British goddess, Britannia, who wears a helmet and carries arms and a shield, the Japanese goddess, *Yamato-hime*, has a halberd. Both these goddesses were seen as iconographically symbolic of war.

The most famous goddess of war in Japan is undoubtedly *Jingu-Kōgō* (Empress Jingu), who was the mother of Ōjin-tenno (Emperor Ōjin, reign: 270-310 C.E.). Jingu-Kōgō was known to have invaded Korea, and to be the Hachiman deity, a goddess of war. She was not only depicted in paintings and prints, but also used in designs as an icon on paper money and postal stamps after the Meiji Restoration.

On the other hand, the Imperial Princess of the 11th Emperor, *Suinin* (reign: 29- 70 B.C.), *Yamato-hime* was known as a Mitsueshiro (a supreme priestess who supports the divine spirit) to lead Amaterasu-Omikami (the Goddess of the Sun and ancestor of the Imperial House) toward the Ise district for the construction of the *Ise Jingū* Shrine. In addition, there was a legend that *Yamato-hime* aided her nephew, *Yamato-takeru*, in battles.

We know the popularity of *Yamato-hime* and *Jingu-Kōgō* from a table of ranking, *Kokon Teijyo Bijin Kagami* (A Ranking of Chaste and Beautiful Women Past and Present) (Figure.
2) The two goddesses were represented in various commercial media, such as tobacco posters and kimono patterns.

2. METHOD

The visualization of *Jingu-Kōgō* and *Yamato-hime* was a parallel event with the systematic implementation of State Shinto by Naimu-shō (the Department of the Interior). In this study, I am using two other approaches by analysis of official documents. The first is about the foundation of *Yamato-hime no Mikoto* Shrine as a Betsugū (associated shrine) of the Ise Shrine, after a petition adopted by the Imperial Diet. The second is the so called Shintō Shirei issued by GHQ/SCAP, the official notification of the “Abolition of Governmental Sponsorship, Support, Perpetuation, Control, and Dissemination of State Shinto” after the defeat in World War II.

By examining these official documents, I hope to find the reason for the extinction of visual images of this goddess as a national icon. This investigation will also clarify the transition of images of goddesses from Meiji 35 (1902) to Shōwa 20 (1945).

2.1 The foundation of the shrine for *Yamato-hime no Mikoto*

*Yamato-hime* is now enshrined in the *Yamato-hime* Shrine in Ise city as one of Betsugū (associated shrine). Originally, the establishment of this shrine was requested once in the Meiji era, but it did not happen. After entering the Taishō era, the Mayor of Ujiyamada City, Noriyuki Fukuchi, submitted a petition to the Imperial Diet, and the shrine was finally established. According to the *Seigan Kengi Kankei Bunsho* (Petition and Proposal Documents) of National Archives of Japan, the opinion “The enshrinement of *Yamato-hime*” written by Noriyuki Fukuchi, was submitted by the chairman of the House of Lords, Iesato Tokugawa, to the Prime Minister, Shigenobu Ōkubo, and attributed *Yamato-hime* as a Mitsueshiro (supreme priestess) for Amaterasu Ōmikami (the Goddess of the Sun). By reading through the congressional document, this petition was deliberated on in the second session of the petition council in the 36th Imperial Diet, Taishō 4 (1915), but suspended under consideration. Three years later, this petition was discussed in the 40th Imperial Diet on 14th March, Taishō 7 (1918), again. After lively discussion, “The proposal for the enshrinement of *Yamato-hime*” from Ikuzo Ōka was presented to Prime Minister, Masatake Terauchi (in office: 9 October 1916 – 29 September 1918), on 20th March, Taishō 7 (1918). In response to this, the Minister of the Interior (*Naimu-shō*), Takejiro Tokonami, declared the establishment of the *Yamato-hime* shrine to the new Prime Minister, Takashi Hara (in office: 29 September 1918 – 4 November 1921). It was later approved by the government on 4th January, Taishō 10 (1921), and a ceremony of enshrinement was held.

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2.2 Shintō Shirei, Abolition of Governmental Sponsorship, Support, Perpetuation, Control, and Dissemination of State Shinto, 1945 by GHQ/SCAP

After the defeat in World War II, the GHQ/SCAP declared the “Abolition of Governmental Sponsorship, Support, Perpetuation, Control, and Dissemination of State Shinto (Kokka Shinto, Jinja Shinto)” on 15th December, Shōwa 20 (1945), which is now known as Shintō Shirei. The main point of this instruction was the prohibition of support for Shinto by the nation, in particular prohibiting the use of public resources and forbidding the teaching of Shinto doctrine in state education, and forbidding research on Shinto. The Ise Shrine was also forbidden for use at national events, as follows:

1-d. The Religious Functions Order relating to the Grand Shrine of Ise and the Religious Functions Order relating to the State and other Shrines will be annulled.

It also instructed the Ministry of the Interior (Naimu-Shō) to dissolve state-sponsored Shintoism, especially via abolishing the Jingi-in (the Institute of Divinities).

2-e. The Shrine Board (Jingi-in) of the Ministry of Home Affairs will be abolished, and its present functions, duties, and administrative obligations will not be assumed by any other governmental or tax-supported agency.

Particular attention potentially relating to the goddess, can be seen in the following two paragraphs:

1-k. God-shelves (kamidana) and all other physical symbols of State Shinto in any office, school, institution, organization, or structure supported wholly or in part by public funds are prohibited and will be removed immediately.

2-b. The provisions of this directive will apply with equal force to all rites, practices, ceremonies, observances, beliefs, teachings, mythology, legends, philosophy, shrines, and physical symbols associated with Shinto.

In the first Japanese translation the word used for Symbol was Hyōshō (a symbol appearing on a surface) and in the final text Shōchō (an abstract symbol). As an example of a physical symbol, this instruction listed God-shelves (kamidana), but this symbol would of course contain a goddess image as well as a more abstract image as an icon.

3. DISCUSSION

From the discussion in the Imperial Diet about the Yamato-hime Shrine, it can be seen that Yamato-hime was quite well known to people in the Meiji and Taishō eras. For example, the congressman Katsu Kawasaki from Mie prefecture, which contains the Ise Shrine, made a statement asserting that “Speaking of Ise Jingu shall recall Yamato-hime”. What we can see from this proposal is that in celebrating Yamato-hime as an associated Ise shrine, the Yamato-hime legend was restricted to the position as a Mitsueshiro (supreme priestess) that led Amaterasu (the Sun Goddess) to Ise. In the proposal, it is not mentioned that there is a genealogy of a "fighting goddess" that supported the wars of the legendary Emperor, Yamato-takeru. Kitazawa Rakuten's idea that the association of a fighting goddess—Yamato-hime—is clearly denied by both citizens of Ise and the state during the Taishō era.

3 “Special government office concerning the god dispute settlement agenda”, The 40th Imperial Parliament House of Representatives, 16th March 1918.
After that, and until the present, *Yamato-hime* has been honored only as a *Mitsueshiro*. As already mentioned in the *Kindai Gasetsu* (Hayashi, 2016), *Yamato-hime*’s image is held in copyright by Rakuten himself, who severely insisted on his copyright and sole attribution, such that expansion in commercial art is hardly seen. The goddess Ryūyō Machida painted as a poster in Taishō 7 (1918) is not a *Yamato-hime*, but a figure reminiscent of Toyosukiihi-hime wearing a moon icon. In the oil painting, *Yamato-hime* was depicted during the Pacific War. Sanzō Wada’s “Kōa Mandala (Mandala of the Greater East Asia Co-prosperity Sphere)” Shōwa 15 (1940) represented as a goddess who holds the *Yata no Kagami* (the eight-span mirror; part of the Imperial regalia) that is a shinto embodiment of *Amaterasu*. However, since this painting, there are no works depicting *Yamato-hime*.

As mentioned above, the *Shintō Shirei*, imposed after the defeat, banned the visualization of national Shinto. The state was also prohibited from participating in the festival of the Ise Shrine. However, after that, the administration of Shinto moved to the *Kunai-chō* (the Ministry of the Imperial Household) after the dissolution of the Ministry of the Interior (*Naimu shō*), and the Ise Shrine survived as a private sanctuary of the Imperial Family. According to Loo’s argument, the *Shintō Shirei* imposed by SCAP restricted the political function of Ise, but did not mention the relationship with the Emperor. (Loo, 2010)

### 4. CONCLUSIONS

The goddess symbolizing Japan was explored in the Meiji era and *Yamato-hime* with a weapon was imagined by Rakuten Kitasawa as a "fighting goddess" to stand alongside British *Britannia*. At the same time the Ministry of the Interior (*Naimu-Shō*), established the State religion of Shinto institutionally. In the Taishō era, the momentum to make a *Yamato-hime* Shrine in Ise Jingū intensified, and it was actually built over eight years after the petition was submitted to the Imperial Diet. However, in this shrine *Yamato-hime* was treated as a servant of *Amaterasu*, and any association with war was omitted. During the Taishō and early Showa periods, Jingu-Kōgō and *Yamato-hime* were drawn mainly in commercial art and on kimono patterns. During World War II, *Yamato-hime* appeared momentarily in a painting as a symbol of the Greater East Asia Co-prosperity Sphere, but among the general population the impression of *Yamato-hime* was fixed as an image of a decent, non-martial Princess. After the defeat of World War II, GHQ/SCAP’s *Shintō Shirei* policy clearly prohibited symbols related to Shinto. Because this goddess, in either martial or non-martial form, was clearly a symbol that commingled Shintō and the state it fell under this new prohibition and thus could no longer be tasked to represent State Shintō. The image of *Yamato-hime*, could thus no longer be used to represent the country or personify Japan in the form of a goddess.

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Address: Associate Prof. Michiko HAYASHI, Faculty of Art and Design, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN e-mail: michikohayashi@geijutsu.tsukuba.ac.jp
The “Stunde Null (Zero Hour)” for Japanese Art History in Germany

Minami EGUCHI
Faculty of Art and Design, University of Tsukuba

ABSTRACT
When the Nazi regime collapsed and the World War II finally ended in May 1945, the life of people in Germany was completely devastated. It was the time to begin the reconstruction from zero, so-called “Stunde Null (Zero Hour)”, and the research base for Japanese art history was no exception. This paper examines the condition of Japanese art history in Germany in the immediate post-war period and the course of its recovery.

As the interest in Japanese art grew since the end of 19th century, the research of art history has been developed in Germany, and Berlin was a major research hub. However, the East-Asian Art Collection in Berlin was badly damaged from war and substantially confiscated by the Soviet military after the war ended. The Japanese art historians in Germany lost their research environment, then re-established in small steps. For example, Dietrich Seckel established a department for East Asian art history at Heidelberg University in 1948. Also, the East Asian painting exhibition in Celle, 1950 displayed a small part of the East-Asian Art Collection, which was stored in a salt mine during the wartime.

1. INTRODUCTION
It has been one and a half centuries since the cultural exchange between Germany and Japan officially started. In the field of art, the interest in Japanese art grew since the end of 19th century in Germany. Then the rich art market, the ideal research environment as well as a global network including art historians in Japan had been developed especially in Berlin. Toward its steady development, recent research well examined how their human networks contributed to the two countries’ cultural politics from the latter half of the 1930s to the end of World War II. For example, fine art exhibition such as the “Old Japanese Art Exhibition (Ausstellung Altjapanischer Kunst)” in Berlin 1939 played a significant role as a tool for propaganda. The key figure was Otto Kümmel (1874-1952), an East Asian art historian and the Director General of the National Museums in Berlin. He established the East-Asian Art Collection (Ostasiatische Kunstsammlung), a research base for the East Asian art history and also worked for the Nazis. By the end of war, what he enthusiastically established was absolutely demolished by the hostile countries. The permanent gallery of the collection was bombed and badly damaged on February 3rd 1945. The art collection was seized by the Soviet military, then the most of them are stored still in the State Hermitage Museum in St. Petersburg to date.

After Kümmel faded from the limelight, there was no means of continuing the research of Japanese art history in Germany. As the diplomatic relations between Japan and West Germany begun in 1952, the cultural exchange recovered by degrees and their systematic development especially after 1960s has been well recognized. However, the chaotic situation in the immediate postwar period remains unconsidered. With the memory of golden age, how did Japanese art circles re-established the research bases in Germany from scratch?

2. STUNDE NULL

In Germany, the moment when the World War II ended is often called “Stunde Null (Zero Hour)” indicating the starting point of reconstruction. Leopold Reidemeister (1900-1987), curator of the East-Asian Art Collection and Kümmel’s co-worker, could not come back to Berlin because neither place to work nor art collection was remained. Therefore, he moved to Köln to work at the Wallraf-Richartz-Museum. The occupation authorities carried the process of denazification (Entnazifizierung) to rid the German society of the Nazis-ideology, so persons who had a relationship to the Nazi-party removed from official or important positions. As a result, many curators and directors were dismissed, although the denazification hearing was not held in the case of Reidemeister. He then worked devotedly for the “Wiedergutmachung”, the reparations of the modern art which had been persecuted by Nazis during the war.

2.1 Dietrich Seckel in Heidelberg

Reidemeister left the field of East Asian art, but a new member soon joined from Japan. Dietrich Seckel (1910-2007) received his doctor’s degree in German studies, then lived in Japan from 1936 to 1947 as German teacher and started researching Japanese art history there. During his eager research on emaki or Buddhist art, he interacted with Yashiro Yukio (1890-1975), Yamada Chisaburo (1908-1984) and other famous scholars. Surprisingly, he also made the acquaintance of art historian from the US such as Sherman Lee (1918–2008) and Langdon Warner (1881–1955) right after the war. In his memoir, Seckel noted that those Americans were helpful and friendly although he might be not much acceptable for them politically.

In 1947, almost all Germans who were living in Japan were repatriated. Seckel was released after three weeks screening and started to work at public library in Stuttgart (Württembergischen Landesbibliothek). His first work as Japanese art historian in Germany was editing catalog for the exhibition of Japanese woodblock prints and illustrated books.

4 A series of photography took by Seckel (1936-1942) is digitalized and published on the website of Heidelberg University Library: http://www.ub.uni-heidelberg.de/helios/digi/heidicon_seckel_archiv.html. See also Anne-Laure Bodin, 2016, Japan durch die Augen eines deutschen Kunsthistorikers gesehen, Master thesis (Heidelberg University).
6 Ibid., 94-95.
1948. Soon he got to know some East Asian art historian such as Werner Speiser (1908-1965) and Rose Hempel (1920-2009), who were Kümmel’s pupils. Then he finished his habilitation at Institute of Art History in Heidelberg University. The external examiners of his thesis were Wilhelm Gundert (1880-1971), an expert of Japanese and Buddhist Studies, and Otto Kümmel. It indicates that Seckel met Kümmel and his circles for the first time only after the golden age, but he managed to re-establish the research base for Japanese art history with their support. Although he was the only person at the department (Ostasiatische Abteilung) when he started teaching at Heidelberg University in 1948, the member of faculty steadily increased and formed an Institute of East Asian Art in 1965. Seckel recalled: “when I started, there was neither book nor photographic slide”. Now the institute is one of the biggest research center of East Asian art history in Europe.

2.2 Display of Japanese Art

The East-Asian Art Collection in Berlin has obtained permanent gallery at the former Applied Art Museum (now Martin-Gropius-Bau) in 1924 designed by Kümmel. During the war, the collection was stored firstly in basement of the building, then moved to the “Zoo flak tower” in 1943. A part of it was sheltered in a salt mine in the west of Germany and transported by British army to Celle and Wiesbaden after the war. Consisted of Chinese and Japanese scroll paintings, the Celle part had an opportunity to display in summer 1950 as the exhibition “Ein Jahrtausend Ostasiatischer Malerei (One thousand years of East Asian Painting)” at Celle Castle (Figure 1).

![Figure 1: Exh. Catalog (Celle)](image1)

According to the foreword of catalog, the exhibition was curated by Kümmel. Though retired from his official job, the learned chose the items to display, designed the installation and edited the catalog. It was the last work in his career as a result. The introduction he wrote for the catalog explaining Chinese and Japanese paintings is six pages long. The exhibition with same contents was also held at Charlottenburg Palace in Berlin from September 1951 to March 1952 (Figure 2). Despite the fact that the exhibition spaces in Celle Castle and

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7 The exhibition “Ostasiatische Graphik” (Sammlung Hahn) was held at Tübinger Kunstgebäude in 1948.
11 The exhibition in Berlin was entitled: Ein Jahrtausend Ostasiatischer Malerei: Meisterwerke aus der Ostasiatischen Kunstabteilung der Berliner Museen.
Charlottenburg Palace were not suitable for displaying works of East Asian art, the museum staff strongly promoted to present the objects remained in West Germany to the public. Also, 300 objects stored in the mine returned to the collection (the Museum of East Asian Art) until 1957. The museum nevertheless had to wait to acquire its own permanent gallery in Dahlem until 1970.

3. CONCLUSIONS

Through the study of “Stunde Null”, it is determined what the researchers established until 1945 and their loss after the war. Moreover, the research base or the temporary exhibition space created in the chaotic period can be seen as a researcher’s demand for academic open space. As we saw in the cases of Seckel and the painting exhibition, it is obvious that Otto Kümmel’s role and influence were huge even after the war. Without his contribution, the Japanese art history in Germany could never be successful and continue to the present day.

Due to the lack of research resources, the situation in East Germany is yet to be investigated. It is inferable that the museum and researchers relate to Japanese art affected by the Cold War significantly.

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Address: Dr. Minami EGUCHI, Faculty of Art and Design, University of Tsukuba
1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN
E-mail: southy373@hotmail.com
From Pictorialism to Propaganda: 
the Photography of Hamaya Hiroshi in Manchuria

Shih-cheng Huang,
Graduate School of Comprehensive Human Sciences, 
History of Art Field, Master’s Program in Art and Design, 
University of Tsukuba

ABSTRACT
My presentation will focus on the photographer Hamaya Hiroshi, who photographed Manchuria with various commissions and published in the magazines Manchuria Graph (Manshu Gurafu) and FRONT when he travelled to Manchuria in 1940. In this research, I would like to illustrate how Japanese photography was transplanted to Manchuria in the first half of the twentieth century. As ‘modern Japanese art’ was fully reconceptualized in Japanese art history while revealing the historicity of Western and non-Western art history, the development of Japanese modern photography in Manchuria also follows a similar pattern. After Japan started to colonize Manchuria from 1905, this new conceptual reflexivity exposed the politics through which words, categories, and values were ‘transplanted’ to other Asian nations as being the same as those Japan had earlier been forced to absorb from the art notions of Europe.

This presentation will explore the various ‘transplantations’, in the way Fuchikami Hakuyō organized the Manchuria Photographic Artists Association (Manshū Shashin Sakka Kyōkai) and in the way Hamaya Hiroshi photographed Manchuria for commissions from propaganda magazines. This paper will probe the developing situation of photography in Manchuria in the 1930s, to examine how the Japanese photographers established their own photographic visual expression in the ‘continental’ region, and what the function of their works was in local society.

1. INTRODUCTION
In 1906, after the triumph in the Russo-Japanese War and the fulfillment of the policy of continental advancement, Japan established South Manchurian Railroad (SMR) company and launched a new means of colonial management. For transmitting the existence and significance of Manchuria to the ‘inland’ nation (Japan), an enlightenment campaign with SMR was developed. In the ‘public relations’ activities aimed toward ‘inland’, the representation of the continent by Japanese photographers began with visual ‘material’ which emphasized its role as advertising.

Hamaya Hiroshi visited a foreign country for the first time on the invitation of SMR in 1940. Hamaya was curiously intrigued by the reality of foreign countries when he arrived Mukden station and saw Manchurian people gathered there. The roar of both the old and new in Mukden vehemently echoed while Japan’s “Five Races under One Union, the Realm of Peace and Tranquility” was regarded as the guiding principle of this country. In the Soviet graphic magazine USSR in Construction the central theme of the propaganda also was tremendous developed both inside and outside the country at the time when Hamaya stayed in Mukden.
2. MANCHURIA PHOTOGRAPHIC ARTISTS ASSOCIATION

Imagined as a new utopia built from 1932 to 1945, Manchuria was a modernist experiment site for the Japanese Imperial Empire who schemed continental advancement. Not only projects such as mining exploitation, heavy industrialization, and consolidation of transportation network were systematically promoted, but also the domains of education and culture were ambitiously fostered. The idealistic appearance of Manchuria inspired a remarkable romanticism amongst Japanese youth at the time. For Fuchikami Hakuyō, the organizer of ‘constructive’ photography magazine Hakuyō, Manchuria has become a literal new world.

Fuchikami moved to Dalian in 1928, due to the invitation of SMR, and expanded his fruitful activities in this Manchurian setting. He never ceased to pursue his dream of “photographic art” in the Hakuyō era, and formed the Manchuria Photographic Artists Association in 1932. In September 1933, Fuchikami revealed his talent as a substantial executive editor for the graphic magazine Manchuria Graph which was launched for the purpose of widely reporting the current state of the recently founded Japan puppet state of Manchukuo.

The first great stage for Manchuria Photographic Artists Association was the “Manchurian Scenery Photography Exhibition” in the 1933 Chicago World Exposition. After that, the exhibition visited 23 cities across the country. Their work represented the landscape of the continent focusing on the Japanese ‘justice’ which had pacified the foundation of ‘Manchuria’ instead of depicting the lives and ‘emotions’ of other ethnic groups. The image of the phantom country of Manchuria was drawn with intense contrasts of light and shadow and was endowed with a capacity to directly shake the viewer’s mind beyond simple nostalgia.

3. THE DEMISE OF TRANSPLANTED PICTORIALISM

In October 1939, the propaganda graphic magazine NIPPON presided over by Natori Yōnosuke, published ‘special issue Manchoukuo’ and the ‘inland’ photographic magazine Photo Times also published ‘special issue Continental’ in 1940. It was the first opportunity to address the diversity of photography institutes, organizations, and photographic expression in Manchuria. In addition to the successive release and print of graphic magazines and albums due to a number of visiting photographers from Japan reporting various aspects of Manchuria, the Manchurian government began to consider the pictures they should provide themselves. For this reason, Mutō Tomio, the director of Public Relations Office under the General Affairs State Council of Manchuria, established a ‘registration photography system’ in 1940. Registration of cameras and concomitant regulation of technology and expression was aimed at photographers via the ‘priority distribution system’ to address the material shortage situation. Furthermore, criticism against these works also exemplified a pictorialist expression, embodying a certain of nostalgia, that Fuchikami had transplanted to the continent.

Manchurian scenery expressing ‘the beauty of picture construction and the prodigality of introspection’ relied on realistic landscape, although it overlapped with


2 Fuchikami, Kodama, ‘Editorial Note,’ in “Manchuria Graph” No.1, Vol.7, 1939.01: colophon page
‘longing’ and ‘imagination’. The realism that Manchuria photographic artists tried to emphasize was only the aspects of poverty and suffering of ‘the other’. The reality of Manchuria had never been presented toward the ‘inland’ and even was denied and annihilated in Manchuria. Because Fuchikami left Dalian in 1941, bureaucrats rather than photographers dominated the development of photography in Manchuria and oversaw ‘pictorial photography’ being completely collapsed into and converged with ‘photojournalism’. In 1943, according to the promotion of Mutō to the ‘inland’, the ‘Manchoukuo photography’ created and controlled by him stopped inviting and publishing any public participation. Finally, the ‘Manchurian photography’ by Japanese photographers came to an end.

4. MANCHURIA GRAPH

When Natori Yōnosuke launched inaugural issue of graphic magazine MANCHOUKUO in 1940, Hamaya Joint ‘industrial development’ group of “Eight Photographic Magazines Recommended the Manchuria Photographic Unit”. After about a one month stayed in Manchuria, he published works in Manchuria Graph and participated in a “Field Report by the Manchuria Photographic Unit Exhibition” which was held at Shirokiya Department Store in Nihonbashi, to introduce photojournalism in Manchuria to the public. Hamaya had traveled to Manchuria again for a commission from the magazine Front in 1942 to cover the celebration of the tenth anniversary of the establishment of Japan’s puppet state in Manchuria.

4.1 Railway Protection Movement

The Railway Protection Movement photographed by Hamaya was a railroad welfare activity on the initiative of the Kwantung Army for ‘seven million people along the railroad line’. Under the slogan ‘the Realm of Peace and Tranquility is from railroad’ it introduced ‘railway protection work’ in order to maintain security after Mukden Incident. The Railroad Vigilance Village (later the Society for Railroad Welfare), established in September 1933, guarded the resident ‘Manchu people’ around the railroad tracks, while preferentially obtained the distribution of welfare facilities and goods. As the mainstay organization of the railway protection movement, the railroad welfare youth corps fundamentally understood railroad security and also received education such as modern agricultural management. The railway protection work positioned as “a means unwittingly leading people to realize their dependence mentally and materially, on the railroad” and was intended to inspire love beyond any profitable perspective. It was a more advanced piece of propaganda work with the purpose of mobilizing spontaneity.

4.2 White Émigré

The white émigré, not originally included under the slogan “Five Races” of Manchuria, acquired a new position at this time because they were photographed not only in Romanovka village after 1940, but also on the street corners of Harbin. The portrait of ‘white émigré’ photographed by Hamaya as a newly generated icon in

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registration photography’, differed in appearance from innocent adults already stereotyped to represent the ideal of “Under One Union”. The emigrants, pictured as déraciné, revealed a moderate melancholy and lived a self-sufficient life in the desolated northern Manchurian village due to their exile after the Russian Revolution. According to the Japanese national policy of “the Building of the New East-Asian Order”, they were represented not as immigrants but as “a part of the new construction”, which was not attributed to the ideal of Manchuria but instead strongly reflected the concept of Japan’s ‘Greater East Asia’.5

4.3 Fushun Colliery

The laborer (coolie) in Fushun colliery was repeatedly photographed as a representation of Manchuria-Mongolia. A photograph by Fuchikami showed a laborer engaged in an open-pit coal mine, and was endowed with a sort of romanticism as an “indication of a serious affliction of life” seen in their gesture. The composition of the labor force of the Fushun coal mine was complicated because of the management staff being made up entirely of Japanese, while Manchurian people could never attain these positions. Although a photographer’s own viewpoint was supposed to show the officially sanctioned image of the cultivation and pacification of Manchuria to the ‘inland’, when Ha maya photographed Manchurian employees loading an explosive and blowing up with electricity, he tried to focus on the lives of ordinary Manchurian people and concerned himself with the ambience and ‘intimacy’ of everyday life.

5 CONCLUSIONS

This research hopes to emphasize the personal relationships and public intersection between domestic and continental Japanese photographers, which has been largely obscured within official histories of these two areas. Photographic expression in Manchuria underwent upheavals in the ephemeral history of the nation. From the pictorialism transplanted by Fuchikami to the propaganda conveyed Hamaya, Manchurian photography coincided with the formation of an ‘East Asian’ image in Japan, even as the Manchurian photography developed later than it did in the ‘inland’. Nostalgia fed into militarism due to the national ideology and political changes and the absence of avant-garde photography in Manchuria. Although Hamaya photographed for propaganda magazines, he still kept an affinity with his object and revealed peaceful moments in a turbulent age.

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Educational Practice in the Arts and Crafts Classes for the Harmonious Development of “Thinking”, “Willing” and “Feeling”: Focusing on the Clay Modeling in the Steiner School

Nahoko YOSHIDA
Doctoral Program in Art and Design, University of Tsukuba

ABSTRACT
I consider whether it is possible to practice the art education of Steiner schools in the public schools of our country. From practical examples, I try to suggest the way to conduct the arts and crafts, and classes in which harmonious development of "thinking", "willing" and "feeling" is encouraged. I planned and practiced classes aiming for harmonious development referring to the classes, which I have observed at the teacher training course at the Nuremberg Steiner school, and to some books for teachers about method and the view of the subject. And from children's remarks and questionnaires, I considered lessons from the viewpoint of "thinking", "willing" and "feeling" in the classes. In that sense, this research could propose the lesson of arts and crafts for development of human nature and show a potential to practice the activity of clay modeling at the Steiner school in the arts and crafts at the public elementary schools in Japan.

1. INTRODUCTION
The major factor of the attention to Rudolf Steiner (1861 - 1925) and Steiner school (Free Waldorf school) in our country was a book written by Michiko Koyasu1 in the 1975 about her daughter's school life at the Steiner school in Munich. The background of attention was explained in the research about the trend of Steiner school in Japan as follows.

In the 1970s, the values of the Meritocracy and competitionism accelerated further, caused overheating of the educational competition, and school violence, bullying, school refusal were became a problem. Within these backgrounds, Alternative education has gradually begun to bud as an antithesis to the public education. (Ohno, 2008: 2)

After the book was published, researches and translation into Japanese progressed by some scholars and translators. Kindergartens accepting the Steiner’s ideology and activities of "Saturday class" were spread all over Japan. From the 1990s to the beginning of 2000, the Steiner schools were founded one after another. At the present, 2 schools as an educational foundation and 7 as a NPO are in the list by the Association of Waldorf schools3.

1 Koyasu, Michiko, 1975, A Primary School in Munich, Tokyo.
2 Ohno, Hiromi, 2008, A Trend of the Steiner Education in Japan, Studies in humanities and cultures: Graduate School of Humanities and Social Sciences, Nagoya City University 10, 95.
In a foreign country, for example the United States, Australia, there are some public schools accepting the education of the Steiner schools into the educational curriculum. However such a school doesn’t exist in Japan, so there is little research about practices of the Steiner school’s education in Japan.

Therefore, through this research I will investigate the potential of art education at the Steiner schools in the arts and crafts lesson of the public elementary school in Japan. About earlier researches, there are studies of Sasaki and Kuragano (2010, 2011: 4) who tried to practice art activities of the Steiner schools in the music, arts and crafts and Japanese calligraphy lessons. These are valuable researches that proposed the practices of the Steiner school’s education in the Japanese public school. In these researches he practiced wet-on wet painting with watercolors in the arts and crafts and practice of straight line in the Japanese calligraphy lesson through the physical activities in terms of the bringing up of sensitivity of children. However a lesson of wet-on wet painting was with only one color, and children could not feel enough the beauty of colors and mixing experience as essence of wet-on wet painting. Also, these researches don’t suggest the lessons from a "harmonious development" point of view, at which Steiner schools aim, because it focuses on only the sensitivity of children.

2. HUMAN FORMATION IN STEINER SCHOOLS

Steiner schools depend on an "anthroposophy(Anthroposophie)" human oriented spiritual philosophy, which is founder Steiner’s ideology, and he aimed for harmonious development in education. Specifically, it is assumed that the Nature of human being is "body(Leib)", "soul(Seele)" and "spirit(Geist)"5, and develop of human beings can divide every 7 years. Teachers must work for children in first term, from 0 to 7 years old for its "body", in the second term, from 7 to 14 years old for "soul", and in the third term, from 14 to 21 years old for "spirit"6. So at the Steiner school, which educates children in elementary school stage, it mainly focuses on development of "soul." Steiner said, the activities of "soul" was "thinking(Denken)", "feeling(Fühlen)" and "willing(Wollen)"7.

Last year I clarified here, that how to raise, "thinking", "feeling" and "willing" in art activities, through lesson examples at the Nuremberg Steiner school. I made it clear that "willing" was raised from own desires and motivation to product, "feeling" was by emotional changes such as "sympathy" and "antipathy" to the art work, and "thinking" was by linking with contents of other subjects. In other words, the educational goals of the Steiner school is to make "thinking", "feeling" and "willing" work in the school education,


5 Steiner, Rudolf, 1968, Allgemeine Menschenkunde als Grundlage der Pädagogik, Dornach, 54.


7 Steiner, 1968, op.cit., 90.
and make whole human beings work, "body", "soul" and "spirit". These can become aspects of the lesson to practice art activities of the Steiner school at the public school in Japan.

3. RESEARCH METHOD

Therefore, in this research, I planned lessons of arts and crafts with clay in terms of the harmonious development of children's "thinking", "feeling" and "willing", and I practiced these clay modeling lessons for 6th grade children in the public elementary school in Japan (in Tsukuba-city). In the lesson, I used the voice recorder and camera to record it. After the lessons children filled out a questionnaire of the description form. With these materials I looked back and hypothesize lessons in terms of children's harmonious development.

4. CLAYMODELING IN THE NUREMBERG STEINER SCHOOL

In Steiner schools, there are some art activities, those are woodworking, metalworking, stone carving, painting and so on. This time, I observed the clay, because that is utilized not only in the lower grades but also in the upper grades. In the Nurnberg Steiner school, beeswax clay and soil clay are used in the lessons. In the lower grades, they use beeswax clay related to the characters in the picture book, which class teacher read in the class and learning of zoology or botany of Main lesson. Children over 5 grades study clay modeling in a professional lesson called "Handwerk". The 9th grade children make abstract forms such as sphere and geometric solids, after that they make a representational forms such as human and animals. Subject of human head is in the 10th grade.

5. PRACTICE IN THE ARTS AND CRAFTS IN A JAPANESE SCHOOL

Based on the above, I planed lessons of arts and crafts in the public elementary school in Japan. To practice in the public elementary school, I designed the lesson based on the textbook of arts and crafts, and I used art activity of Steiner school as an introduction and preparation of lessons. I practiced the lesson relating to the subject of, "From the mysterious entrance..." published from Kairyu-do, textbook of arts and crafts 5, 6th 2nd volume. All subjects were 8 times long, and I tried the subject of making sphere with clay 2nd times.

In the lesson, first I asked children "What is the form of Sphere?" We talked about the form with remembering the mathematics of the 5th grade and with reminding other sphere-shaped things. I gave them clay and I talked to make a form with only own hands. At first children clapped the clay to make the rough shape, and the movement of the hand gradually changed, they fixed a form with palm or fingers. In the lesson I found that children tried to fix a part of art work with unsatisfying until they satisfied. And in this lesson nobody said "finished!" on the way of lesson, they concentrated on working. At the end of the lesson, children made a circle in the classroom with clay in their hand, and turned the ball of clay around according to the rhythm to appreciate the differences one by one. As soon as clay comes from a neighbor, they noticed the difference of weight, size, temperature and so on, such as "heavier", "lighter", "smaller", "bigger", "warmer", "cooler", "slippery" etc. From these comment, these subject stimulate children's feeling, "sympathy" and "antipathy" and worked to "feeling".
After I finished this all lessons of "From the mysterious entrance …", I carried out questionnaire. As a result, 99% of 129 persons except absence had enjoyed these subjects. In the field of free description, about half of them have written about the activity of baa of clay and shapes with corners and surface that I practiced in the 3rd times of lessons. For example, they wrote about the difficulty to make even a simple form with hands, about the difference of artwork and others and oneself.

5. CONCLUSIONS

From the above, this lesson was possible to work to children’s "body" by using the palm and fingers, and make children concentrate to the activity with a "willing", that make rounder form or more beautiful. And children acted with the ideal "ball" in own image. That works on the children’s "feeling" through feeling "sympathy" and "antipathy", while they are making. In addition, the subject using the contents of the previous learning not only has led to the motivation to the activity, but also has developed the ability of the multiple thinking. In other words, it has been seen that this lesson has raised a "soul" through working on "thinking", "feeling" and "willing".

This research was a practice of art activity of Steiner school in the arts and crafts lesson, utilizing the official textbooks in accordance to the Japanese national curriculum standards. In my lesson practice, I was able to encourage children's harmonious development through working on "thinking", "feeling" and "willing", which is the activity of "soul" in order to try to bring up it at elementary school stage based on Steiner's human ideology. In that sense, this research could propose the lesson of arts and crafts for development of human nature and show a potential to practice the activity of clay modeling at the Steiner school in the arts and crafts at the public elementary school in Japan.

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Address: Nahoko YOSHIDA, Doctoral Program in Art and Design, University of Tsukuba 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8574, JAPAN  
E-mails: yoshida.nahoko.xp@alumni.tsukuba.ac.jp

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Multi-Sensory Effects of Interactive Toys on Children`s Empathy and Collaboration Feelings: Developing and Evaluating ‘Play and Design’ Sections

Rodrigo FERNANDES, 1  Ikkaku KAWAGUCHI, 1  Toshimasa YAMANAKA, 2
1 Department of Kansei, Behavior and Brain Sciences, University of Tsukuba
2 Faculty of Art and design, University of Tsukuba

ABSTRACT
How to develop cooperation from childhood? In order to understand the relationship between sensory stimuli during play and cooperation, we developed and administrated ‘play and Design’ workshop sections. On these sections, 36 schoolchildren were divided in three groups. Two groups played different sensory team game challenges followed by Team Design tasks. A third group, considered our control group, performed the team design tasks before playing the games. For this paper, we based our analysis on two self reports, one administrated after the game section, and another after the team design section. Our results gave positive indications for the light and sound game stimuli group. Additionally, a strong correlation between the responses of the game and the team design self reports have been observed, indicating a relationship or maintenance of the children’s perception during play and team design tasks. We believe our findings can help understanding the relationship between play and cooperation, aiding on the design of interactive toys and on the inclusion of children in collaborative design processes.

1. INTRODUCTION
For working in society, cooperation, or the act of working together towards a same end or goal, is often encouraged. Many factors can affect cooperation and, among them, Malinverni and Burgues (2015) find empathic or affective behavior to relate positively. Based on these assumptions, we have been asking “how can we develop a more empathetic and cooperative society from childhood?”. Playing is an irreplaceable way for children to learn, communicate, and develop affection (Santer, 2007). Modern play tools, called ‘Interactive toys’, are using technologies that expand feedback possibilities. These toys can engage children through sensory stimuli such as light mechanism for sight; electronic sounds for hearing; or haptic inputs for touch (Delden, 2012).

Related with sensory perception and affection, Kansei is a Japanese field and term that describes the function of the brain, which would be the source of emotion, inspiration, intuition, pleasure, displeasure, taste, curiosity, aesthetics and creation (Beuttel, Yamanaka, 2010). While we can find established relations between play, empathy and cooperation (Hart, 2017), we could not find dedicated studies to the effects of sensory-stimuli on affective and cooperative play behaviors. Therefore, this research aimed to understand if and how different multisensory-stimuli on interactive play toys could affect cooperation on children. To achieve part of this understanding, we performed design sections for children involving play, sensory stimuli, and teamwork. With our procedures described on the next section, we are currently working on the following research question: Can different sensory elements of interactive toys given during play activity affect our cooperation perception?
2. METHOD

On this section, we are going to discuss our experiment elements and procedures, such as the game stimuli selection, the group preparation, the activity steps for each group, and our self-report tool for gathering data.

2.1 Game stimuli – Hikari Tsumiki

Hikari Tsumiki 2.0 is a building set, composed of different interactive blocks, where the goal is to create tangible circuit structures. The set contains blocks with electronic lights, sounds, and motors that can be activated by switches, movement, light, and sound sensors. This set was chosen due to its flexibility, since we could design different game challenges for the specific sensory blocks.

2.2 Sample preparation – creating the participant groups

We counted on the cooperation of 36 students of Liberty International school, aged 6 to 14, from second to ninth grade, and divided them in multi-age teams of four children. Prior to the experiment, individual interviews were conducted to pre-evaluate the empathy development of each student and their relationships with peers. After this step, we organized groups based on age, gender, grade, and empathy disposition.

With the Hikari blocks, we designed two team game challenges. One for playing with the light and sound blocks, and another with the motor blocks. among those groups, we wanted to see if the difference between stimuli would affect the way children perceived team interaction. After the game, children had to design together a new interactive toy, first through individual sketches, and then through team idea generation. A third group, considered our control, would perform the team design tasks before playing the games.

![Flowchart illustrating the sample process.](image)

2.3 Self-Report tool

A Self-Report composed of 10 questions was administered twice, once after the game section and another after the design section. Among its questions, we asked: “how fun was the activity you had”, “how easy was the activity you had”, “How good was the time of the activity”, How happy are you with your team”, “How helpful was every one of your team”, “How did you feel mostly during the task”, “how each friend felt during the task”, and “How much do you want to retry this task”. While most questions consisted of Likert scales of five levels, the feeling-related questions had a range of six emotions to choose.
3. RESULTS AND DISCUSSION

For analysing our data, we evaluated the groups’ mean scores of the highlighted questions, attempted to evaluate the difference between means with Kruskall-Wallis Test, performed a co relation analysis of the report questions with Spearman’s Rank Co relation test and evaluated the subtracted mean score of groups. Gender, Age, grade, and empathy frequencies have been observed to guarantee group stabilization. Both empathy related questions were not answered in a satisfactory way, therefore, empathy was excluded from analysis and redesigned for posterior experiments.

On table 1, displaying groups’ mean score of game and the design report questions, we can see higher evaluations of the light and sound group on every question, except “time suitability” for game report and “Want to Retry” on the design report. Although this finding is considered positive for the high stimulis group, this relationship was not proven significant through the non-parametric Kruskall-Wallis test. The only significant difference happened on the “easiness” question of the game report (Sig. 0.48), however, more than sensory stimuli difference, this finding indicated a difficulty unbalance between groups. As an isolated parameter, difficulty did not seem to affect other factors.

Table 1. Mean score results per group game/design task. * indicates higher score and ‘ indicates lower score.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Fun</th>
<th>Easiness</th>
<th>Time Suitability</th>
<th>Team Happiness</th>
<th>Team Helpfullness</th>
<th>Want to Retry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light sound</td>
<td>1.16*/1.50*</td>
<td>0.33*/1.0*</td>
<td>0.41’/1.0*</td>
<td>1.16*/1.33*</td>
<td>1.0*/1.08*</td>
<td>1.5*/1.5’</td>
</tr>
<tr>
<td>Motor</td>
<td>0.80’/1.40</td>
<td>-1.0’/0.0’</td>
<td>0.60/0.40</td>
<td>0.40’/1.00’</td>
<td>0.30’/0.40’</td>
<td>1.10’/1.70*</td>
</tr>
<tr>
<td>Inverse</td>
<td>1.00/1.11’</td>
<td>0.33/1.00</td>
<td>0.77*/-.2’</td>
<td>1.00/1.11</td>
<td>0.44/1.00</td>
<td>1.22/1.56</td>
</tr>
</tbody>
</table>

We followed to check, on the different groups, correlations between the questions of the game and the design task report, specially between the same questions. For the Light and sound group, the question “how fun” of the game report, strongly correlated with “How fun” (CC .876, Sig. 0.000) of the design task. The question “Team Happiness” correlated positively with the question “Time Suitability” (CC .581, Sig. 0.048) of the design task. The question “Team Helpfulness” of game also correlated with “Easiness” (CC .678, Sig. 0.015) and “Want to retry” (CC .661 Sig. 0.019) of the design task, as well as strongly correlated with “Team Helpfulness” (CC .780 Sig. 0.003) of the design task. Finally, the question “Want to Retry” of the game report strongly correlated with the question “How fun” (CC .733, Sig. 0.007) of the design report and correlated with the questions “Easiness” (CC .590, Sig. 0.043), “Team Happiness” (CC .596, Sig. 0.041), and “Want to Retry” (CC .577, Sig. 0.049) of the design task.

For the inverse section group, the question “How fun” of the design task report correlated with “Team Happiness” (CC .668, Sig. 0.049) of the game report. The question “want to retry” of the design task report correlated with the questions “How Fun” (CC .779, Sig. 0.013), “Team Happiness” (CC .769, Sig. 0.016), and “Want to Retry” (CC .777, Sig. 0.014) of the game report. For the motor group, we could not find correlations in
between reports. We can see more correlation indications on the light and sound group, especially on the questions “How fun”, “Team Happiness”, “Team Helpfulness” and “Want to Retry” with those possibly being key factors of the relationship between play and teamwork. Finally, as an attempt to further explore this correlation between questions, we evaluated the mean scores of the game and design reports subtractions. Although also not significant, we have found that the overall variance did not surpass 1 point in between the scale, with most of participants maintaining the same score between questionnaires. the motor group showed the greatest difference between game and design reports, and the inverse group showed the least difference between the reports.

4. CONCLUSIONS – FUTURE STEPS

While we could observe differences between the group mean scores with higher mean scores to the light and sound, our results were not statistically significant. This can be both due to a low population or to lack of significant differences in between stimuli groups. Strong correlations between the same report questions of the game and the team design tasks, however, could be observed, pointing that the impressions children had during game sections can affect posterior team design tasks, possibly more so than the other way around. Explanations and elements of this relationship should be better explored.

We must consider a Bias in this hypothesis, however, as other factors such as an inclination to answer the same response, seen on the subtraction frequency between reports, regardless of the stimuli can also be possible. Therefore, for our future steps, we plan to better evaluate the relationship between play and teamwork activities among children. After establishing this relationship, we will look back into sensory elements of play activity that can affect empathy and teamwork feelings.

Video analysis of children relationship during game and design activities, as well as analysis of design creations can bring new light into this research and shall be also considered for our future steps. As a pilot experiment, our findings helped opening way for future studies that explore the relationship between sensory games and children teamwork, helping both on the development of new interactive play tools, and on the creation of new collaborative design approaches with children.

ACKNOWLEDGEMENTS

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The Influence of Physical Features in Lively Urban Contexts of Shopping Streets

Giancarlo CARMELINO,1 Toshihiro HANAZATO,2
1 Ph.D. Candidate, School of Art and Design, University of Tsukuba
2 Professor, School of Art and Design, University of Tsukuba

ABSTRACT

The present research aims to understand how the presence of physical features influences lively street life of shopping streets, and what role their temporality and number represents on the decision making for pedestrians on urban contexts. Literature based on the Non Verbal Communication Model shows that the spatial layout of urban contexts non-verbally communicates its meaning through physical elements giving necessary visual cues on pedestrians. It classifies them into three group: fixed, semi-fixed and non-fixed features. Fixed features such as buildings, Semi-fixed features as street furniture, and non-fixed features, or human actions. Among these, semifixed features provide significant distinctiveness by improving the spatial experience depending on its degree of manageability. The ongoing study is based on on-site counting of pedestrian number and speed related to semifixed features of two Tokyo shopping streets, Yanaka Ginza in Taito area and Shimokitazawa in Setagaya area. Yanaka Ginza was selected because of its original urban fabric and pedestrian scale from the Tokugawa period. In contrast, Shimokitazawa offers a youthful identity and more active nightlife. The initial findings from the countings describes 2 different stances on Yanaka Ginza and Shimokitazawa between 14:00 to 21:00 hours: a) Yanaka Ginza shows a reduction of number of people and manageable objects with an increase of walking speed; and b) Shimokitazawa presents an increase of manageable objects and walking speed with a reduction of number of people. Despite observing similar behaviors on Yanaka Ginza and Shimokitazawa during initial hours, it may be suggested that the character of Shimokitazawa changes from a “destination place” into a “transition place”. In addition, statistical analysis corroborates a strong relation between the number of manageable objects and pedestrian behaviors. However, it is important to consider that additional physical features such as street dimensions must be assessed to evaluate future outcomes.

1. INTRODUCTION AND OBJECTIVE

The present research aims to determine which physical features of urban contexts support lively street life in shopping streets, and what influence temporality and number represents on decision making of pedestrians. Literature based on the NVC Model (Non Verbal Communication Model) shows that the spatial layout of urban contexts non-verbally communicates its meaning through physical elements and gives necessary visual cues on pedestrians (Rapoport, 1982). These provide an adequate legibility, the ease in which information is able to be perceived; and readability, the ease in which information is able to be understood. Studies conducted by Rapoport (1982) divides physical features into three main groups: fixed, semi-fixed and non-fixed features. Fixed features such as buildings or city fabric, have a subjected condition to major regulations and communicate in a static
pace. Semi-fixed features, or attachable elements such as street furniture, curtains or billboards, are complementary to fixed features and communicate in a slow pace. And non-fixed features, or human actions, communicate on a rapid pace within the built environment. Among these, semifixed features are able to provide significant distinctiveness by improving the spatial legibility and readability, and thus influencing decision making of pedestrians (Rapoport, 1990). They can change easily, and provide a richer spatial meaning due to its manageability. In other words, the management of semi-fixed features may influence how urban contexts can be experienced by supporting more complex social activities and behaviours.

2. RESEARCH QUESTIONS AND HYPOTHESES

Based on literature reviewed and observation surveys, the following research question arises: 1) What characteristics of physical features of urban contexts are the most significant in supporting lively street life? ; and 2) How do these characteristics motivate people’s decision making? Two initial hypotheses are proposed: 1) Lively street life results from the interaction of the number and temporality of fixed, semifixed and non-fixed features; and 2) Number and manipulation of semifixed features have a significant relation with the occurrence and the increase of pedestrian activities.

3. STUDY SITES AND METHODS

As urban typology, Shopping Streets in Japan are ideal for the study of lively urban contexts due to the diversification of social interactions. The approach of this ongoing research is based on the assessment of two first shopping streets, Yanaka Ginza in Taito area and Shimokitazawa in Setagaya area. The shopping street of Yanaka Ginza was selected as a first studied site because of its original urban fabric and pedestrian scale inherited from the Tokugawa period. In contrast, Shimokitazawa offers a youthful identity and more active nightlife environment with a myriad of vintage shops, kisaten and restaurants.

As a first stage, the research performed observation survey as initial assessment for the identification of variables followed by models of statistical regressions for a subsequent correlation matrix. The field survey aimed to describe the weekend day from 9:00 to 21:00 hours of Yanaka Ginza on January 10th, 2016 (13° C) and Shimokitazawa on May 8th, 2016 (27° C). As a first stage, the field survey gathered numbers of buildings’ dimensions, furnishing, agglomeration of pedestrians and speeds in Yanaka Ginza on May 15th, 2016 (24° C) and in Shimokitazawa on May 22nd, 2016 (29° C) every hour from 9:00 to 21:00 hours (12 hour span). The samples were collected by performing walkthroughs along the shopping street using a tally counter and timing the walking speed using a hand chronometer. The samples were arranged into three categorical features following the NVC model: fixed, semifixed and nonfixed. The fixed features, are composed by buildings’ height, street width, walkable area and number of stores, also considering their opening hours. The second category, semifixed features, describes street furniture and greenery collected according to the management and number such as banners, parked bicycles, planters, chairs and display counters. The third category, nonfixed features, describes pedestrians’ walking speed and agglomeration, classified by gender (male - female) and age (children - adult – elder).
The present paper presents a preliminary observation of semifixed and nonfixed features as well as initial steps of statistical analysis (Fig. 1). The samples were correlated with significant validation (p= 0.01 and p=0.05) and assembled in matrixes for each shopping street (Table 1).

The semifixed features were classified as: a) manageable objects; b) non-manageable objects; and the nonfixed features as: a) number of pedestrians; and b) walking speed. The classification made possible to draw some preliminary findings that gave insights for more variables and to be assessed on next steps of this research.

4. PRELIMINARY FINDINGS

As a first finding, the number of manageable objects and number of pedestrians present a strong correlation in Yanaka Ginza (r = 0.8868 p = 0.00012) and Shimokitazawa (r = 0.8122 p = 0.00132) (Table 1). It is important to note that in Yanaka Ginza there is a simultaneous decrease on number of people in 290 (from 302 to 12) and on number of manageable objects in 305 (from 414 to 109) from 14 to 21 hours (Fig.1). On the contrary, the number of people in Shimokitazawa decreases in 117 (from 284 to 167) and the manageable objects decrease in 27 (from 412 to 385) from 14 to 21 hours. The different decreases on both sites may indicate the emergence of different manageable objects from 14 to 21 hours in Shimokitazawa (Fig. 1).

As a second finding, the correlation between number of pedestrians and walking speed on both sites indicates that the higher is the number of people the slower is their walking speed. Although this may seem to be an obvious observation, the values on Shimokitazawa shows to be lower (r= 0.6966 p = 0.0118) than Yanaka Ginza (r=0.8200 p = 0.0010).

A next finding comes from manageable objects and walking speed. Yanaka Ginza is the only site that shows a high number of manageable objects related to a slow walking speed (r = 0.6951 p = 0.012). Although Shimokitazawa presents a higher number of manageable objects from 14:00 to 21:00 hours, it does not seem to significantly affect the walking speed (r = 0.45 p = 0.138) (Fig. 3). The last finding indicates that only in Yanaka Ginza there is a strong correlation between walking speed and non-manageable objects (r = 0.7826 p = 0.003). Despite the understanding that the number of non-manageable objects do not change drastically during the day, it suggests the effect might be caused by an extra or extras variables.

Figure 1: Number of Manageable Objects, Non-Manageable Objects and Pedestrians in Yanaka Ginza and Shimokitazawa Minamiguchi

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5. CONCLUSIONS

It is noticed during 14:00 to 21:00 hours, the sites subdivide into 2 different models. Yanaka Ginza shows a reduction of number of people and manageable objects; and an increase of walking speed resembling an inverse process from the first period (from 9:00 to 14:00 hours). On the other hand, Shimokitazawa presents an increase of manageable objects and walking speed; and a reduction of number of people. The model may suggest that the character of Shimokitazawa changes from a “destination place” to a “transition place” from 14:00 to 21:00 hours. Even though the number of manageable objects has a strong relation to pedestrian variables, it is important to consider that additional physical variables such as variety or street proportion may influence outcomes. It is fundamental on future stages the expansion of places and variables involved in sustaining lively urban contexts of shopping streets.

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Address: Giancarlo CARMELINO, Faculty of Art and Design, University of Tsukuba 1-1-1 Tennodai,,Tsukuba, Ibaraki, 305-8574, JAPAN
E-mails: carmelinoh@gmail.com
Investigation for Degraded Stone Pillar Bases of the East Cocoon Warehouse of the Tomioka Silk Mill By X-Ray Diffraction Analysis
Yishan ZHOU¹, Ana ROMERO¹, Toshiya MATSUI¹, Masae OKANO ²
¹ University of Tsukuba,
² Tomioka Silk Mill

ABSTRACT
In 2014, “Tomioka Silk Mill and Related Sites” was inscribed on the World Heritage list for which have bear witness to the renewal of sericulture and industrialisation of Japan and the development of international raw silk industry in the early 20th century. As the main constitute of this heritage, the Tomioka Silk Mill, which locates in Tomioka City, Gunma Prefecture, is now open to the public.

Along with converting from industrial spaces into public spaces, degradations of constitutions of the Tomioka Silk Mill, (e.g., bricks, timber frames, stone pillar bases) have been observed. In the Eastern Cocoon Warehouse, which is utilised as exhibition space in recent years, salt precipitations and powdering phenomenon on the surface of stone pillar bases is threatening the long-term preservation of the historic building itself. In order to figure out the relevant factors that have induced these degradations, and develop a suitable conservation method, surface precipitations and powders of 88 stone pillar bases of the Eastern Cocoon Warehouse have been investigated.

The stone base samples have been analysed by X-ray diffraction analysis(XRD).In XRD analysis result, except for mineral constituents of stone (e.g., orthoclase, quartz, kaolinite, etc.), calcium and magnesium sulfates (gypsum, hexahydrate, etc.) also have been detected mainly in samples from exterior stone bases. The formation of sulfate minerals is possible due to a chemical process between carbonate constitutes in stone and SO₂, O₂ in surrounding atmosphere, or physical process induced by water activities between stone bases and earthen foundation of the building.

http://www.tomioka-silk.jp/tomioka-silk-mill/guide/id=736

Figure 1: The East Cocoon Warehouse of the Tomioka Silk Mill
1. INTRODUCTION

In 2014, “Tomioka Silk Mill and Related Sites” was inscribed on the World Heritage list for which have bear witness to the renewal of sericulture and industrialisation of Japan and the development of international raw silk industry in the early 20th century. As the main constitute of this heritage, the Tomioka Silk Mill, which locates in Tomioka City, Gunma Prefecture, is now open to the public.

Along with converting from industrial spaces into public spaces, degradations of constitutions of the Tomioka Silk Mill (e.g., bricks, timber frames, stone pillar bases) have been observed. In the East Cocoon Warehouse, which is utilised as exhibition space in recent years, salt precipitations and powdering phenomenon on the surface of stone pillar bases is threatening the long-term preservation of the historic building itself. In order to figure out the relevant factors that have induced these degradations, and develop a suitable conservation method, surface precipitations and powders of 88 stone pillar bases of the East Cocoon Warehouse have been collected and investigated (Including 60 of the exterior eastern and western sides, 4 of the exterior northern and southern sides, 24 in interior space).

2. METHOD

After being finely powdered in an agate mortar, the stone base samples have been analysed by X-ray diffraction analysis (XRD). XRD spectroscopy is an economic and reliable technique utilising the X-ray diffraction from periodic crystal lattices, to obtain X-ray diffraction spectrum for identifying and quantifying the crystalline phases in samples. XRD analysis measurements have been conducted with the Bruker AXS, D8 ADVANCE/TSM under conditions of 1.542 nm CuKα Radiation at 40mV/40mA, over 5° -70° 2θ interval, at a scanning speed of 0.1 sec/step (6000 steps in total).

3. RESULTS AND DISCUSSION

In most samples quartz, feldspars (identified as orthoclase in this study), clay minerals (kaolinite) are identified, which are considered as common components in stone. Besides, calcite, gypsum and hexahydrite(MgSO₄ · 6H₂O) are also identified in some samples.

The results of the X-ray diffraction analysis are summarized in Fig.2. In different side of the East Cocoon Warehouse, results of the X-ray diffraction analysis appear different characteristics.

In the case of the eastern exterior side, calcite (CaCO₃) are identified in samples of No.1~10, 13~17, 22 stone pillar bases, which are mainly located at north part of the eastern exterior side. On the other hand, the stone pillar bases from which gypsum(CaSO₄ · 2H₂O) are identified, are seems neighboring roof drain pipes(No. 6, 17, 18, 20, 23, 25, 30 stone pillar bases). In the sample of No. 23, the hexahydrite is detected along with gypsum.

In the case of the western exterior side, calcites are identified in several samples collected from No. 9, 13, 14, 18, 19, 25, 27. While in most samples, gypsums are identified (except for No.21, 25, 27 stone pillar base). In samples of No. 1~5, 7, 11, 12, 26, 28 the hexahydrite are detected along with gypsum.
In the case of the northern exterior side, gypsum is identified in samples of No. A. In the case of the southern exterior side, gypsum is detected along with hexahydrite in sample of No.C, gypsum IS detected along with calcite in sample of No.D.

In the case of the interior side, calcite are identified in No. 2~9, 12~21, 24 stone pillar bases, gypsum are identified in No.4, 10~13, 26 stone pillar bases. In the sample of No. 26, the hexahydrite is detected along with gypsum.

The precipitations of calcium and magnesium sulfates appear mainly in northwestern part of the East Cocoon Warehouse.

**4. CONCLUSIONS**

Although stone pillar bases of exterior side of the East Cocoon Warehouse appear to be sound and intact now, some precipitations identified in this investigations implies progressing degradations.

The calcite is a typical natural component of stone, migration of calcium and recrystallization of calcite on the surface of stone can be occurred in environment with high CO₂ levels. The porous recrystallized calcite makes the penetration of salts and pollutant gases become much easier.

The pollutant gas SO₂ is mostly considered responsible for formation of gypsum. The sulphuric acid (H₂SO₄) formed by oxidized SO₂ and water, can react with calcareous materials to form calcium sulfates. Besides, the sulfates members of the MgSO₄ • nH₂O series are also highly dangerous for stone as same as calcium. The transition of CaSO₄ and CaSO₄ • 2H₂O, epsomite (MgSO₄ • 7H₂O), hexahydrite (MgSO₄ • 6H₂O) and kieserite (MgSO₄ • H₂O), are reversible and highly depending on the humidity. The recycle of “obtaining and losing extra-polyhedral water progress” may lead to size changes of sulfate crystals, which will ultimately induce micro-crack and fragile of stone.

In the case of Tomioka Silk Mil, after being inscribed as word heritage in 2014, the visitors increased 3-fold than 2013 as 1,337,720. The great population of visitors will continue in future decades. Along with the vast rise in the number of visitors, the increase of pollutant gases level, oscillation vibration of temperature and humidity surrounding this heritage is definitely inevitable.

On the other hand, the salt degradation of stone is also highly correlated with water movements among the building and its earthen foundation, which is still unknown now.

Therefore, the continuous monitoring of gaseous pollutants, temperature and humidity, and water movement in building earthen foundation is now conducted in the East Cocoon Warehouse. The accumulated data will be analyzed in the future for making visitor management measurements and improving water drainage system.

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Address: Yishan ZHOU, Doctoral Program in World Cultural Heritage Studies, Graduate School of Comprehensive Human Sciences, University of Tsukuba 24-204, Oikoshi Dorm., 2-1-1 Amakubo, Tsukuba-shi, Ibaraki 305-0005, JAPAN
E-mails: rixiaju@gmail.com

Figure 2: Results of the X-ray diffraction analysis

Figure 3: Population changes of visitors in the Tomioka Silk Mill