Received June 30, 2013; Accepted September 15, 2013

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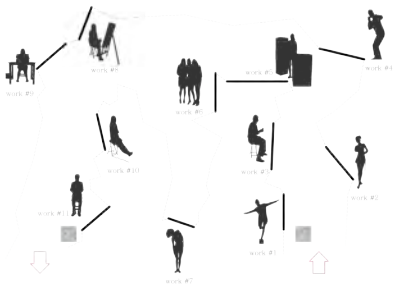
Lay Bare Ⅱ:Analyzing Exhibition ‘Le Système des Objets’ by Affordance



Abstract
This paper brought the concept of affordance and applied into interactive media art exhibition and classified in 5 affordances. Spatial affordance, physical affordance, cognitive affordance, feedback affordance, sensory affordance. By classification, 11 artworks from actual interactive media art exhibition ‘Le système des objets’ deducted the comprehensive list of improvements. As a result, suggestion of the series of artwork ‘lay bare’ which displayed in the exhibition were made. After analyzing ‘lay bare’ by affordances in detail, supplemental points were applied in ‘lay bare Ⅱ’. In this progress, affordance applied selectively. By applying the classification in actual exhibition and suggesting the series of artwork, affordance this paper explored the possibilities of utilizing in art.

Keywords: Interactive media art, exhibition ‘Le système des objets’, affordance

This research is supported by Ministry of Culture, Sports and Tourism(MCST) and Korea Creative Content Agency(KOCCA) in the Culture Technology(CT) Research & Development Program.

1 Introduction

1-1. Background and Purpose of the study

In interactive media art, to increase the interaction with the spectators, works and artists, the affordance which could be induced naturally from the spectator's behavior was important. However, the study on the affordance in the area of art was insufficient. The paper 'research on the affordances in interactive media art exhibition’ was a research newly defined and classified of affordances on the basis of previous studies related to the affordance, according to the art area. In this study, on the basis of classified affordances, it was needed to review how to apply in the actual display situations, and the complement and improvement derived from the application process. Through this, it was to review how to apply affordances in the art area, and by suggestion of related works, to present the theoretical background to derive a new Improvement.

1-2. Scope and method of study

The research on the affordances conducted in the field of media art, 'the study on the affordances in interactive media art exhibition' was reviewed, and the exhibition 'the System of objects' based on the spatial affordance, physical affordance, cognitive affordance, feedback affordance, sensory affordance classified by this study were analyzed. Furthermore, based on the derived direction of complement and improvement, the related work of 'lay bare' that was the work in the exhibition was proposed.

2 Interactive media art exhibition 'the System of objects'

2-1. Installation and exhibition of work

Exhibition 'the System of objects (Le système des objets)' was held from March 2, 2013, to March 8 at Ewha Womans University. It promoted the understanding of the producing authoring tools through a real exhibition as part of the business, 'The integrated authoring tool development in the media art' conducted and supported by Korea Creative Content Agency under the Ministry of Culture, Sports and Tourism. To do this, in fact, by production and exhibition of the media art works, it was to experience and to apply what was needed for authoring tools.

The different types of work were made depending on using what kind of media and how it was represented in media art. In this project, it was to develop authoring tools for the three-dimensional facade LED, 3D projection mapping, tangible interfaces, kinetic installation, interactive facades, interactive performance. Among these, projection mapping was the most sought-kind work until recently the most producted interactive media art. Therefore works were consisted of sensors such as webcam, pressure sensors, distance sensors, and the interactive projection mapping utilizing a variety of interfaces in the exhibition.

2-2. Derivation of complement and Improvement

As actually producing the Interactive media art exhibition and looking at the reaction and the action of the spectators, it was possible to derive the complement according to the proposed affordances classification as follows.

Table 1. Analysis of artwork based on affordance

Work	Affordance					Complement
	Sp	P	C	F	Sep	
Invisible compromise	△	△	△	△	O	secure enough space modify the scaffold form to stair form of low level set indirect lighting in scaffold modify response rate rectify video not to stand out rectify scenario with reality
Now what is the your dream?	O	△	O	△	O	fix the sensor installed inside stand and minimize error range make pop-up book more stably additional function of sound work
Lay bare	△	△	O	△	△	configurate space formed narrow hall control sensor range of camera in detail rectify video scenario in situations additional function of olfactory work
A Snooper	O	O	O	△	O	chnage the coordinate of mouse controller inside flashlight control video change range in detail
Hide and expose	△	O	△	△	△	change exhibition space add sound work
Beyondthe border	O	O	O	△	△	rectify eyes of people in video give perspective shadow effect
My Venus	O	△	O	△	O	rectify system to recognize in detail modify system apply sensor on the road
Artist	O	O	△	△	△	supply feedback to return to initial condition widen the interval between interfaces rectify interface not to show sensor
Strange dialogue	O	O	O	△	O	rectify system to enable natural dialogue suggest limitation on the keyboard
Receiver of communication	O	△	△	△	O	rectify system rectify interface material rectify video to respond between interfaces
Letters from...	O	O	O	△	O	not to loose adjustable resistance and button

2-2-1. Spatial Affordance

Exhibition 'the System of objects' was consisted of the different and unique exhibition space from the existing interactive media art exhibition space that could be commonly accessible. The exhibition space that made up of a tent structure made a large passages naturally raised the engagement of the spectators due to the limited circulation of the spectators and at the same time led to the flow of the entire exhibition. However, works were not fused with its own interface well in some part. Since it was difficult to know the information on each work in advance, it was lack of association between configuration and interface. Specifically, each works failed to secure enough space to make room so that it had difficulty for the independent space. However, as the projection images was major, by assimilating space itself to the screen, spectators were able to experience that the works were in harmony with a space.

Figure 1. Spacial elements of 'the System of objects'

2-2-2. Physical Affordance

Physical affordances was determined by physical form and the size of the input interface. and it was applied to the input interface. In the case of 'Invisible compromise', the scaffold installed a pressure sensor at the foot was used for the input interface. It was appropriately produced to meet the size and width of foot size, but the form of a simple rectangular shape alone was insufficient to induce spectators standing to the stadium. In order to compensate for this, the indirect lighting should be installed to be aware of the scaffold and the stairs should be installed to induce the climbing actions. Only one low step staircase could be derived enough to induce the climbing behavior.

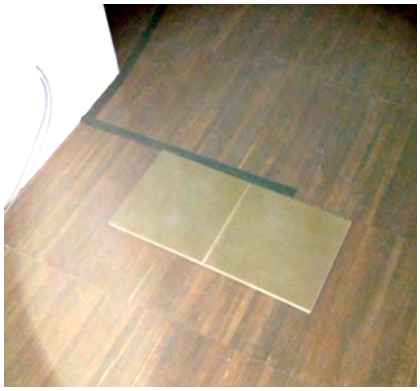


Figure 2. A foot step of "Invisible compromise'

2-2-3. Cognitive Affordance

It was cognitive affordance that helps to predict the outcome or results conduct get by the input of the spectator. Since the input interfaces used in display were flashlight, keyboards, radios, etc. which the spectators had been already learning about the function of these interfaces, it was possible to predict the results and result actions when using these interfaces. In addition, when the correspondence between each input interface and output interface was natural, the cognitive affordance could be improved. In case of the ‘receiver of communication' using the receiver as input interface, the end of receiver was connected with the thread, but because a thread in images was not connected with the thread of the actual receiver, the appropriate response was not fulfilled.

Figure 3. A receiver of 'receiver of communication'

2-2-4. Feedback Affordance

The feedback affordance was the affordance to the feedback given by the input of the spectator. In exhibition, since there was not enough fast reaction time between spectator behavior and output, it was difficult to experience some of the work. In case of reaction rates as well as the input interfaces which were day-to-day things, the spectator's participation was decreased due to failure to meet spectator's expectations in the functions. The flashlight was used in the work 'A Snooper' as the input interface. However, in this work, in fact, the expected results were not shown as a feedback. Because the remote mouse controller installed inside lanterns was very tricky to operate, as well as the initial coordinate values were not properly set. As the function of flashlight that was recognized by spectators did not correctly reflect to the output interface, the participation of spectators was falling and it became difficult to experience the work.

Figure 4. Broken flash light of 'A snooper' and 'Artist'

2-2-5. Sensory Affordance

The interactivity between spectator and the work would vary greatly depending on how much exhibition had connectivity between the interfaces and was expressed sensately. The desk and chair with keyboard in 'Strange dialogue’ were used as input interfaces. And the same desk and chair were also used as the output interface. People in the screen were waiting in holding a pencil and sketchbook instead of a keyboard. The space was also made an independent space with the recessed structure. Since the overall coordination and linkage of the work were very good, the spectator would be able to sit in the chair naturally. Like this, the sensory affordance helped to induce action by giving linkages on the overall composition of the work.

Figure 5. 'Strange dialogue'

3 Proposal of related works

In this section, the related work with the work of this researcher 'lay bare' in the works displayed in the exhibition 'the System of objects' was proposed. While keeping with the overall concept and scenario of the 'lay bare', on the basis of an analysis of the exhibition 'the System of objects', the improvement direction was set to increase the interaction with the spectators.

3-1. Intention and scenario of planning

The 'lay bare' with the temporary title, 'grub' was sarcastic that food itself was not consumed in modern society, rather than social symbol of the food was consumed, and it was a video work that since the figure enjoying the food itself was discovered in personal space, it made be ashamed. In this work 'lay bare', people's actions were changed by spectator's eyes. It was important where the spectator's eyes to stay, and because of this, what kind of interaction with the work. In order to bring spectator's eyes as input, both sides of screen where the work was projected were set as the inlet and the outlet of the exhibition space.

Table 2. A scenario of 'Lay bare'

Spectator's Circulation	Input	Scenario	Remark
Spectator's Circulation	Input	Scenario	Remark
before enter		gobble food	after fade in and replay
when entering	data 'in' recognition	surprised	configuration in 3 stages
when staying		hide the food and	compose a variety of scenario and replay randomly
when going out	data 'out' recognition	send the spectator	
after go out		discard food	after fade out reset

Spectator's eyes were divided into 5 through the circulation that spectator entered into the entrance and went out to the exit. Spectator's eyes configuring the path through the constraints of behavior were to provide a linear scenario such as 'eat-surprised-hide-send-discard'. Spectators had the same path with a constant flow path by constraint of the exhibition space and experienced the work of the same scenario. Thus, to provide a more rich and diverse experience for each spectator, a variety of images for each case was to configure. In addition, considering more than one spectator, the surprised images were constructed dividing into three stages.

3-2. Application of affordances properties

The work 'lay bare Ⅱ' was proposed as a format to improve the more participation of the spectators in the work 'lay bare'. Thus, the affordances was looked into how to apply it to the 'lay bare' in the exhibition 'the System of objects' and it was suggested ways to improve.

3-2-1. Spatial Affordance

The work by using the rear projection technique was provided the image from one side of the screen, and in the form of hall space, the entrance and exit were separated clearly and the space was configured to ensure the independence of the work.

Especially when eating or being surprised images were played, because it was used by a particular sound, other works should be enough to secure the distance. In addition, in order to provide the scenario according to the spectator's eyes, before entering the spectator at the entrance to check the screen, it was to consist of the space of the hall structure. In the exhibition 'the System of objects', it could be configured freely as desired to keep the tent structure in the exhibition space. Because holding the frame with rod and specifying the desired side as the projected screen, the spectators' diverse behaviors could be led and the work could be projected from different angles. Thus, in the first situation, as intended, plenty of space organization was possible, but in the process of deployment along with other works, the independent space was difficult to secure. In addition, due to large width, in the position of the spectator, it was difficult to recognize the entrance and the exit section clearly.

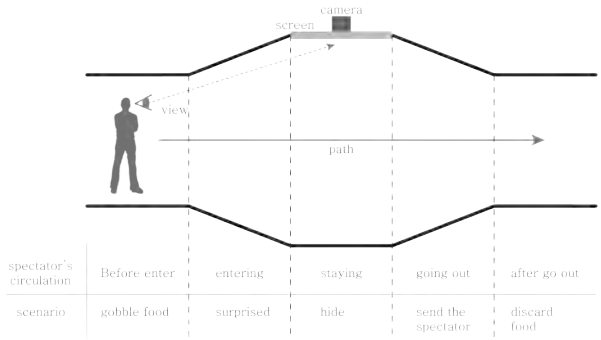


Figure 6. Spatial structure at the first time

The spatial affordance indirectly presented potentiality for the work. Thus, in the work 'lay bare', it was important to configure the circulation matching the concept of the work. In

the related work, the width was to be created more narrowly to secure the independence of the work and to clarify the entrance and exit section. If reducing the width of the space, the spectator could be awakened from previous work, as well as it could be secured independence. In order to clearly distinguish between the inlet and outlet sections, additional lighting could be used. If the lighting was set on the space where the spectators eyes were staying in front of the work for a long time, the spectators were naturally derived under the lighting to enjoy the works. While narrowing the width, the contact angle with the screen where the work was projected on should be adjusted accordingly. Because from the range that begin to narrow upto the entrance of the work, the vision for the screen surface was to secure sufficiently. As a result, spectators could experience a little deeper.

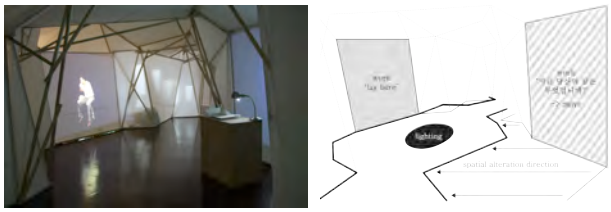


Figure 7. Positioned 'Lay bare' and the re-organized space structure

3-2-2. Feedback Affordance

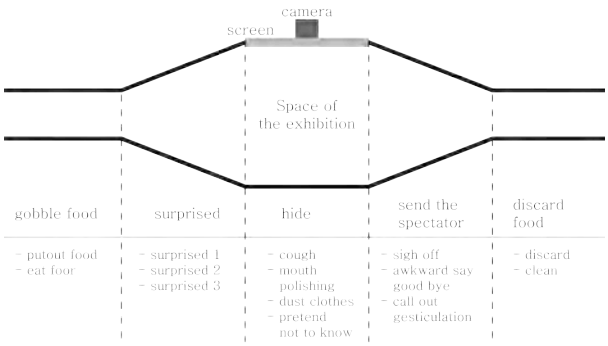


Figure 8. Scenario followed by space structure of the first time

The 'lay bare' providing the linear scenario was getting to a feedback that was the scenario itself provided by the circulation of spectators. In order to be able to know whether the feedback was deployed by the spectators, it was important if the scenario was well organized. The scenario of 'lay bare' set at the beginning was set to both sides of the screen as the entrance and exit section, and it was to provide images per section formed by the two intervals as a standard.

The five scenario depending on the spectator's circulation were big scenario such as 'eat', 'surprised', 'hide', 'send', 'discard' and by providing more than one picture for each scenario, a variety of situations were to provide randomly to the spectators.

<Picture9> scenario configuration according to initial exhibit space

In the exhibition 'the System of objects', it was possible to look into the reaction of the spectators for a variety of scenarios that were designed in the first. There were spectators who reacted and experienced to meet the intention of the work, but there were also the spectators who did not understand the whole context of the work. When the spectator entered into the entrance section, the surprised video is played. The video who was directed to the most dramatic direction due to the emergence of video spectators make sure that what was surprised. As the reaction was big enough, some of the spectators to get feedback continued to stay the inlet section to determine if there was feedback. While the spectators were staying in front of works, the video that was playing showed the actions to hide. However, the context of the configured scenarios were not naturally accepted by the spectators. Each image was not connected naturally and was cut off because of the difficulty in reading the context. So in the four scenarios ' to cough ',' mouth polishing ',' to dust clothes',' to pretend not to know', one scenario that had the most natural flow, "to pretend not to know" and the 'called out gesticulation' which was a scenarios provided in ‘send’ was to provide. In particular, the video 'called out gesticulation' was a image that instruct the direct action to the spectator so that it was able to induce relatively higher participation. The ‘sigh off’ and ‘discard’ of the video images in the exit section did not stimulate the spectators. Since these images were relatively small sound and the videos were static movement, the spectators could not recogniz properly if it was the feedback by themselves. Thus, by using the dynamic movement or sound, the clear and concise feedback needed to be provided.

Table 3. Scenario comparison of 'Lay bare' and 'Lay bare 2

Location of spectator	Video scenario					
	lay bare				lay bare 2	
	Before installation		After installation		Related works	
before enter	eat	put out food	eat	put out food	**eat**	**put out food**
		eat food		eat food		**eat food**
inlet section	surprised	surprised stage1	surprised	surprised stage1	**surprised**	**surprised type 1**
		surprised stage2		surprised stage2		**surprised type 2**
		surprised stage3		surprised stage3		**surprised type 3**
in front of work	be settled	cough	hide	pretend not to know	**hide**	**hide food according to the**
		mouth polishing				
		dust clothes		call out gesticulat		

		pretend not to know		ion		**spectator**
outlet section	send	sigh off	send	sigh off	**send**	**get angry**
		awkward say good bye				
		call out gesticulation				
after exit	discard	discard	discard	discard	**discard**	**discard**
		clean				

The feedback affordance helped to see clearly that the output value by the spectator was appeared by the spectator. The control was required such as better visualization of the output values and the faster response speed. Thus, in the 'lay bare Ⅱ', the scenarios was modified to have a consistent flow according to the spectator's circulation and interactive works changed by the spectator's eyes were to create. Eating picture remained the same, but the sound was more clearly increased to deliver and to recognize the initial situation. The surprised video was aware of the feedback by the spectators to maintain this structure, but more and more surprised video divided into three stages, instead of more surprised video, different kinds of surprised videos were divided and provided. There was no need to limit the number of spectators, and the more dramatic direction became possible. Hide images should be available to provide the video interacted by the spectator's eyes rather than to provide different pictures at random, In the interval, depending on the location of the spectator's eyes, poses to hide the food were different.

This was able to provide a consistent scenario, as well as according to personal eyes flow of the spectator, the work to be experienced would be different. In this case, depending on the eyes, based on the work by providing a high degree of reflection that respond in real-time, the feedback by the spectators should be clarified. Overall, the video was short and concise configuration and, in particular, the video that was replaying in the inlet section and the outlet section should be directed as dynamic and dramatic images.

3-2-3. Physical Affordance

The work 'lay bare' did not show the input interface to accept input values resulting from the interaction with the spectator. In the case of other works, stool, pop-up book, flashlights, a keyboard, a receiver, a radio were used. Like this, to use such a specific input interface might be advantageous to drive the behavior of the spectators. However, because this work was changed by the spectator's eyes and behavior, it did not require a specific input interface. The sensors that was not apparent in the work was installed to accept spectator's eyes and behavior as the input, so the spectator could focus on the work.

In the exhibition 'the System of objects', webcam was used as a sensor to identify the spectator's circulation. The path of the spectator was identified by placing it in the top left of the screen of work, and the spectator's movements were detected by pixelating the screen. Webcam with a unique composition of the exhibition space in the screen capture that artist wanted could be set the inlet and outlet sections that artist wanted. However, because the work itself did not reveal the input interface, the spectators were confused to take what kind of action in the first place. In order to shift as the author intended to move naturally, the other affordances were used to complement. In addition, there were spectators who did not move as intended path by the author. In order to continue to see the surprised video, some spectators kept staying the inlet section and some moved also from the exit section in the opposite direction to the inlet section. Because inlet and outlet sections were fixed by using a webcam, the scenario tailored to the direction of movement of the spectator could not be provided.

Therefore, it needed to build a system to identify any direction of spectators' movement. In addition, the WebCam took a lot of influence of especially light, so that it was sensitive to the changes of exhibition space. This work has been implemented unstablely. This work has been implemented unstable. Therefore, in order to implement a stable work, it was needed to a minimum to reduce the influence of light.

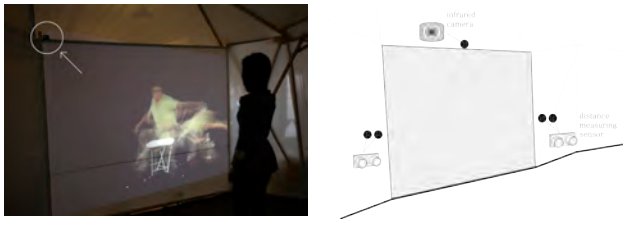


Figure 9. Web cam position of 'Lay bare' (L), Sensor position of 'Lay bare 2'(R)

The work 'lay bare Ⅱ' utilized the other affordances as assistance to follow the circulation that author intended when the spectator faced to the work for the first time. The spectator's circulation was constrained by the spatial affordances. As a result, even if there was no physical input interface, the spectator's input would be able to get more clearly. And according to the spectator's circulation that move freely, it was to set up the system. Without setting the entrance or exit, it was to determine the interval by the spectator's circulation. For this, the distance sensor was installed two each space respectively in the space of the inlet section and the outlet section, and spectators' circulation direction would be able to determine. Since the distance sensor was not affected by the light, and would recognize the distance of the object that placed in front of the sensor, the movement of the spectator was able to recognize more stably. In addition, when staying situation that the spectator faced the work, depending on the spectator's eyes, in order to enable the work to interact, an infrared camera has been installed to track the spectators's eyes in the spectator section that encouraged to stay and installed the lighting. This was an eye-tracking system based on a video to track the relative position of the pupil and it was a way to measure by the eye movement. In

the middle of the top of the screen, an infrared camera was installed, and it would be in line with the spectator staying space. Also if possible, this sensor would not be appeared.

3-2-4. Cognitive Affordance

In the case of cognitive affordances, an affordance helped to predict the future. The display method for this was naturally to configure the counterpart of input and output interface. However, this work should not provide clues for the prediction.

3-2-5. Sensory Affordance

The sensory affordance was an affordance that how the spectators feel sensately by connectivity of the exhibition components. As one work that composed of the exhibition 'the System of objects', it was in harmony with other works, but the work itself did not provide a harmonious linkage. Thus, in order to improve the linkage between each component, the spectator's senses should be actively used in the 'lay bare Ⅱ'. Increase the size of the sound and it should be configured richer. In addition, because the image centered to eat, so that to make eating behavior look more outstanding, the images were reconstructed as the composition that highlight people's upper body.

3-3. Construction of related work

The input values that led to a change in scenario with the video scenarios as the center were controlled through a distance sensor and an infrared camera.

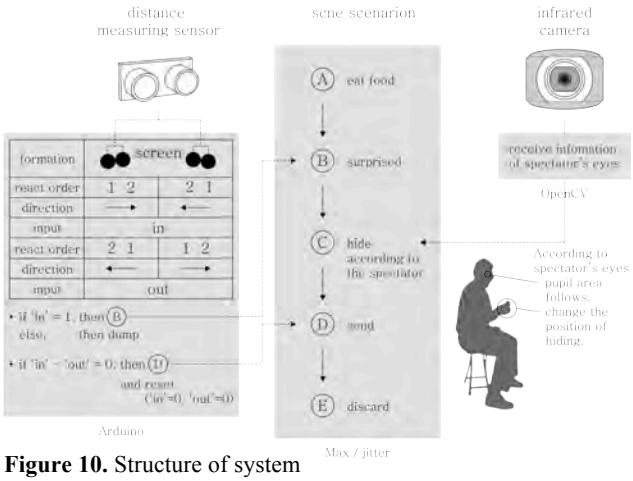


Figure 10. Structure of system

Two distance sensors that were installed on each side of the screen recognized if spectator's coming up or going out in order to respond. The input values of distance sensors were transferred to Max / jitter using the Arduino. Measure the direction of the movement of the spectator in real time, and considering the number of spectators, the configured scenarios were provided. Offer the scenario B based on the first person at all times, and only if all have gone, offer the scenario D. Scenario C was govern by an infrared camera as the sensor. The eyes of the spectator were tracked through the sensor. A program to track the eyes used the OpenCV. The input value was transmitted through the Max / jitter in the implementation of accepting information of the infrared camera and tracking system. The components of 'lay bare Ⅱ' were composed of exhibit space consisting of rod and textile, distance sensors and infrared cameras that are obscured in the input interface, and output interface with rear projection image.

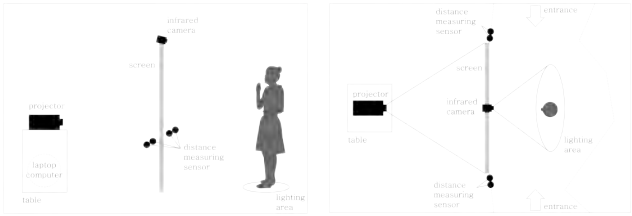


Figure 11. Blueprint of 'Lay bare 2'

4. Conclusion

In this study, affordances of interactive media art exhibition were classified and applied to the actual display and the related works had tried to be suggested. The participation of the spectator derived through previous studies, 'research on the affordances of interactive media art exhibition' was analyzed based on the five kinds of affordances, but there were the limitations to apply them on the exhibition of the art works uniformly. Because the work was not a design, we could not judge that classified affordances must be applied with the result that would have the value as a work. Only, as the technology-driven work, it was just one of the ways to increase the participation of the spectator rather than to be lack of interactivity. Thus, classified affordances should be used selectively according to the artist's intention and the situation on the display. Nevertheless, in this study, if using classified affordances in construction of a display, theoretical background was presented to composed of display more richly.

On the basis of an analysis of the exhibition 'the System of objects', the work of this researcher 'lay bare' complement was analyzed in detail and by deriving the direction of the improvement, the related work, 'lay bare Ⅱ' was proposed. In practice, however, because it failed to go through the process of implementing of the work, there was the limitation that no observation how the interaction of the spectator and the work could be done. In particular, compared to the previous work, 'lay bare', it was not checked the potentiality on the changes of the participation and experience of the spectator. However, on the basis of five affordances, detailed analysis was possible, and based on this work, the proposal of works to improve the affordances was possible. Based on this, future research was presented.

The exhibition 'the System of objects' was an exhibition with only a projection technique. Therefore, through this exhibition, there were limitations in the derived complements. In addition, by utilizing not only projection but also various media, the research on the interactive media art was needed. Because affordances appeared differently depending on the media, so the participation could be enhanced by offering the affordances in consideration of this. In addition, when the related work 'lay bare Ⅱ' was actually displayed, and looked

at what happens the interaction with the spectator. Thus observe if the improved affordances have been applied well to the 'lay bare'. In the process of being guided the behavior of the spectators, it helps to analyze the intuitive and easy to access by what criteria and it would be classified the better affordances by analyzing.

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