A Survey for Measure the Digital Art Presence

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Abstract

Presence represents a cognitive sense that is subjectively felt by individuals on the existence of objects when it is not feasible to recognize the presence of means in the environment suggested through particular means according to the definition of dictionary. In the various multimedia contents and display system created by development of digital technology, presence is a very important concept. Development of digital technology influenced on the field of art creating the genre named digital art. Digital art is used for how various cutting-edge technologies is represented as the art, and such types of art are currently becoming a very important field of research to recognize the presence. Therefore, this paper has analyzed and investigated methods used to measure presence in the digital art.

Keyword: Presence,

1. Introduction

Digital development in modern society in the 21st century means how the changes in information delivery has been actively proceeded and is showing the characteristics [1] of producing knowledge through exchanges. This is an outcome brought by changes in information acceptance from media development. Therefore, digital art is expressing the artistic value as well as adopting exchange of information.

Artistic value exists in the authentic property. Authentic property is a comprehensive concept of everything to be handed down from the origin of objects including the physical continuity of objects and also historical testimony value [2]. Historical testimony value of the work is based on physical continuity of objects. Therefore, if the value is gone through mechanical work beyond the work led by humans, the historical testimony value becomes suspicious. Hereupon, the concept of authentic property is weakened by duplication. Digital development forms a new perspective of art through collapse of authentic property, in other words, historical testimony value. Therefore, functions of art work have been changed to pursue various values beyond authentic value as the functionality of exhibition value has been expanded due to digital development [3].

There are many of the works in digital art that can derive interaction with audiences by using cutting-edge technology. In other words, there has been an increasing trend of interest on presence as the experience and communication with audiences becomes important.

Presence represents a cognitive sense that is subjectively felt by individuals on the existence of objects when it is not feasible to recognize the presence of means in the environment suggested through particular means. In addition, it also indicates a subjective felt by individuals as to how they live in the environment created by media. As for Internet lecture that is currently much provided these days, students are able to feel how teachers are physically near them through sound and video even though they do not exist next to them. Development of digital technology tends to create various multimedia contents that maximize the presence. Many of the multimedia contents that make people

feel the presence in the virtual world through stimulation of five senses including 3D or 4D movies have been manufactured, and MHD including Osculus is becoming popular.

Multimedia contents based on virtual reality make learners psychologically recognize how they exist in the place even though such a place does not physically exist in reality. Augmented reality has recently improved cognitive power of humans by providing three-dimensional multi-sense information and hence leading them to concentrate on information. Expression method of information in the use of various sensory organs including sight, hearing, and tactile sensation brings sensual concentration and hence enhances the presence.

It is intended to investigate the concept of presence, cases related to application of presence in the field of art, and cases about measurement methods and analyze them. Technical development has created a genre named digital art. Digital art is involved in direct interaction in the use of digital technology unlike other art genres, and response of audiences is of a distinct element for completing the work. Digital art hereof makes it feasible for audiences to feel a higher level of presence than other art genres.

2. Related Works

2.1 Presence

Psychological response and state occurred in the virtual word is called as presence. Studies conducted as of now have diversely used the concept of presence. First of all, an artificial intelligence scholar at MIT named Marvin Minsky was the first person that raised the importance of it. He identified how control system of remotely adjusting robot not only provided accurate cognitive and perceptive power but also created three dimensional world of reality in a particular awareness condition of users, in other words, a remote area. In addition, he suggested a term named telepresence in 1979 (Rheingold, 1991) [4].

Study on the presence has actively been conducted at MIT by Sheridan and Furness (1992) [5]. Afterwards, telepresence started being unified as a term named presence. This is because presence is similarly applied to the recognition of humans in both medium environment and physical environment. At last, presence is more of a realistic recognition over mediated by experience. (Lombard & Dittom 1997)[6].

Studies on the presence are divided into four categories as follows. First of all, they are studies indicating the existence for 'being there' (Reeves, 1991; Sheridan, 1992; Slater & Usoh, 1993; Schloerb, 1995; Kim & Biocca, 1997; Biocca, 1997; Taeyong Kim, 2000)[7, 8, 9, 10, 11, 12, 13]. According to the quote of conceptual definition given by Kim and Biocca, the presence is in a condition of "a person's perception of being at a specified or understood place." Secondly, they are studies defining the presence as psychological, cognitive, and perceptive states (Barfield & Hendrix, 1995[14]). Third, they are studies defining the presence as how part of bodies or senses exists in other environments including the concept of mobility (Kim, 1996[15]; Kim & Biocca, 1997[11]). Fourth, there are studies defining the presence as intellectual delusion, subjective experience, and absorption existing in the mediated environment (Steuer, 1992[16]; Lombard & Dittion, 1997[6]; Witmer & Singer, 1998[17]; Freeman &Avons, 2000[18]; Lombard et al., 2000a[19]). Other than them, a term named telepresence is also used. It means to provide a feeling how one exists in a remote area from reality. It indicates how one is absorbed into the virtual environment simulation creating delusion where they are at a remote place.

Presence has multi-dimensional meaning. Heeter (1992[20], pp.262-271) has classified the presence into individual presence, social presence, and environmental presence according to the experience of 'being there.' Individual presence indicates a degree of how a human feels to exist in the virtual world. Social presence indicates that a human

seems to exist in the relevant world and respond with users. In addition, environmental presence represents how an environment recognizes to exist with users there and corresponds with users.

2.2 Development of Presence

Presence was connected to communication study since experience on reality in various recently emerged fields including virtual reality, remote meeting, high-resolution TV, 3D, IMAX, simulation game, remote education, remote diagnosis, and HMD has become an important element. Presence is being applied and proceeded in each field. The concept of presence becomes more important by designing the presence in the eye of engineering so that it can be recognized through illusion on users (Lombard & Ditton, 1997)[6].

Presence is not a phenomenon invented by particular technology. However, it is being overtly emerged by remote control and virtual reality technology in the 20th century. In addition, it has been keeping up with conceptual development. Courses of presence development are as follows in the Fig. 1.
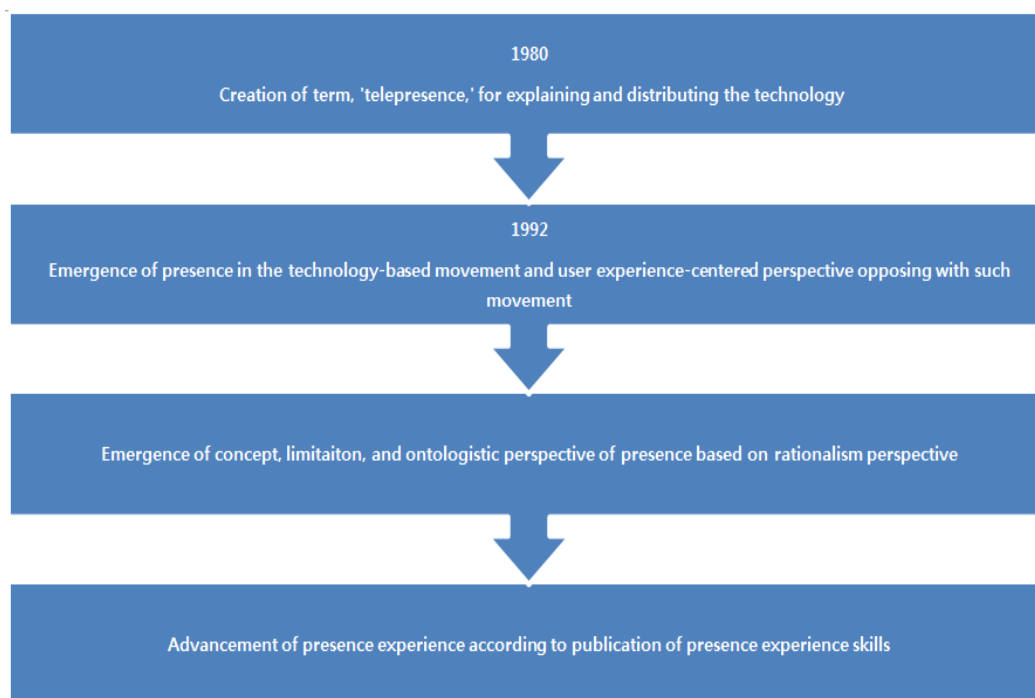
**Figure 1. Courses of Presence Development**

Minsky emphasized the necessity of high level and sensational feedback. Hereupon, Minsky insisted that there would be no difference between remote control and direct control in the future (Minsky, 1980)[21]. Figure 2, 3, and 4 indicate devices related to remote control emerged after the 20th century. It is closely related to the presence as what indirectly controls objects with as well as remote control.

In order to deviate from the technology-centered definition, Steuer (1992)[16] defined the concept of presence in the perspective of user experience. He defined the environment as real environment and virtual world and also the presence as 'the sense of being in an environment.

3. Presence

3.1 Factors of Determining the Presence and Case Analysis on Digital Arts

Steuer (Steuer, 1992)[16] insisted that a course of communication via virtual reality would be changed as shown in Fig. 2. In addition, he explained the factors of determining the presence by classifying into vividness and interaction in the relationship between human experience and technology.
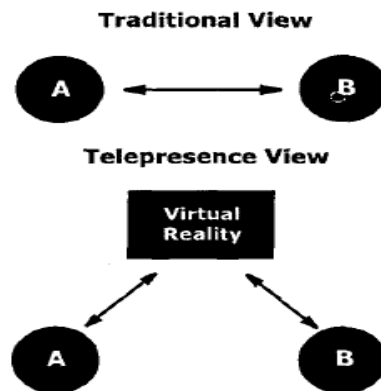
Figure 2. Changes in Communication Model from Telepresence View

Kim (2000)[13] reclassified them and selected sensory immersion, sensory fidelity, cognitive fidelity, and personal factors as factors in determining the presence. In addition, Jang (2004)[22] has re-organized the concept of these determining factors in the perspective of telepresence art and found and analyzed cases of previously applied telepresence arts based on them.

Sensory immersion represents how much five senses of acceptors are absorbed into the virtual world in front of them. DT in Berlin has delivered data from home of the brain from ART + COM Institute to Geneva in Swiss via ISDN (Integrated Services Digital Network) at the exhibition hosted by Telekom in Germany in 1991 (Figure 6). Users in Geneva wearing data goggles and data gloves have navigated preferred directions and time periods in the data set transmitted from Berlin. In other words, it made a new leap forward beyond a method of enjoying the art works right in the front and made viewers feel that they were in the image.


Figure 3. Home of the Brain (Monika Fleichmann & Wolfgang Strauss, 1992)

Sensory fidelity represents that realism shall be outstanding for virtual world to be realistic. It can be classified into vividness and interaction as what Steuer suggested. As for the case of work with vividness, Telematic Dreaming firstly displayed in real setting in the Koti Exhibition by Kajaani from Finland held in 1992 connected two places with distant beds with 2MB ISDN. Visitors lying on the bed were given a feeling as if they lied on a difference place with partners. Sermon has derived for strong visual impression to stimulate touch even though it was not feasible for users to touch badbate.

Figure 4. Telematic Dreaming(Paul Sermon, 1992)

Figure 5 is a case of interaction that Traces have connected CAVE (Cave Automatic Virtual Environment) in different places with network. Real time graphics and sound were realized only with body movement. Users went to the virtual image space interacting with traces of dim light that realized body movement and dimension. Users watched a huge virtual space, heard sound delivered to the space, and experienced vibration of the floor.
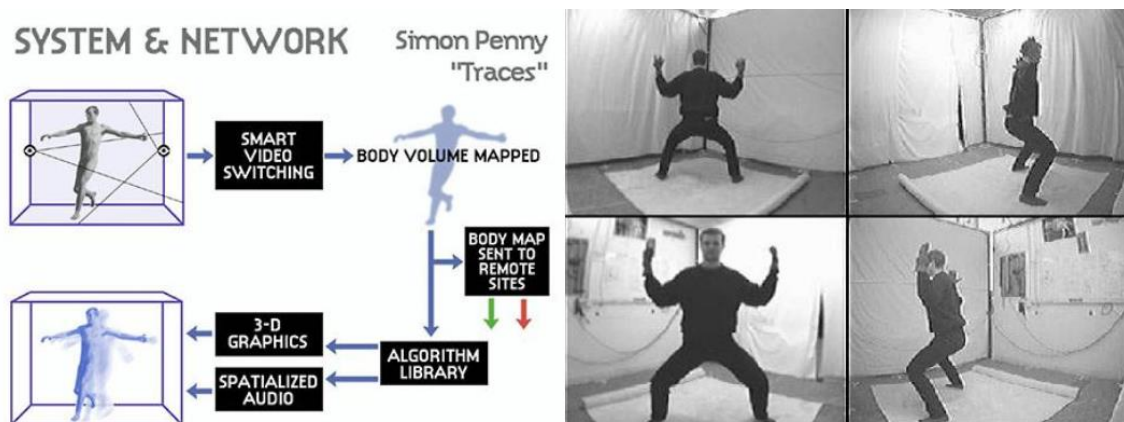
Figure 5. Traces: Vision System (1998)

Cognitive fidelity indicates a cognitive experience that object or characters in the virtual world can concentrate on unrealistic environment. Figure 6 is in the Chroma-key room installed in Wilhelm Lehmbruck Museum in Germany. Visitors in this place meet with visitors in shower room and locker room of miners located in abandoned mines as

the second place of this installation. One side of water screen in high pressure shower coming from the center of shower room is projected with visitors in each of museum and locker room. On the other hand, the other side is projected a scene of miners taking a shower at the shower room in the past in black film. This makes us remind of past generations of minders cleaning cinders with tired bodies after hard-working underneath the ground.

Figure 6. A Body of Water (Paul Semon & Andrea Zapp, 1999)

Factors mentioned above are properties of information configuring the virtual world. Presence is based on subjective judgment of acceptors and also influenced by characteristics of individuals. Visitors at Telematic Vision(Figure 7) are exposed to a scene as if they are watching TV. Sitting down on the easy chair and watching large screen monitor, it is possible to see oneself on the real size as well as how visitors are sitting down on the easy chair with them through ISDN image meeting link. Visitors play around with people next to them in difference spaces, become familiar with each other, and scream. Restrictions in reality are disappeared making them free from practical outcomes of behaviors. Hereupon, visitors showed different behaviors depending on their personal characteristics.

Figure 7. Telematic Vision (Paul Sermon, 1992)

3.2 Measurement of Presence

Among criteria of measuring the presence, the representative one is PQ (presence questionnaires) and ITQ (Immersive Tendency Quesitonnaires) organized by Witmer&Singer(1998) [17]. Four elements of control, sense, interruption, and practicality were individually evaluated and integrated them for statistical support. Therefore, they are regarded as paradigm standards of questionnaires for measuring the presence.

Table I. Factors Hypothesized to Contribute to a Sense of Presence			
Control Factors	**Sensory Factors**	**Distraction Factors**	**Realism Factors**
Degree of control	Sensory modality	Isolation	Scene realism
Immediacy of control	Environmental richness	Selective attention	Information consistent with objective world
Anticipation of events	Multimodal presentation	Interface awareness	Meaningfulness of experience
Mode of control	Consistency of multimodal information		Separation anxiety/ disorientation
Physical environment modifiability	Degree of movement perception Active search		

Figure 8. Immersive Tendency Quesitonnaires

Witmer&Singer(1998)[17] has selected the important elements in experiencing the presence in the virtual world as involvement and immersion. Involvement is a degree of paying attention on external stimulation, and immersion is a degree of interacting with environment produced by external stimuli and including them. Factors influencing on these two elements are classified into control, sensory, distraction, and realism and organized as shown in table 1.

Lessiter[23] has organized ITC-SOPI (Independent Television Commission Sense of Presence Inventory) method based on questionnaires, a subjective measurement method, as follows to utilize the presence as qualitative evaluation tools for media experience.

Table 3. *Items that Failed to Load Significantly (≥0.3) on any of the Four Factors which were Deleted from the Revised ITC-SOPI*

ITC-SOPI item	Loading F1	F2	F3	F4
I was aware of the real world	−0.23	−0.15	−0.03	−0.11
I wanted to see more of the space in the displayed environment than I was able to	0.18	0.23	0.07	0.19
I found it easy to forget that I was watching a display	0.19	0.23	0.25	0.19
I had the best viewpoints	0.20	0.19	0.19	−0.05
The temperature of the real world distracted me	0.05	0.03	−0.12	0.26
I was distracted by the quality of the technology	0.15	0.07	−0.17	0.29
I wanted to make specific sounds louder or softer	0.20	0.11	−0.05	0.25
I felt I knew what was going to happen next	0.02	−0.02	−0.11	0.03

Figure 9. Example of Result in Utilizing ITC-SOPI (J. Lessiter, et al.. 2001)

Barfield and Weghorst (1993)[24] have suggested telepresence measuring methods as (1) self-statement evaluation, (2) physical response, (3) work achievement in the virtual world, (4) work achievement in the real world, and (5) a degree of feeling dizziness due to difference of reference in space recognition (or time to overcome them all).

Most of these measurement methods were for measuring whether to experience the virtual world through virtual world display. Therefore, it is nearly impossible to apply them in a situation where message is accepted through public media. 'Self-statement evaluation' is what can be applied to a situation using mass media without difficulty among suggested methods above.

Barfield and Weghorst (1993)[24] has used 'sense of being there,' 'sense of inclusion in the virtual world,' and sense of presence in the virtual world' as criteria on self-statement evaluation. In addition, 'sense of being in the computer-generated world' and 'computer-generated world being more like somewhere I visited than something new' were used as measurement items in the study conducted by Slater, Usoh & Steed (1994)[25]. Kim and Biocca (1997)[11] organized and summarized various telepresence self-statement evaluation criteria used in aforementioned studies and created criteria of mass media telepresence criteria consisting of 8 items and utilized them in the empirical study.

Other than them, icon criteria applied to television developed by SAM created in 1980 were used by Lang, Gieger, Strickwerda & Summer (1993)[26]. Slater, Usoh & Steeds (1994) created SUS (Slater, Usoh, & Steeds) questionnaires, and IJsselsteijn, Ridder, Hamberg, Bouwhuis & Freeman (1998)[27] created SSCQE survey. In addition, Lombard, Reich, Grabe, Bracken & Ditton (2000)[28] divided into high presence and low presence creating the television survey to verify presence experience for watching TV. As a result, 7 elements of concentration, intentional-social interaction, intentional-social relationship, biological response, social realism, social enrichment in human relationship, and general social enrichment were classified.

4. Conclusion

Deriving concentration in the field of digital art is regarded as direct interaction between the work and audiences. However, it is not merely regarded as interaction if feedback is given between them. When audiences and the works create a complete equilibrium in the art and derive interpenetration with each other, it is then regarded as a true interaction. Concentration in the field of digital art is regarded as a strong presence. This paper has identified cases applying the presence in digital art according to determining factors in presence and also cases applying with measuring methods. Such a

study will make it feasible to configure storyline in the perspective of cognitive fidelity so that users can concentrate in various fields including games, products, advertisements, virtual world, and design.

Follow-up study is scheduled to deal with development of measurement methods according to characteristics of users (age, gender, and nationality, etc.) as well as compare/analyze each of the measurement methods for presence. It is intended to materialize generalization of criteria and apply the presence to each medium.

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