THE SCREEN AS BOUNDARY OBJECT

IN THE REALM OF IMAGINATION

A Thesis
Presented to
The Academic Faculty

by

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In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in the
School of Literature, Communication, and Culture

Georgia Institute of Technology
May 2009

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Date Approved: December 18, 2008

ACKNOWLEDGEMENTS

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SUMMARY

As an object at the boundary between virtual and physical reality, the screen exists both as a displayer and as a thing displayed, thus functioning as a mediator. The screen's virtual imagery produces a sense of immersion in its viewer, yet at the same time the materiality of the screen produces a sense of rejection from the viewer's complete involvement in the virtual world. The experience of the screen is thus an oscillation between these two states of immersion and rejection.

Nowadays, as interactivity becomes a central component of the relationship between viewers and many artworks, the viewer experience of the screen is changing. Unlike the screen experience in non-interactive artworks, such as the traditional static screen of painting or the moving screen of video art in the 1970s, interactive media screen experiences can provide viewers with a more immersive, immediate, and therefore, more intense experience. For example, many digital media artworks provide an interactive experience for viewers by capturing their face or body though real-time computer vision techniques. In this situation, as the camera and the monitor in the artwork encapsulate the interactor's body in an instant feedback loop, the interactor becomes a part of the interface mechanism and responds to the artwork as the system leads or even provokes them. This thesis claims that this kind of direct mirroring in interactive screen-based media artworks does not allow the viewer the critical distance or time needed for self-reflection.

The thesis examines the previous aesthetics of spatial and temporal perception, such as presentness and instantaneousness, and the notions of passage and of psychological perception such as reflection, reflexiveness and auratic experience, looking at how these aesthetics can be integrated into new media screen experiences. Based on this theoretical research, the thesis claims that interactive screen spaces can act as a site for expression and representation, both through a doubling effect between the physical and virtual worlds, and through manifold spatial and temporal mappings with the screen experience. These claims are further supported through exploration of screen-based media installations created by the author since 2003. The thesis thus demonstrates how screens as boundary objects between the real and virtual spaces can create an imaginative realm for both artists and viewers alike, and can provide the critical distance necessary for viewers to have a reflective and meditative experience.

CHAPTER 1

INTRODUCTION

"The spectator makes the picture."
Marcel Duchamp[1]

Screens Everywhere

Figure 1.1   Opening Ceremony of the 2008 Beijing Olympics

In August 2008, at the opening ceremony of the Beijing Olympics 2008, for about two hours people in the world had the opportunity to observe a series of spectacular media art performances, which were created with many creative and artistic ideas and state-of-the-art media technologies. That night, the most interesting scene to watch, for me, were the free-floating screens created by every possible type of media presentation. In that show, every surface seemed to be converted into a screen. The dome and the ground of the Olympic stadium, the "Bird's Nest," and even the performers' bodies

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became illuminating screen surfaces through video projections or by emitting light to create an immersive and dramatic experience for the viewers.

While watching this world-wide show, I thought that our daily life experiences nowadays, where screens are everywhere, are becoming similar to this scene. It is not so long ago that little cell phones started having screen displays and embedded cameras. The most up-to-date Apple iPhone has a bigger screen, which completely fills the device, providing new experiences with any mobile device-accessible information. In Seoul, Korea, many people on the subway watch their small screens on mobile devices such as portable media players (PMPs) or mobile TVs, which are made possible by Digital Multimedia Broadcasting (DMB) systems, a digital radio transmission system for sending multimedia (radio, TV, and datacasting) to mobile devices. Also, almost every new car has a GPS navigation system with a screen that tells us the way to get where we are going. Demonstrating TouchWall, Bill Gates, Microsoft chairman, envisioned turning nearly every surface which we touch, into a computer and media presentation. In his keynote address at the CEO Summit[1] in Redmond, Wash., Gates said, "When I say everywhere, I mean the individual's office, the home, the living room." When this becomes fully realized, then our refrigerator in the kitchen and the walls in the living room will become interactive and informative surfaces for media presentation, communication, entertaining, and immersive experiences.

These pervasive interactive media screen experiences are expanding, in fact, as the result of and along with the pervasive, ubiquitous, embedded, and prevailing computer-based interactive technology that has been continuously developing in recent decades. Familiar examples embedded in our everyday experience are mobile phones,

RFID embedded ID cards, and ATM machines in banks and stores. In these examples of pervasive and embedded computing, we find that the screen exists as a communicative channel, first as an output for display, and second and more recently, as an input for interaction. The experiences of new media screens are very much based on the notion of interface as input and output with support of computational technology, and in this sense, new media screens are very much related to the computational system. Today, interactive screens are everywhere, from generic touch screens to today's two-finger-touch or multi-touch screens, such as those used by the iPhone and Microsoft Surface[2] which can zoom in/out, rotate, or "flip" information almost magically. Screen-user interaction is currently a hot topic in the hi-tech communication industry. It has become clear to me that along with the development of computational media, new kinds of screen experiences will find their way into other areas of life and art.

Human Computer Interaction

As we use and depend on these kinds of interactive computing systems more and more in our daily life experience, many researchers are developing computing systems and designing human interaction into these systems. To make the interaction more fluid and more reliable, most of this research often focuses on how to maximize the level of success we have as we interact with such systems. Artificial intelligence (AI) researchers are developing computer systems, which can perceive their own environment and be receptive to human actions reliably and efficiently (Russell and Norvig 2003). Human-computer interaction (HCI) research has concentrated on how the interaction between the computer and the user can be designed in order to make systems easy to understand. A renowned HCI researcher, particularly on usability and cognitive psychology of human

computer interaction, Donald Norman argues in his book *User-Centered System Design* (1986) that HCI research aims to make mental models with which to analyze and align designers' and users' interpretations of system behavior by sharing "a unified underlying stance on interpretation that circumscribes both the problem of interpretation and its presumed solution."[3] HCI researcher Pheobe Sengers and designer Bill Gaver write that "(HCI) often focuses on how designers can develop systems that convey a single, specific, clear interpretation of what they are for and how they should be used and experienced"(2006).[4]

New media art or interactive art not only utilizes new media (computer-based media) as its medium for artwork creation, but also exploits the interaction between human and computer for new ways to experience art. Since most interactive artwork uses the computing system as a communicative means, the interactive artwork often focuses on how to make a reliable input system that can sense the participant's interaction and present a complicated output that can provide new experiences, which are possible only with a computer-based creation. Although this kind of interactive artwork does not explicitly aim for functionality and usability in the interaction with the system, in the sense that the system requires an interactive and communicative process between the human and computer, sometimes the focus is still not very much different from that of the HCI type of computing system design. Despite the fact that there are shared interests between the HCI research and interactive art, interactive art must have its own interests and directions as a genre of art which distinguishes it from commercially applied scientific and technological research.

Interactive Art

Interactive art is a type of art that involves a viewer's active participation.[3]

Interactive artists often claim that their work is open to the audience's participation.

Therefore, their work has an open-ended structure that allows or even encourages the

audience to "complete" the creation. In this sense, in interactive artwork, the relationship

between the creator and the audience becomes blurred, sometimes to the extent that some

even say that the audience becomes a co-creator of the work.[4] However, when we think

about interactive art in this way, the following question can be raised: Is there any art that

is not interactive? In a broader sense, all forms of art are interactive because the process

of viewing and interpreting a work of art can be considered a kind of participation with

that work. For instance, according to Dada artist Marcel Duchamp, "The spectator makes

the picture" (Paz 1978, 85). With this notion, Duchamp expresses the idea of the artwork

as a mirror with the piece, *The Bride Stripped Bare by Her Bachelors, Even* (1915-1923).

This piece is also called *The Large Glass* because a transparent glass is attached to the

work and it reflects the viewing context such as the images of whoever observes it and

the space of where it is presented, e.g., a gallery reflected through the glass. In *Marcel

Duchamp: Appearance Stripped Bare,* Octavio Paz (1978) sees this Duchamp's painting

as an incomplete one that is perpetually completing itself. As a mirror, the image and the

window combined, "the spectator can only set in motion the apparatus of signs that

comprises the whole work" (Paz 1978, 85) and complete the work.

In "Transforming Mirrors" (1995), interactive artist David Rokeby writes that the

artist has made room for the spectator's subjective readings of the work in both

Duchamp's and Krueger's cases by quoting a comment by computer artist Myron

Krueger, who developed early interactive works with which the interactive artist, "anticipates the participant's possible reactions and composes different relationships for each alternative."[9] But Rokeby also says that the interpretation is changed from the mind of the spectator to the external machinery that is as an extension of the spectator in the above cases; "The relationship between the spectator and this extension is externally defined" (136). Therefore, he asserts, "as the role of the spectator is questioned and transformed, so is the role of the artist" (136) in interactive art.[10]

In *Art as Experience*, John Dewey (1984) says that a work of art is an individualized participating experience. A work of art is recreated every time that it is esthetically experienced by the viewer. The viewer creates an imaginative relationship with the self through his/her experience with an artwork, and this kind of process can be called "interactive engagement." In this sense, all artwork is interactive. I think that in this participation and interaction, the most important thing is the interacting with the self. The viewer may himself/herself find different meanings in the piece on different days, at different hours, or in different stages of his own development. Therefore, as Dewey write, "the meanings that are imaginatively evoked, summoned, assembled, and integrated are embodied in material existence that here and now interacts with the self" (Dewey 1984, 222).[11]

If we could agree that to a certain degree, all artwork is open to participation and multiple interpretations by the viewers depending on their experiences with the artwork, we can imagine that there will be some differences with regards to the subjective reading in such experiences. Some works encourage this more, whereas other works encourage this less. We may ask the following questions: How is this subjective reading affected in

a particular type of work? If we say that all art is interactive, how and why can interactive artwork provide a different experience from the other genres of art for the viewer? How can interactive artists and designers ensure a more subjective reading of an interactive artwork piece and the experiences it elicits?

As Walter Benjamin argues in his famous 1968 essay, "The Work of Art in the Age of Mechanical Reproduction," people's perception has been changed by newly developed media experiences; our sensible perceptions are now changing along with the evolution and development of media.[8] In this thesis, by thinking of and expanding the above questions, I will examine how our perception of art has been affected as a result of new media experiences and how the screen-based media experience can be invaluable as it expands our real world experience into the digital world.

Thesis Overview

Chapter 1 gives an overview of the chapters of this thesis.

Chapter 2 begins by addressing the specific challenge of incorporating multiple feedback loops in an interactive media system to create a new form of art experience. It then goes on to suggest two different methods of opening or expanding these closed loops, namely a doubling effect, and manifold spatial and temporal mapping.

Chapter 3 addresses the conceptual foundations of looking at the screen as a boundary object from psychological and philosophical perspectives. By examining the temporal and spatial perception of visual art, particularly that of video art and sculpture, and the fractured subjectivity of the virtual world and the real world, I will look at how we can create critical distance within our interactive media art experience. I will also discuss how we can look at the screen as an imaginative realm for practical and

theoretical purposes.

Chapter 4 discusses how we look at the screen-based media experience as a mediated experience, in much the same way that we look at windows and mirrors. Along this line, I will examine the conceptual ideas of a distorted mirror or a transformed or "blind" window through several examples of artwork that utilize these concepts.

Chapter 5 discusses design practices and screen-based interactive artwork that I have created in order to incorporate the idea of critical distance into interactive screen experiences. The main foci of this chapter are movable screens as screen objects and responsive space screens as screen experiences.

Finally, Chapter 6 concludes this thesis by reflecting on the thesis and questioning the future direction of interactive screen art.

Acknowledgements

As a final note before beginning the thesis, I would like to acknowledge the following things. Needless to say, many of the ideas in this thesis have been influenced by former studies and techniques. Among these ideas, the following texts particularly influenced and shaped my thinking for this thesis. Rosalind Krauss's psychological readings of video as a narcissistic medium and her phenomenological analysis of a person's experience with any work of art in/through the notion of passage (in her book, *Passages of Modern Sculpture*) have influenced my perspective of the interactive media and screen based media experience as they are compared to traditional media artwork. Also, Jay David Bolter and Richard Grusin's book, *Remediation*, and Bolter and Diane Gromala's book, *Windows and Mirrors,* have helped me develop my conceptual ideas and perspectives to look at the medium as a tool for interaction and experience. In these

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books, the authors look at new media as an evolution from one medium to another medium, and continuous practices and experience shifting between "mediated experience" and "immediacy." Aware of these perspectives, I try to expand them further in this thesis as an interpretation of looking at screen experiences from the very traditional screen relationship of viewer and viewed to the very specific experience with a screen-based interactive art installation using a camera-screen interface. Finally, at the time that I proposed this thesis, I came across David Rokeby's "Transforming Mirror" and found that his notion and stance is very similar to my idea. I have used a number of his rich examples and arguments while expanding my own argument throughout this thesis.

CHAPTER 2

PROBLEM SPACE AND THESIS STATEMENT

2.1. Situations under Closed and Instant Feedback Loop

The nature of video is in its signals, which are kept in constant movement. Particularly in the very early years of video, when there were no editing devices for post-production as there are nowadays, the video signals were generated inside the camera and circulated between the recording and displaying equipment in a closed circuit. Pioneering video art in the 1970s, such as tapes by Vito Acconci and Bruce Nauman videotapes, and video installations by Nam June Paik, are typical examples of showing the diverse conceptual experiments with this kind of immediate and mirroring condition between the camera and the monitor. While examining these early video works, art critic Rosalind Krauss (1978) claimed that the psychological aspect is the corpus of the video medium. What Krauss observed in early video art was a simultaneous reception and projection of an image between the camera and monitor with the human body centered in this camera-monitor encapsulation as a conduit/medium (see Figure 2.1.1). The body re-projects the performer's image with the immediacy of a mirror, and this self-encapsulation of the body or psyche as its own surround creates a narcissistic perception in its closed feedback loop.
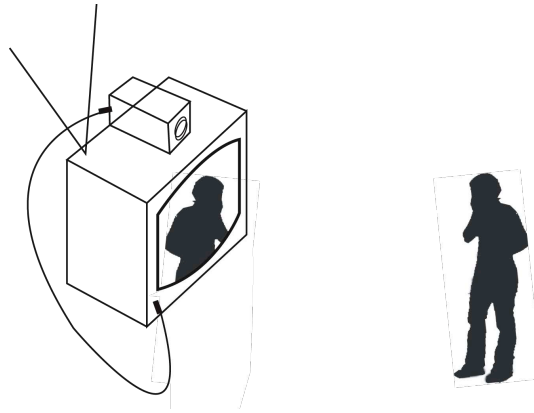
Figure 2.1.1 The basic model of feedback loop in the camera-screen interface is the simultaneous reception and projection of
an image between the camera and monitor with the human body centered in this camera-monitor encapsulation.

In my view, this encapsulation and feedback loop has been extended and even more intensified in interactive screen-based media installations. Particularly as common forms of screen-based digital media art, many screen-based installations use a webcam interface, which leads the viewer to react to the object presented on the screen. The clearest examples are interactive video installations, in which the spectator's image or silhouette/shadow becomes an active force in a computer-generated context. We can better see this by looking at four different types of loops:

1) The physical feedback

As we can easily imagine while looking at early video works, the physical feedback loop is literally the way that the interactor, camera, and monitor are physically positioned. Krauss refers to this loop as a "bracketed" situation, one in which the camera and the monitor are the brackets and the interactor is the object being bracketed (1978, 180-181; Figure 2.1.2). While video art encapsulation uses the artist's body as a medium or conduit in the loop, interactive media

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installations replace the artist's body with the audience's body. In both cases, bodies are used as an interface.

2) The electronic feedback loop of data transferring

This loop is in a similar to the physical feedback loop. When video is said to be an electronic medium, this means its origin depends on the electronic transfer of signals (Spielmann, 2008; Figure 2.1.3). Interactive screen-based media also use this electronic signal transmission, but expand this signal circuit so that the circuit between the camera and the monitor includes other sensing systems as input, and larger or multiple displays as output. Sometimes the circuits for sensing system or even displays can be wirelessly connected, but this does not mean that the signal transmission has disappeared.

3) The code-level feedback loop

When we think about programming codes in a procedural system such as a computational system, all codes are structured in closed loop syntax (Figure 2.1.5). For example, if a thing [A] happens, then do this [B], or if the thing [A] does not happen, go to another sub-loop to do other things [C]. Once every step is executed, return to the first line of code and repeat the whole process again until the system quits. The interaction made, involved, or measured in/by this system cannot escape from this loop.

4) The psychological loop

Finally and most importantly, all the loops described above fall under a more intensified psychological loop because of the real-time interactivity between the interactor and the system (Figure 2.1.4). In such an interactive system, the system responds to the actions of the interactor, and the interactor responds based on the responses of the system. In this situation, the viewer stands "in-between" the camera and monitor, and his/her [inter]action becomes the feedback responses from the work as a system. Since the images on the screen update instantly based on the movements of the interactor, the system keeps encouraging her to continue to react. This kind of mirrored feedback (a direct feedback that feels unmediated) is helpful in producing a strong sense of immersion, which leads the viewer to a directly immersed experience in the virtual space. However, this immersive experience can be limited and somewhat simplistic, in that sometimes this kind of direct and mirrored feedback provokes merely visceral responses from the viewer. In the same way, the system immediately responses (the events updated rapidly or even instantly, or the real-time image processed and displayed in a real-time), the interactor/viewer immediately react without having a chance to ponder her action from a certain distance. The directly mirrored feedback and the exact mirroring effects keep the system closed and the viewer self-absorbed. In this situation under real-time feedback, there is little room for subjective reflection on the interaction.
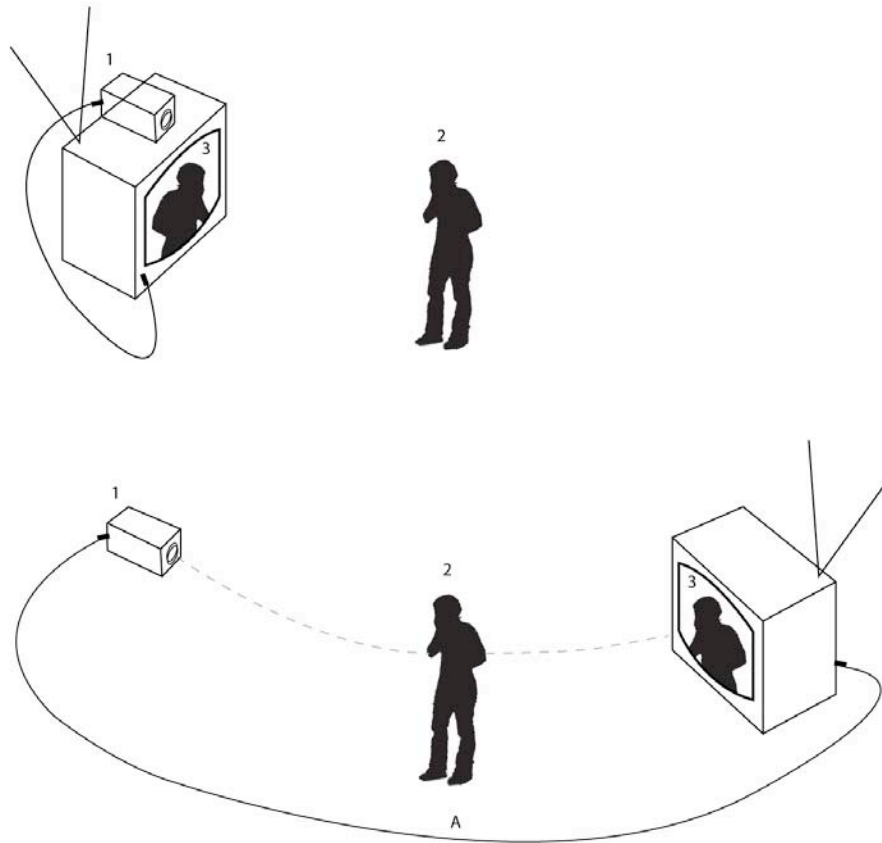
Figure 2.1.2   A: the physical feedback loop as camera and monitor (screen) encapsulation

The figure above shows the basic model of camera-monitor interface. A camera (1) received the image of the human body (2) and projects (displays) the image on the monitor (3). This basic model can be re-diagramed like the figure below as in sequential way.
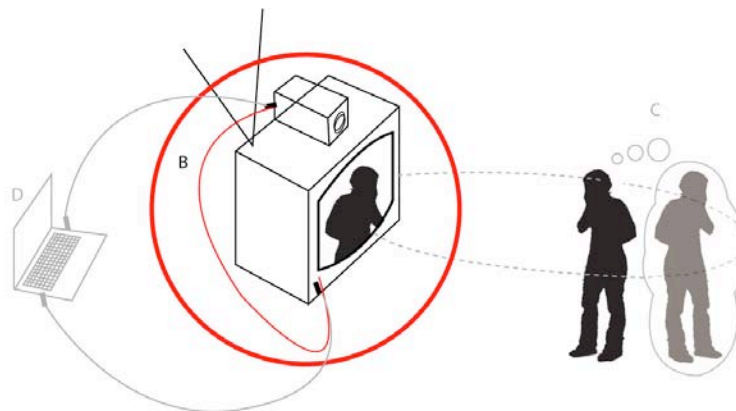
Figure 2.1.3   B: the electronic feedback loop
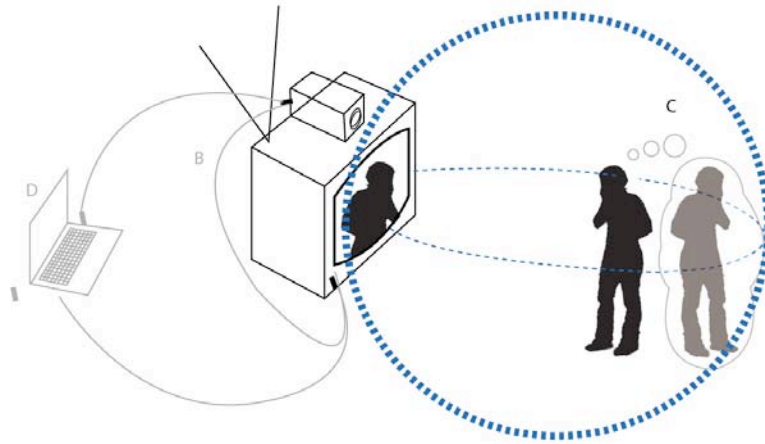
Figure 2.1.4   C: the psychological feedback loop
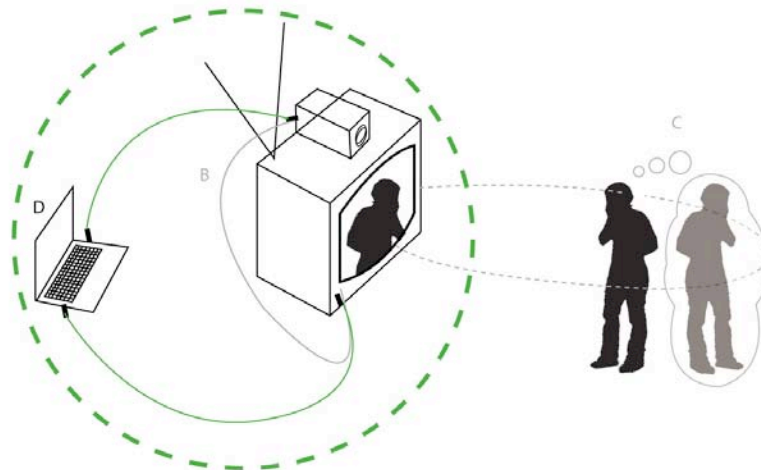
Figure 2.1.5   D: the code-level feedback loop

Current research studying the relationship and interaction between humans and computers, particularly in Human–Computer Interaction (HCI) research, suggests that experiences with digital systems require fast and instantaneous feedback in order to enhance efficiency and usability. They often focus on how designers can develop systems that convey a single, specific, clear interpretation of what they are for and how they should be used and experienced. For example, Ben Shneiderman introduced the term "direct manipulation interface," which involves continuous representation of objects of

interest, and rapid feedback within the context of office applications and the desktop metaphor (1983; 2004). The objects presented to a user contain real-world metaphoric meaning and allow the user to directly manipulate information using actions. Common desktop examples include a file folder for filing, a magnifying glass for viewing, a flashlight for searching. With an intuitive and natural relationship between objects and actions, the user can see the results of an action as an immediate feedback, and this rapid, incremental feedback allows him/her to make fewer errors and complete tasks in less time. In Artificial Intelligence (AI) research develops systems that perceive their environment and take actions to maximize their chance of success in their interaction with the user and the system. In contrast, if the interactive experience is intended as an artwork, it can have different goals. Artists may want to explore, question and challenge the relationship between the viewer and the interactive system. They may want to elicit diverse and flexible dialogues between the work and the viewer in order to expand the scope of the experience to evoke a dialogue between the self and the world beyond. In this case, it is important to provide sufficient distance for critical reflection or to conserve time so that the viewers can ponder their actions with and the reactions of interactive system.

In this thesis, I look at how to expand the scope of interactive feedback, particularly in screen-based interactive art experiences, in order to leave room for users to look back at themselves and to communicate their experience with the world. In the artworks described, I thus encourage viewers to be able to find an imaginative space and time in their interactive experience.

2.2. Screen Experience as a Realm of Imagination in the Closed Feedback Loop

(Involuntary Memory in Programmed Situations)

Thesis statement:

Screen-based interactive media experiences consist of multiple levels of complex closed feedback loops. By manipulating the boundary conditions of the screen experience, we can open or expand these loops and provide critical distance for reflection for the viewer.

To show how this is possible, I have conducted theoretical background research and have also tried to expand these loops through my artwork exploration. Based on the theoretical examination, I propose two main methodological approaches that show how the direct mirroring effect in the closed loops can be opened and expanded. The first approach is a "doubling effect," and the second one is "manifold spatial and temporal mappings."

Thesis claims

1. By pairing and layering the physical and virtual worlds, the screen can create a "doubling effect" in the perceptual experience of the viewer. At the same time, through the gap slowly revealed from this pairing, the closed-loop can be expanded or opened.

    I use the term "doubling effect" to represent the matching or pairing of the two separate but corresponding layers between the physical and virtual worlds. This

pairing is realized through tangible screen interfaces, where the form and content

correspond to each other as the user manipulates the screen. For example, the

perception of a spinning object can be enhanced through a spinning screen interface.

Similarly, three-dimensional virtual space becomes more palpable when it is displayed

in a three dimensional display. Since this doubling effect is highly based on perceptual

experience, it is best achieved through implementation and experience.

2. Manifold (multiple) spatial and temporal mappings created through the screen object

    can enable the viewer to achieve a responsive and continuous interaction. This

    experience can open the imaginative realm and at the same time, it can create the

    critical distance the viewers from the interaction.

The phrase "manifold spatial and temporal mappings" denotes the variety of

imaginative ways that physical and virtual mappings can be created with multiple

space and time elements. With these flexible and diverse mapping methodologies,

several different times or spaces can be composed together, and in that ways that do

not happen in the real world. To realize these mappings, I try to expand my screen

space from a two-dimensional one to a three-dimensional one (room-sized or an

environmentally scaled installation), so that the viewer's bodily interaction 'in front

of' the screen or 'in' the screen can be freer and more natural. The responsive space

screen uses computer vision technology to sense the viewer's body movements and

display virtual imagery as a reflection of their movements onto the space screen in

real-time. This reflection of virtual imagery is not necessarily a mirror-reflection of the viewer's body movement or a representation of the viewer's image (or direct representation of the viewer's presence). With the virtual imagery, the viewer's experience can be represented in manifold (multiple) time and space fields.

Through these approaches, this thesis will investigate how to open and expand the closed feedback loop and how to provide the critical distance necessary for the viewer/interactor to reflect on the artwork.

CHAPTER 3

THEORETICAL BACKGROUND
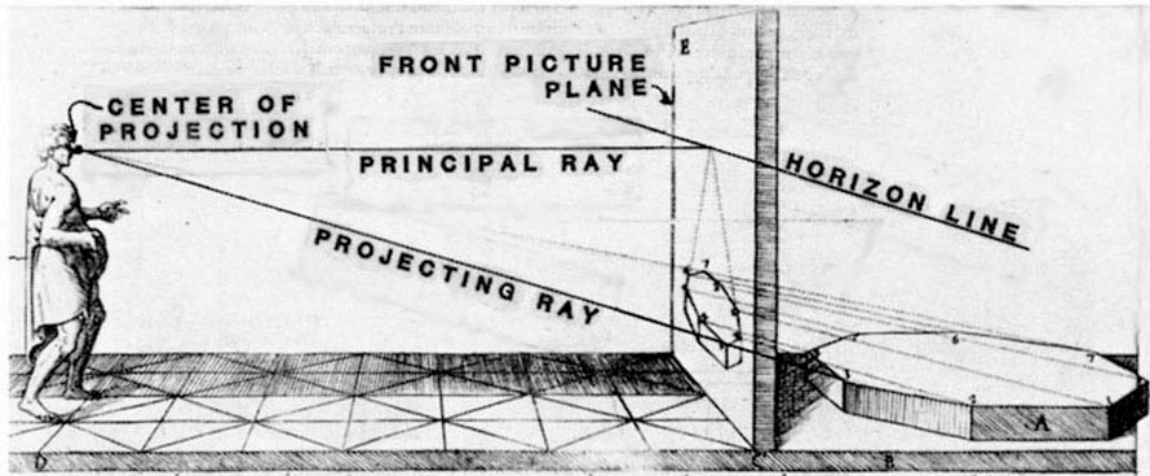
Figure 3.1.1 Picture plane with linear projection

I focus on the screen as an engagement and experience and with a work of art. This thesis concerns how the screen, particularly the new media screen, provides an artistic experience both as an art object and as a process. This chapter provides the theoretical basis for this dissertation. The screen experience is examined in the context of media aesthetics and in relationship to traditional visual art media. Also, the screen experience is examined through psychological, philosophical, and methodological perspectives. Through this examination, a conceptual framework of new screen experiences emerges. This framework shows how my artworks, as interactive media art and design research, explore and create screen experiences as realms for the imagination.

3.1. Screen as a Boundary Object

I would first like to discuss how I look at and define the screen. By looking at the screen from the literal meaning to perceptual and experiential contexts, this section will

introduce the notion of the screen as a boundary object. This definition forms the conceptual framework of my screen exploration.

The Screen in Diverse Analyses: Denotative and Connotative Meanings

The term "screen" is ubiquitous and familiar, and its usage varies. This section examines the diverse usages and aspect of the screen. If we regard the screen as a medium that contains certain types of content, then Lev Manovich's screen genealogy that describes three types of screens in visual history is appropriate here as he discusses in The Language of New Media (2002, 95-103). In his view, the first type of screen is a "classical screen," which is a static, pictorial screen. A painting on canvas is a typical example. Its two-dimensionality and a rectangular-shaped frame enclosing the canvas are key characteristics. The second type is a "dynamic screen," which display moving images, such as a video screen, a movie screen, or a television screen. The third type of screen is the "interactive screen," or the "screen in real time." This type of screen is still evolving (95-103).

In addition to Manovich's concept of screen genealogy, screen-based media can be categorized according to the process of production: The first type of screen is one that is manually produced by human agents, from cave paintings to painted canvases. The second type of screen is the screen produced through mechanical means, such as photographs or moving images produced through the use of cameras. While this second type is still the output of an analog process, the third type of screen, such as the computer screen is the product of digital processes. In this case, the screen display is often used for the representation of the result of a computer-driven algorithm or the procedural affordance of the computer. In the digital era, we can also make a distinction based on the

relationship between the screen and the outside world. For example, the most common screens such as TV screens, computer screens, or projection screens, while located in our physical space, display virtual images. As technologies have developed, new kinds of screens have begun to make diverse connections between the virtual world and the physical world using different methods. Examples include mixed reality screens, augmented reality screens, virtual reality screens, and holographic screens.[1]

Literally, the word "screen" itself has diverse meanings and various implications, which are thoroughly defined by the "Theories of Media: Keywords Glossary" project (organized by The University of Chicago, the School of Media Theory)[2]. In this project, the word "screen" is grouped according to its meanings, which are based on the definition from the Oxford English Dictionary. The first meaning of screen is a "surface (the physical face of a screen), display, exhibit"; the second is a "transmitter, mediator, filter, window (medium)"; and the third is a "cover, barrier, divider, mask, filter." This meaning analysis reveals the ontological condition of the screen. According to literal definitions, the screen exists both as a display and being displayed. It functions as a mediator in both senses simultaneously. Sigmund Freud uses the term "screen memories" to refer to childhood memories: Early memory is used as a screen for a later event in the interpretation of dreams. During a therapeutic analysis of a dream, screen memories function to reveal the intrinsic interest of a patient, which is overshadowed by the extraneous fact of the real world. In this case, the screen has a connotation of a selector-mediator. In this sense, the screen becomes a gateway to other suppressed fantasies and the unconscious mind (Freud 1960a; 1960b).

Based on these literal and genealogical analyses, the first part of this chapter will focus on the general notion of the screen as a medium of visual representation and a form of remediation of the classical screen. The screen will be discussed not only as a physical mediator but also as a conceptual and psychological one.

The Screen: Its Physical Condition

One of the main physical characteristics of a screen is its two-dimensionality. Throughout the history of painting, painters have devised many solutions to create the illusion of three-dimensionality on a flat field. Renaissance paintings were developed through one-point perspective, and Cubist painting composed multi-perspective images, or collages, employing real objects on a fabricated space. This two-dimensional space has challenged painters to represent what they see in the three-dimensional world. At the same time, this dimensional limitation has also encouraged artistic imagination.
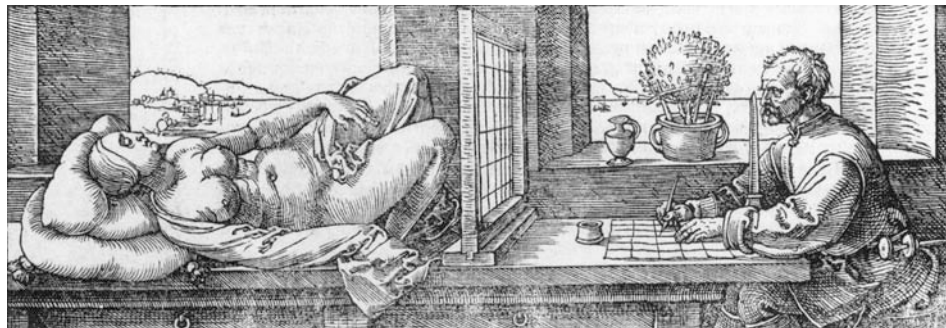
Figure 3.1.2 *Draughtsman Making a Perspective Drawing of a Woman* (1525) by Albrech Dürer
The term "Dürer grid" originates from this etching.

Another physical characteristic of a screen is the frame around the screen. The frame functions to divide the space into illusionary space and physical space. Outside of the frame is our ordinary physical space. The physical boundary provides a certain visual focus, dividing the content inside the screen from the white wall outside it. Thus, the

frame leads viewers to concentrate on the inner space of the screen. The philosopher

Jacques Derrida describes the frame in Western art as a form that seems to be separate

from the work yet is necessary for marking its difference from everyday life in *The Truth*

in Painting (1987). A frame elevates the work, removing it from the realm of the

ordinary. The work thus depends on the frame for its status and visibility: "(The

frame)…disappears, buries itself, effaces itself, melts away at the moment it deploys its

greatest energy. The frame is in no way a background…but neither is its thickness as

margin a figure. Or at least it is a figure that comes away of its own accord" (61).

From an artist's view as a creator, the space outside the screen is the area where

s/he is located physically. When viewers look at the work, their perspective replaces the

creator's view. The screen is like a retina gazing toward another object located outside of

the creator/artist. Sometimes, the painting canvas or the screen is regarded as an

expanded retina of the artist's perception. In "Video Black" (1990) video artist Bill Viola

describes this perspective-shifting experience between the artist as a creator and the

spectator in front of the screen as "standing in my ['artist's] shoes…" He mentions that a

consequence of this shift is that the picture plane and the retina become the same surface.

However, he also emphasizes that the key question for artistic techniques such as the

manipulation of the viewer and his/her behavior was "whose retina?" (447-448). Viola

says that the retina would be the first screen in our bodies. It is the first window to see the

outside world that is a part of our body (448). We gaze at the object through this lens, and

the result is represented through this screen.

Another distinctive characteristic of screens is the rectangular shape of the

surrounding frame, a physical frame or a white marginal space as in old-fashioned

pictures. Therefore, painting becomes displaceable and freely exchangeable, i.e. commodifiable (Morse 1990, 154). Although time has passed and technology has developed, the screen form still remains the same. The moving image screen is also enclosed by an encasement (a brown cathode-ray tube in older TVs) or a monitor frame. Manovich says that from painting to cinema, the visual culture of the modern period is characterized by an intriguing phenomenon, the existence of another virtual space, another three-dimensional world enclosed by a frame and situated inside our normal space (2002, 95). Indeed, the screen itself is a typical remediating form.[3] Maintaining its traditional shape, the way that it establishes a relationship between the world inside the screen and the physical world outside the screen continues to change.

The Screen: The Boundary of Space and Time

The screen includes different temporal and spatial units simultaneously. The motion picture screen includes events changing over time. First, it holds the time when the image was created (either animated or shot and recorded) and the image itself holds its own virtual time. When the viewer comes to look at the screen, he finds that it also includes the real-time of the space in which he/she stands (the noise or voices from other audience members, the sunlight from windows, etc. come together in the viewer's perception). When the screen displays moving images, it presents the images in real-time and forces viewers to experience the virtual time as if it were real time. In this way, several different kinds of time collide in one component simultaneously. Margaret Morse says that what a viewer sees on the television screen typically begins by presenting itself as if it were real time actually shared by the viewer, media presenters, and personalities (1989, 161). That is, television has developed a mode of presentation that envelopes the

viewers in a virtual reality. The screen surface is an area where the diverse characteristics of spaces and times meet together.

Because of the complex presentation mechanism provided by the screen, particularly by the surface of a screen, I hesitate to articulate whether the image is 'in' the screen or 'on' the screen. While the actual imagery finally arrives 'on' the screen and we can see only the surface of the monitor, the virtual imagery makes us feel as if we are looking at the embossed space 'inside' of the monitor. This provides the feeling that the image is created and the event is happening 'inside' of the screen. The perceptual experience of the screen may depend on the viewer and how their mind and body perceive it. Describing the video game space and its relationship with the player, Taylor says, "I never pass through the medium of screen; acting on the screen rather than within the screen because I have identified with and taken in only my own actions instead of a character's, as I do with Alice. Taking in my own actions does not allow me to pass through the screen, but only to act on the screen because the screen acts as a divider until I can find a way into the game space (2003)."

Sense of Immersion (Involvement, Illusion, Engagement)

In the article "Embodied Virtuality: Or How to Put Bodies Back into the Picture*,"* Katherine N. Hayles (1996) says that the interface mechanism is highly grounded in physical, bodily experiences. Once the devices for the interface begin to circulate, they become part of the user's general common knowledge, and are conventionalized through familiarity. Over time, they lose their strangeness; we forget the metaphorical discrepancies and adapt our own bodies to accept their particular functional limitations. If we regard the screen as the fundamental interface between the virtual world inside the

screen and the physical world outside the screen, then screen experiences (e.g., TV screens, movie screens, computer screens) are so embedded in our daily lives that we can easily forget the existence of the screen between the virtual world and ourselves. Indeed, interface mechanisms help erase our awareness of the existence of the screen; However, the screen medium itself in visual history has long been developing its own strategy to eliminate its existence from a viewer's experience.

Throughout visual history, the screen has carried the metaphorical sense of a window. We "look through" the screen as it delivers us visually and psychologically into other worlds. Renaissance artists Filipo Brunelleschi and Leon Alberti developed the illusion of such a window, creating three-dimensional space inside two-dimensional space through the Cartesian perspective in order to involve spectators in the experience of "being there." Although illusionary imagery is a static image on canvas, if a spectator becomes completely involved in that illusionary world, the medium of the canvas begins to disappear, and s/he will get the sense of immersion and strong engagement. In this way, the screen experience delivers a sense of the "here and now."[4]

Unlike the static canvas, moving image screens enforce a much stronger sense of immersion. In "Desire for the screen," Annette W. BalKema says that a dynamic screen (the electronic screen of a video or of a TV) is "a mass of electronic waves trembling along a blue-colored surface. Because of the light the screen radiates and the presence of blank pixels, it seems to promise an entire world of images beneath its mass of electronic depth. One is aware of being both for and in the screen, of being immersed in the screen's world of electronic pixels" (2000, 22). She writes that such a specific perception created by the world of the screen and its electronic waves and pixels make the subject

experience a sense of immersion in the electronic space. Moreover, she likens the immersive experience of the screen to a swimming pool, a metaphor similarly employed by French philosopher, Merleau-Ponty, in his essay *The Eye and the Mind* (1993). BalKema writes, "The perception of the swimming pool and its inherent reflection of light and water seems to provide a sensation of unity between the water and its surrounding similarity to the sensation of unity that subjects experience while being both immersed in the screen and still present in the surrounding world."[5] When we look at the television, the sensation of unity makes us feel as if we were located within the image. As flat surface of painting field have been a challenge for painters who seek to represent the world in screen-based experiences, however, the materiality of the screen has been a challenge. The physical nature of the screen—the two-dimensionality and the frame or margin of the screen—prevents viewers from full involvement in the represented world. The insistence of the materiality of the medium itself constitutes the in-between relationship of the real and the virtual.

Sense of Rejection (Separation and Alienation)

From both Eastern and Western stories describing great painters, we can look at the keen relationships between the real and the virtual in painting. *Samguksagi,[6]* written by Bu-Sik Kim in the 12th century, illustrates the story of a legendary Korean painter Solkuh. One day, Solkuh drew a pine tree on the wall in a temple in an extremely realistic way. Later on, the neighborhood often saw dead birds in front of the wall, and this was because the birds kept flying into the wall to land on the painted tree.[7] Likewise, Pliny the Elder's anecdote about two great Greek painters, Zeuxis and Pharrhasius, tells about a painting as a transparent window. In this story, these two painters competed with each

other to prove who was the greater painter. Zeuxis painted grapes on the wall so realistically that birds were deceived and flew into the wall in an effort to eat them. Pharrhasius, in turn, painted a curtain on the wall that deceived Zeuxis, who now thought that his painting was behind the curtain (Bolter and Gromala 2003).

Interestingly enough, these stories from Eastern and Western painters are very similar to each other. Both emphasize the representational practice of painting and how it is measured by the standard of transparency. Thus, both stories tell us how much the painted screens have become so much like a window in real space that birds and even men are deceived. According to this view, shared by traditional Eastern and Western culture, the practice of the painted screen has created an illusion like a transparent window. However, at the same time, both stories also touch on another critical characteristic of the screen's space: the fact that virtual spaces and physical space coexist simultaneously. The coexistence of virtual space and physical space is an ontological condition of the screen. In its material condition, the screen always faces a physical reality. The very surface (the physical surface onto which images are projected or attached) and its flatness mark a division between viewers and the illusory world that painters laboriously create. As this condition imposes a sense of separation, the screen experience becomes the experience of rejection and exclusion.

Screen as a Boundary Object

In her analysis of Vito Acconci's video and installation works, Kathy O'Dell (1998) mentions tension arising on the surface by citing Anzieu's psychological analysis about skin. According to Anzieu, skin has three primary functions: to "contain and retain," to mark a "protective boundary" against penetration by the outside; and to afford "a means for communication" by providing an "inscribing surface."[8] Likewise, skin has a metaphorical identity that divides space and material inside and outside, while remaining a component of the body. The screen has an ontological condition resembling that of the skin. The screen functions as a container and retainer of the virtual image within it, as a protective boundary in physical space (This is reinforced by the materiality of screen, its frame, and flatness.), and finally as a gate of communication by interconnecting the first two. The screen is located on the boundary of virtual reality and physical reality (Figure 3.1.3). It constitutes a boundary between a sense of immersion (a sense of engagement) and a sense of rejection. It is the psychological boundary between a sense of unity and a sense of alienation and the perceptual boundary between similarity and difference. Therefore, the screen itself becomes a boundary object: the screen is the object that constitutes the "in between" boundary and is located on this boundary.

Similar to screen, which has an analogy to skin, the computer is described as a "liminal" object by Janet H. Murray (1998, 292-292). The computer creates a public space that also feels private and intimate. Thus, the computer experience becomes a psychological threshold between external reality and our own minds. By quoting D.W. Winnicott's "transitional" experiences, Murray also argues that this liminal experience comes from the fact that the real thing is the thing that isn't there. In order to sustain such

powerful immersive trances, we have to do something inherently paradoxical: we have to

keep the virtual world "real" by remaining "not there."[9] The paradoxical and transitional

experience of the computer begins by looking at the screen of a computer monitor.

Indeed, the screen itself is an inherently paradoxical area with its "in-between" zone. This

paradoxical doubled and transitional experience of the screen seems analogous to Walter

Benjamin's auratic experience, which will be discussed in the following section.
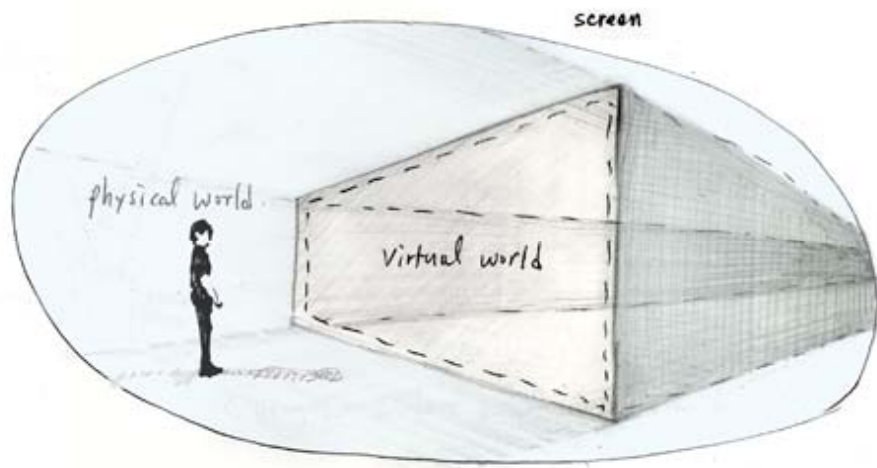
Figure 3.1.3   A diagram of screen in the physical space and the virtual space

3.2. The Double Logic of the Screen

The production of space is a search for reconciliation between mental space (the space of philosophers) and
real space (the physical and social spheres in which we all live).

(Lefebvre, 1991)

The gaze of nature thus awakened dreams and pulls the poet after its dream.

(Benjamin 1968a, 200)

In the previous section, I argue that the screen is an object at the boundary between virtual and physical reality. The screen exists both as a displayer and a thing displayed, simultaneously functioning as a mediator. The screen's virtual imagery produces a feeling of immersion in its viewer, yet at the same time, the materiality of the screen produces a sense of rejection from her/his complete involvement in the virtual world. Therefore, the screen is a boundary object.

The notion of looking at the screen experience as a boundary object and as an oscillation between these two mental states of immersion and rejection have led to look at the screen experience or the situation of the screen as a one in a double logic. This chapter will apply two perspectives, which seem useful to interpret this situation of double logic. The first one is an experience of double logic that was examined in Benjamin's notion of the aura as a unique manifestation of distance and involuntary memory. Auratic experience itself also anticipates the double logic of Jacque Lacan's gaze theory as illustrated in his image-screen diagram (Figure 3.2.1). If we appeal to this double logic, we can examine both aura and screen experiences as desires for immersion and possession in response to rejection and nostalgia in the gaze. By putting together Lacan and Benjamin and through the process of gazing, this section will attempt to discover new modes of perception produced by screen-based media by extending (or perhaps reframing) the concept of aura.

Benjamin's Aura

Benjamin defines his notion of aura in various ways in his several different texts. In "The Work of Art in the Age of Mechanical Reproduction" (1968b), he argues that aura belongs to works of art that are unique, as almost all art was before the technology of

mechanical reproduction. The uniqueness and originality of art brings the attitude of reverence and thus the experience of aura. Because of its very uniqueness, a work of art can be experienced only at a specific place and time. For example, the *Mona Lisa* must be viewed at a specific place at a specific time—in this case, the Louvre in Paris. This is the sense of the "here and now" experience of aura that each work possesses because of its history of production and transmission (Bolter et al. 2006, 24).

From its uniqueness and originality, Benjamin further explains that aura is "a unique phenomenon of a distance," regardless of "how close it may be" (1968b, 222). Even though viewers are allowed to touch the work of art, the history and cultural values surrounding it still remain unapproachable and untouchable. Its uniqueness is inseparable from its being embedded in the fabric of tradition. As a result, aura implies the sense of remoteness, "distance-no-matter-how-near." This tension between far and near and between the unapproachable and the approachable, works both at a psychological and at a cultural and economic level. This ambiguity reflects Benjamin's ambivalence toward the status of aura in the mind or in the world (Bolter et al. 2006, 26).

Benjamin also correlates the aura of a work of art with an experience with nature. (In the same way that the concept of aura can be seen as the unique phenomenon of a distance, however close it may be, another aspect of aura can be illustrated with reference to historical objects.) According to Benjamin, "If, while resting on a summer afternoon, you follow with your eyes a mountain range on the horizon or a branch which casts its shadow over you, you **breathe** (*experience*) the aura of those mountains, of that branch (1968b, 222-223; 1981, 209)."[10] I believe this auratic experience in nature is another "here and now" experience, because nature itself always changes and never stops. One

can be engaged in a particular natural experience only at a particular moment, and only in a specific place, as Benjamin specifies when he invokes the aura of a mountain on the horizon and the shadow of branches on a summer afternoon. In this sense, the auratic experience is an empathic moment and contains a sense of nostalgia for a moment that can never be repeated.

In "On Some Motifs in Baudelaire," Benjamin extends the argument of aura in "The Work of Art" and analyzes the relationship of perception in photography to perception in painting through the notion of "mémoire involontaire" (involuntary memory). He says that photography, as a form of mechanical reproduction, is an expression of the desire of the contemporary masses to bring things "closer" spatially and humanly by overcoming the uniqueness of every reality. "If a distinctive feature of the images that rise from the *mémoire involontaire* is seen in their aura, then photography is decisively implicated in the phenomenon of the 'decline of the aura'" (1968a, 187). For Benjamin, remembrance is essentially conservative, memory is destructive (160). "What was inevitably felt to be inhuman, one might even say deadly, in daguerreotypy was the (prolonged) looking into the camera, since the camera records our likeness without returning our gaze" (187-188). Hence, the photograph technique of mechanical reproduction withholds the moment universally and permanently, and eventually "reduces the scope for the play of the imagination" (186). On the contrary, he notes, "the painting we look at reflects back at us that of which our eyes will never have their fill" (187). Here, we can see how Benjamin's notion of the uniqueness of auratic experience deriving from "involuntary memory" has extended further to the perception of gaze:

But looking at someone carries the implicit expectation that our look will be returned by the object of our gaze. Where this expectation is met (…), there is an experience of the aura to the fullest extent. "Perceptibility," as Novalis puts it "is a kinds of attentiveness." The perceptibility he has in mind is none other than that of aura. Experience of the aura thus rests on the transposition of a response common in human relationships to the relationship between the inanimate or natural object and man. **The person we look at, or who feels he is being looked at, looks at us in turn. To perceive the aura of an object we look at means to invest it with the ability to look at us in return. This experience corresponds to the data of the *mémoire involontaire*.** (These data, incidentally, are unique: they are lost to the memory that seeks to retain them. Thus they lend support to a concept of aura that comprises the "unique manifestation of a distance." ... The essentially distant is the inapproachable: inapproachability is in fact a primary quality if the ceremonial image.) (188, emphasis mine)

Look at the thing, and the thing being looked at looks at us in turn. Likewise, Benjamin's auratic experience is highly connected to reciprocal gazes. In this sense, we can find an important connection between the aura and the gaze. In fact, gaze theory is the primary focus of Jacque Lacan's theory.

Lacan's Double Logic

Critical theory, particularly by Derrida and Lacan, challenges traditional notions about the relationship between language and the subject. The Cartesian subject functions as a focal central point from which it can survey the world and its objects. According to this tradition, language functions as a direct translation of reality. However, along with his notion of mirror stage[11], Lacan offers a "screen" theory in a more dynamic and complex relationship among image, language, and subject in his book *The Four Fundamental Concepts in Psychoanalysis* (1978). For Lacan, "the subject is not a

substance endowed with qualities or a fixed shape." Instead, the subject is "a series of events within language, a procession of turns, tropes and inflections" (Bowie 1978, 76). Thus, in the process of human vision, images, and "the screen" are also important in the constitution of the subject.

Lacan distinguishes his concept of gaze from the traditional concept of vision. The Cartesian perspective, the cone vision system, is a traditional system in which the subjective eye determines the subject's perspective. Lacan complicates this system where everything flows from the eye by incorporating "the double gaze." If the gaze of a person looking outward is a singular cone of perspectival vision, then the reciprocal gazes exchanged between seeing subjects and seen objects can be diagramed as in Figure 3.2.1. Thus, two symmetrical cones of vision are overlaid one upon the other: the usual cone of vision that emanates from the subject on another cone, emanates from the object at the point, which he refers to as "the gaze." Thus, the subject is under the regard of the object, photographed by its light, pictured by gaze. Lacan claims, "this gaze turns the subject into a picture" (105). "We are beings who are looked at, in the spectacle of the world... (The) gaze circumscribes us." (75) The point at which the cones intersect forms a plane at which the two gazes converge. This plane of two gazes converging—where the eye and the gaze meet—is the screen. Lacan states, "The screen is here the locus of mediation" (107).[12] On this screen, according to Lacan, identity is negotiated between the imaginary and the symbolic. The image of the subject/viewer projects onto one side of the screen and the image of the subject/viewer is seen by the other/object on the other side.
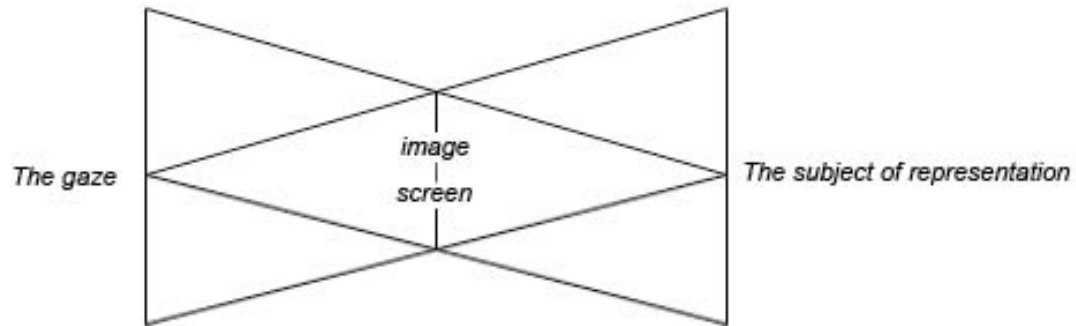
Figure 3.2.1   Diagram of Lacan's gaze

The uncanny effect of Lacan's gaze, i.e. *I see myself seeing myself* reflects a
double logic. The subject is looking outwardly, but in effect, is determined, formed, or
produced from the outside and becomes nothing more than an effect of that situation. The
distance between the subject and the object affirms the position of the subject. While the
subject has an embodied identity, the field of visual perception is outside of the subject
and is then embraced by the subject as being internal when the subject perceives itself
within that field. Lacan's intersecting gazes create the subject's identity. Lacan's
projective identification is none other than the adaptation of an image by a subject. In the
developmental process, particularly in the mirror stage, the subject adopts a socially
acceptable, and thus unified image of self. "Identification also functions after the initial
development of the subject when the subject sees herself in another image and then
incorporates this into her imaginary integrity" (Taylor 2003).[13] In this complex process,
the image-screen becomes a meeting place for the subject and the object's gaze. The
perception of the screen constitutes the subject's experience and finally re-establishes the
subject.

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Aura in Double Logic: Breathing in/of Aura

Returning to Benjamin's nature analogy, now we can see that the auratic

perception of nature is none other than the returning gaze from nature. Breathing the aura

of the branch and the mountain can occur only through an encounter with reciprocal

gazes. Similar to Benjamin's auratic perception from painting and portrait photography,

which returns the gaze back to the person who appreciates it, nature also returns the gaze

of the person who is resting and inhaling/exhaling the aura of nature.[14] On the other hand,

in the web of reciprocal gazes, the auratic experience never promises to return that which

is always fulfilled. Because of its unique manifestation of distance, the aura continuously

invokes desire from the subject; if we are trying to grasp it, it always escapes. If we could

say the auratic moment is similar to the fulfilled and immersive moment, then the

moment of desiring the fulfillment of aura would be an unbearable but agreeable moment

of rejection. Since the aura is not a promised endowment that is always ready to be given,

Benjamin's notion of "involuntary memory" seems more precious.

As mentioned above, Benjamin claims that the aura of the reciprocal gaze

accompanies "involuntary memory." Because of the "involuntary" factor, viewers

encounter the auratic experience only at a special moment. Benjamin says, "(Paul) Valéry

has set forth the conditions for this fulfillment: We recognize a work of art by the fact

that no idea it inspires in us, no mode of behavior that it suggests we adopt could exhaust

it or dispose of it" (1968a, 186).[15] Truth in art and the beauty of nature can never be

grasped permanently and feasibly. They are just a "unique manifestation of a distance."

An individual can notice and approach it only by involuntary chance as a momentary

experience. Because the encounter is a gifted one, the viewer's perception and

appreciation differ on various occasions. If the auratic moment is a "free-floating," ephemeral experience that meets with the beloved, fulfilled gaze, then that experience can never come with a predetermined expectation. Within this involuntary and momentary experience, a desire for the unapproachable is expressed. In this sense, the gaze-back condition (the meeting with beloved gazes) constructs the double logic and contains multiple directions of desires that are never fulfilled.[16]

In "On Some Motifs in Baudelaire"(1968a), in order to explain the auratic experience, Benjamin appeals to Baudelaire's notion that the perception of the aura creates a "'region of the intangible, imaginative': that of art in which only that is allotted a place 'on which man has bestowed the imprint of his soul'" (186). What Baudelaire regards as the realm of imagination is for Benjamin the realm of aura (Bolter et al. 2006, 25). The auratic experience, through "involuntary memory," is the moment in which spectators can meet a reflected image of themselves. It is a moment of self-contemplation, a realm of imagination fulfilled by emotional feedback when they meet their soul.

What Benjamin claims is that the crisis of artistic reproduction that manifests itself in this way can be seen as an integral part of a crisis in perception itself. Although he never explicitly evaluates a crisis in perception, for him, the auratic perception of paintings seems like one way of seeing the world, and the perception of photography seems like another. Through the explanation of the aura, he argues that human perception has emerged based on changing technologies of representation and therefore, the perceptibility of art can be changed or newly formed when the artistic medium changes. As a typical example of remediation, the screen keeps its traditional concepts and

perceptibility, but simultaneously, as technologies develop, new approaches define new screen experiences by adding more features. New media screens such as the screens in VR, AR, and various forms of interactive design also push their frontiers, leading to another interpretation of this boundary and the experience at this boundary.

New explorations of the screen create new possibilities for perceptibility beyond the existing condition of the screen. If the image-screen is located at the center of the double logic and provides the meeting place of two gazes, i.e. as the meeting place of the subject's and object's gazes (in this case the person who experiences the screen, and the object or situation presented by, on, or in the screen), the screen itself is located in the "in-between" of two different things, and the ontological condition of the screen is a process of oscillation between them. If we are able to look at the aura in the double logic situation, then similarly to the aura, the screen itself, as the meeting place of viewing and being viewed, and as the meeting place of desire and rejection, becomes the realm of imagination. In the realm of imagination, screens can open diverse ways of meeting gazes. In section 3.6, I will discuss the screen as a realm of imagination further.

3.3. The Physical World and The Virtual World (Virtual Reality)

Our body and mind experience the digital world differently from the way they experience the normal physical world. Katherine Hayles writes that the digital media experience changes the traditional concepts of presence and absence in our material body, to concepts of pattern and randomness of information in her several texts (1996; 1998; 1999). In the essay "Cyborg Manifesto," Donna Haraway claims that with digital media, the boundary between mind and body, materiality and immateriality, culture and nature, truth and illusion, become blurred (2003). As the user and the creator begin to encounter

the reflective virtual-self in cyberspace, their identities also change through this experience. This chapter will discuss the viewer's experience, subjectivity in cyberspace, and the aesthetics of cyberspace.

Cybernetic Identity and Aesthetic Feature of Cyberspace

In the book, *Cybernetics* (1948), Norbert Wiener writes about communication between human and machine. He defines "cybernetics" as the science of transmitting messages between man and machine or from machine to machine. This theory of cybernetics was intended to improve the quality of life in a technological society, where people are increasingly reliant on machines, and where interactions with machines are the norm (Wiener 2002). Wiener asserts that the quality of data transmission between man and machine is affected by such factors as noise, entropy, and feedback. Entropy in nature increasingly degrades and destroys organized and meaningful information. Thus, in order to achieve meaningful information efficiently, we need to control entropy. Whether the messages are between man and machines, between machines and man, or between a machine and a machine, cybernetics considers their "communication" and "control." Wiener's insight became the premise behind all human-computer interactivity and interface design. Communication and control is in some ways synonymous with "interactivity." Cybernetics theory informs artificial intelligence (AI) and virtual reality (VR) technology, which has been built on the foundations of cybernetics. On the other hand, as the science of communication and control develops more fluent communication between machine and human, cybernetics treats a machine as a human being. However, this raises philosophical questions about human subjectivity. Postmodern literary critic Katherine N. Hayles points out that this study has the effect of eroding liberal humanist

ideas of subjectivity (1996). If the human is simply part of systems, then the autonomous, sufficient "self" becomes an illusion.

"Can a machine think?" A similar question is posed by Alan Turing's famous imitation game between the machine and a human being (Turing 1950). In this game, the machine is asked to perform thinking tasks like a human being, in order to demonstrate that it ultimately has the capacity of a human mind. This idea anticipates the erasure of embodiment. The logical successor to Turing's test was Hans Moravec's idea of downloading the human brain into a computer, in this way safely ensconcing inside a computer human consciousness, which can then simply be transferred to a new machine. In the book *Mind Children: The Future of Robot and Human Intelligence,* Moravec proposes this kind of mind and body separation, equating subjectivity with the mind. This idea raises the question of disembodiment (1988, 109-110). This kind of serial approach proposes that human identity is essentially an informational pattern rather than an embodied enaction. Through the theory of Cybernetics, Turing's Game, and Moravec's proposal, the idea of machine becoming human being, the idea of "cyborg," has emerged.

Blurred Boundaries: "Cyborg Manifesto"

Donna Haraway (2003) claims that by the late 20th century the cyborg had become our ontology. For her, the cyborg is a condensed image of both imagination and material reality, which can suggest to us a way of constructing our political identities to give up the old dualisms of Western traditions—the traditional dualisms of self/other, mind/body, culture/nature, male/female, civilized/primitive, reality/appearance, whole/part, agent/resource, maker/made, active/passive, right/wrong, truth/illusion, total/partial, God/men. First, Haraway asserts that the boundary between human and

animal and between organism (animal-human) and machine becomes leaky in high-tech culture. Machines have made ambiguous the difference between nature and artificial, mind and body, self-developing and externally designed. Machines become disturbingly lively, and men become frighteningly inert. Also, the boundary between physical and non-physical becomes very imprecise. As modern machines become quintessentially microelectronic devices, they are invisible and ubiquitous. They are as hard to see politically as materially. They are "floating signifiers."[17] It is not clear who makes and who is made in the new relationship between human and machine. With machines, it is not clear what is mind and what is body. Haraway writes, "A cyborg is a hybrid or mosaic that transgresses boundaries and potent fusions. The cyborg is a kind of disassembled and reassembled, post-modern collective and personal self and a fractured identity" (2003, 205).

Cybernetic Identity

While Hayles and Haraway examine the cyborg that is fracturing in the blurred boundaries, some theorists explore how the way our bodies and minds experience the digital world is different from the normal physical world. As the user and the creator begin to encounter the reflective virtual-self in cyberspace they reveal that this experience changes their identity.

Sociologist Sherry Turkle has examined how computers influence our perspective of ourselves in her books, *Life on the Screen* (1995) and *The Second Self* (2005). Applying psychoanalysis, she analyzes how children, teenagers, and adults encounter the computer through inter-networked computing play, like in MUDs (multi-user dungeons). Turkle finds that such game play makes the players take social and psychological roles.

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They think that their roles in the virtual environment are important to them psychologically and their computer is the tool to fulfill theses roles. For some of them who are deeply involved in their activities in the virtual world it sometimes feel hard to get out of that world and readjust themselves to real world situations. Often they confuse (or fuse) their identities in between the two worlds. Turkle finds that some people value their lives more in their second life on the screen, as one of her respondents remarked, "Reality is not my best window" (Turkle 1995, 13; Hayles 1999, 27).

Hayles argues that the virtual reality experience in cyberspace has influenced the idea of subjectivity with regard to the human beings' notion of body in new ways. This new subjectivity has changed the traditional concepts of presence and absence in our material body to concepts of pattern and randomness of information (1999). Comparing computers to typewriters as examined by Kittler[18], she asserts that computers restore and heighten the sense of word as image. In computer processing, there exists no one-to-one correspondence between signifier and signified (digitized effect, 0 and 1): "As I work with the text-as-flickering-image, I instantiate within my body the habitual patterns of movement that make pattern and randomness more real, more relevant, and more powerful than presence and absence" (1998, 153; 1999). In virtual reality, the user's movements, mediated through a stereo-vision-helmet and a body glove, are reproduced by a simulacrum, like an avatar on the computer screen. Multi-sensory interaction creates the illusion that the user is inside the computer. From her own experience with VR simulations, Hayles attests to the disorienting, exhilarating effect resulting from the feeling that subjectivity is dispersed throughout the cybernetic circuit. The user kinesthetically learns that the relevant boundaries for interaction are defined by the

feedback loops connecting body and simulation in a techno-bio-integrated circuit (1999, 27). She asserts that email communication or participation in a text-based MUD already requests the body to rethink itself as self-evident physicality. Allucqurère Roseanne Stone (1995) also proposes that we think of subjectivity as a multiplicity warranted by the body rather than contained within it in the experience of the virtual world. This full-body mediation and the notion of body without physicality make the concept of presence and absence seem irrelevant. Hayles maintains our body is foregrounded as pattern and randomness: "Virtuality can be defined as the perception that material structures are interpenetrated with informational patterns." In fact, since the early 20th century, the body has been understood in a variety of fields, both as a physical structure and as an informational pattern. For example, biologists see the body as an expression of genetic information in DNA, and more over, DNA pattern recognition is used to determine legitimate parenthood and also to detect criminals. For Hayles, "The body is neither simply material object nor informational pattern but both at once" (1996, 6).

The Virtual Body in the Semiotic Square

In the article "Embodied Virtuality: Or How to Put Bodies Back into the Picture" (1996), Hayles poses the questions, concerning the material body: Is a virtual body a combination of human and nonhuman components, both flesh and information? Are we really disembodied in cyberspace? Her answer is that in cyberspace, which is often described as a disembodied medium, we are never in fact disembodied, since the body remains in front of (or behind) the screen rather than within it. She mentions that it is the tautological reality that makes such an illusion close to the surface of the screen, the boundary of the virtual and the real. She also poses the question, "If it is obvious that we

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can see, hear, feel, and interact with the virtual world only because we are embodied, why is there so much noise about the perception of cyberspace as a disembodied medium?" (1). To create the illusion of disembodiment, it is necessary to draw a sharp boundary between the body and the image that appears on a screen, ignoring the technical and sensory interfaces connecting with each other. We want this alternate world to exist so that the body can be left behind, and, at the same time, we know that the body can be left because this world exists (1-2). Understanding the body in the virtual world requires a mode of analysis that can complicate and unravel the simple dualisms creating a cultural construction. For this task, Hayles suggests the "semiotic square" (7-12).
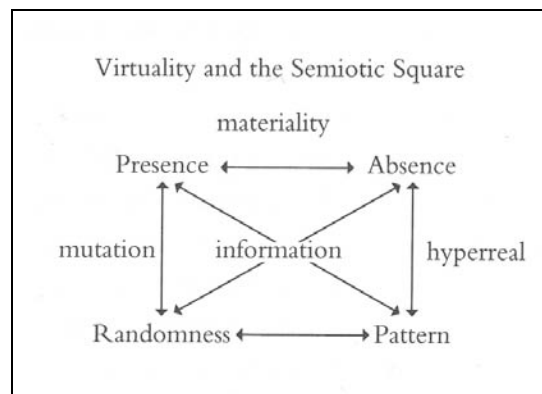
Figure 3.3.1 Virtuality and the Semiotic Square by Katherine Hayles.

The semiotic square is designed to unpack the implications inherent in a binary pair by making explicit the hidden terms that help to stabilize meaning and generate significance. The construction of the semiotic square begins with the choice of a binary pair labeled "materiality." The primary duality for the square is "presence" (material presence of the body) and "absence" (the negative term of the first term, "presence"). The second duality, the pair of "information randomness" and "information pattern," unfolds implications contained in the first pair; The duality of presence/absence and

pattern/randomness in the semiotic square is in a dialectic relationship; therefore, they are in dynamic interplay with each other. Setting these dualities in place, Hayles argues that the semiotic square can be used to investigate the implications of virtuality as a crossing between information and materiality. Thus, absence and pattern are connected with the vertical axis and dignify what Jean Baudrillard has called the "hyperreal." (Hyperreality is the imitation of lost reference, and Baudrillard's notion of simulacrum is based on this hyperreality.) Presence and randomness are connected by the vertical axis called "mutation." Mutation occurs when random variation becomes physically manifest in a material object (refer to Figure 3.3.1).

Hayles argues that the semiotic square represents an integration of information and a material circuit. It explores how the virtual body is discursively constituted. If Moravec equates subjectivity with the mind, Hayles is concerned with the imagining of the integration of the virtual and the nonvirtual into a sense of self that shapes cybenetic subjectivity. Rather than presenting the need for an all-new concept of subjectivity, her investigation incorporates a doubled body both as materiality and information. From this perspective, concepts such as embodiment, space, reality, community, and authenticity of experience are now under examination in relation to virtuality. Halyes expects that this framework, one in which such apparently diverse ideas are shared, can help us understand different manifestations of diverse phenomena of contemporary cultural and artistic approaches.

Art and Aesthetics of Cyberspaces / Virtual Reality

In "Liquid Architectures in Cyberspace"(1991), Marcos Novak proposes cyberspace as habitat for the imagination. His metaphor of "liquid architecture" clearly

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explains his notion of cyberspace and its possibilities. Liquid architecture is a fluid and imaginary landscape that exists only in the digital domain. It is a poetic space where science and art converge through emerging virtual reality technologies, and a poetic language exists to describe the indescribable. In liquid architecture, everything is in transit, from real space to cyberspace, from prose to poetry, from fact to fiction, from static to dynamic, from passive to active, from the fixed in all its forms to the fluid in its ever-changing flow. Thus, it has multiple representations and metamorphic shapes that bend, rotate, and mutate in interaction with the person who inhabits it. Novak says, "If architecture is an extension of our bodies, shelter and actor for the fragile self, a liquid architecture is that self in the act of becoming its own changing shelter. Like us, it has an identity, but this identity is only revealed fully during the course of its lifetime" (284). Like a virtual body in the semiotic square, cyberspace is the extension of cybernetic subjects, and both the notions of a cybernetic subject and cyberspace provide more complicated and endlessly unfolding notions of their own subjectivity and materiality.

Novak's notion of cyberspace and liquid architecture is related to "virtual reality" in terms of its characteristic of transitional status from one end to the other opposite end. The expression "virtual reality" itself is a paradoxical term that implies possibility or impossibility simultaneously (Grau 2003, 15). The real and the virtual are not in opposition, but terms of status. They create a tautological oxymoron that two human desires conflate—a desire to be fooled and another desire to suspend belief (Le Grice 2002, 229). On the other hand, recent findings in neurobiology propose that what we call reality is in fact merely a statement about what we are actually able to observe. Considered in this way, the incorporation of these contradictions in VR artwork is a

necessary aspect of building our cultural language. As Grau points out, the differentiation of reality and virtual reality is based only on interpretation and reflection. The new perspective for transformation of reality opens its realm for artistic invention. Beyond interpretation, any representation about world-like simulation, mutation, will be ripe for the artistic imagination. Because visual art has a history with images, the power that lies with visual artists comes from their ability to construct meaning in representational systems based on considerable experience with the social relevance of image and perception. Different perceptions can provide different representations. Artists working in this domain are renegotiating their positions through constantly reworked aesthetic strategies that relate to the art and the world beyond. Through technological development in digital media, artists can explore cyberspace's blurred boundary between mind and body, between materiality and immateriality, between culture and nature, and between truth and illusion. In doing so, they reflect on the construction of meaning in and around cyberspace.

　　Seeing the artistic potential of new technologies, Nam June Paik said, "The real issue is not to make another scientific toy, but how to humanize the technology and the electronic medium ... and also, stimulate viewers' fantasy to look for the new, imaginative and humanist ways of using technology" (1978, 129). Indeed, how to humanize technology and how to use technology for the realm of imagination is sought in art and science alike.

3.4. Psychological Distance in Aesthetic Experiences:

Between the View and the Media Object

In the previous chapter, I discussed briefly Krauss's notion of video as a psychological medium in order to introduce multiple layered feedback loops and set up the problem spaces of this thesis: I have argued that Krauss's feedback loops have been extended in the screen-based interactive installations due to an additional feedback loop at the code level. I have asserted that the psychological feedback loop becomes intensified because of this code-level loop. This section continues to discuss the psychological feedback aspects in greater depth. Here, I go over two psychological analyses by looking at early experimental video artifacts. The first analysis will be of Krauss's notion of video as a narcissistic medium as mirroring experience. Based on this examination, the next approach introduces video artists' strategic techniques used to create psychological and perceptual distance as a sense of engagement and a sense of separation. These techniques assume the viewer to be on the other side of the screen.

Video as a Psychological Medium

In the mid 1960s, as a response to the one-way, restricted communication of TV broadcasting and with the help of newly developed video equipment for personal use, video began its history as an art medium. Initially, video technology consisted of only image recording technology through the introduction of the portapak video camera in the mid 1960s. The videotape was introduced in 1969. In 1971, replay and rewind capacities were developed.

Whereas film fixes images in motion, video is an electronic flow of images. The video signal transmitted by the camera is kept constantly moving in its surface presence

on the screen. It expresses the flow of electrons. The electronic signal constructs and reconstructs electronic images in the camera and on the screen synchronously. In the early phase of the medium, no tape recording was available and video required the synchronic signal transmission to be sent from the camera to the monitor (or from camera to camera). Many artists experimented with the technical characteristics and conditions of transmission and presence in closed-circuit techniques. Circulating video signals (feedback), time delay, and recursive loops (delayed feedback) were carried out live. In the 1970s, experimental video had to be filmed with a camera from projection screen if the images were to be preserved.

As the video medium became a prevalent exploration by many artists, art critics tried to describe this new medium and its aesthetic. In 1978, art critic Rosalind Krauss wrote the essay, "Video: The Aesthetic of Narcissism." In this essay, she analyzed video as a psychological rather than as a physical medium. Perhaps this could be influenced by psychoanalytic criticism of film in those days. Krauss begins her article explaining why the analysis of video as a physical medium is inappropriate; "While we are accustomed to thinking of psychological states as the possible subject of works of art, we do not think of psychology as constituting their medium" (180). For Krauss, just leaving the video as a physical mechanism or apparatus that comprises the television medium is not enough. Rather, she observes that unlike the other visual arts, video is capable of "the simultaneous reception and projection of an image; and the human psyche used as a conduit" (180). She mentions, "Video is capable of recording and transmitting at the same time—producing instant feedback. The body is therefore as it were centered between two machines that are opening and closing of a parenthesis. The first of these is

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the camera; the second is the monitor, which reprojects the performer's image with the immediacy of a mirror" (181). She looks at the human body and psyche as an important conduit in this medium. Also, she asserts the parapsychological sense of the word "medium." Parapsychologists use the human body as a receiver and a sender of communication arising from an invisible source. In this situation, the human body becomes a conduit in particular relation to the message. This is a temporal concurrence. Krauss states, "the medium of video art is the psychological condition of the self split and doubled by the mirror reflection of synchronous feedback" (183). In short, the psychological situations of the video medium "withdraw attention from an external object—an Other—and invest it in the Self" (184). Thus, aesthetic narcissism is the core aesthetic of the video medium.

Krauss supports her psychological observation by looking at Vito Acconci's video work, *Centers* (1971, Figure 3.4.1). In this piece, Acconci uses the video monitor as a mirror. During the twenty-minute running time, he sustains a gesture pointing to the center of a television

Figure 3.4.1 *Centers* (1971)
by Vito Acconci

monitor while simultaneously filming himself. Krauss claims, "As we look at the artist sighting along his outstretched arm and forefinger toward the center of the screen we are watching, what we see is a sustained tautology: a line of sight that begins at Acconci's plane of vision and ends at the eyes of his projected double" (179). Acconci describes the concept of his piece, "Pointing at my own image on the video monitor: my attempt is to keep my finger constantly in the center of the screen—I keep narrowing my focus into my finger. The result [the TV image] turns the activity around: a pointing away from

myself, at an outside viewer" (Acconci 1972). *Center* constructs a situation of spatial closure, promoting a condition of self-reflection between the camera and monitor. The temporal concomitant of this situation is the sense of a "collapsed present" due to the live feedback. Looking at the temporal and spatial situation of the reflective self, Krauss claims, "In that image of self-regard is configured a narcissism so endemic to works of video that I find myself wanting to generalize it as *the* condition of the entire genre. ... 'The medium of video is narcissism?'"(179-180).

Richard Serra's *Boomerang* (1974), a video work made with the help of Nancy Holt, is also a fitting example for Krauss's examination (Figure 3.4.2). In this video, wearing the technician's headset, Holt begins to talk, but her words are fed back to her through the earphones she wears.

Figure 3.4.2 *Boomerang* (1974) by Richard Serra

There is a slight delay (of less than a second) between her actual locution and the audio feedback to which she is forced to listen. For the ten minutes of running time, Krauss describes Holt's situation like this: "She speaks of the way the feedback interferes with her normal thought process and of the confusion caused by the lack of synchronism between her speech and what she hears of it." In the video, Holt says, "Sometimes I found I can't quite say a word because I hear a first part come back and I forget the second part, or my head is stimulated in a new direction by the first half of the word." As Holt describes, the work demonstrates "the great difficulty coinciding with herself as subject." Holt describes the situation of putting distance between the words and her apprehension—their comprehension is like a mirror reflection. Holt adds, "I am surrounded by me and my mind surrounds me ... there is no escape." Krauss writes that

this is the situation of "the prison of a collapsed present, present time," and that this in turn is the situation of "self-encapsulation—the body and psyche as its own surround" (181). This situation is what Krauss found in the corpus of video art in general.

Perhaps more than Serra's *Boomerang,* Nam June Paik's most famous work, *TV Buddha* (1974), may be the most direct demonstration of video as a narcissistic medium (Figure 3.4.3). This work is a video installation that uses a closed circuit camera and a small monitor with a bronze sculpture of Buddha. The Buddha

Figure 3.4.3 *TV Buddha* (1974)
by Nam June Paik

is sitting in front of a television set imprinting his own immobility on the monitor through the unchanging mirror image. The video reprojects the Buddha's image with the immediacy of a mirror. This situation of simultaneous recording and transmission also negates the time lag existing between the creation and the perception of the usual work of art (Belting 2003). Paik once said that from the antique Buddha statue, he thought of the image of a television viewer and hit upon the idea for this work.[19] However, the subsequent addition of a video camera creates the scene of Buddha now watching his own video-taped image on the screen opposite. In this closed circuit, the endless loop of gazes between the sculpture of the Buddha and the other, reflective image of himself on the screen, and between past and present, takes us to the meditative experience of the self.

In addition to the mirror reflection and its narcissism, we can apply another psychological analysis to video artifacts. We can consider the psychological and perceptual distance provided by the video experience as a sense of engagement and a

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sense of separation. The argument applied here is highly influenced by the class lecture

"Video Art" that was taught by Tirtza Even.[20]

The Medium of "In-betweeness": Psychological Engagement and Separation

In the 1960s and 1970s, many artists tried to incorporate the idea of psychological

connection and disconnection in their use of the video medium. The viewer and the artist

are always separated positioning the screen between them. At the same time, they are

always together, sharing the situation of presence provided by the monitor screen.

Particularly, Vito Acconci and Bruce Nauman are artists who have repeatedly explored

this psychological mechanism of engagement and separation. Although their work seems

similar in the use of this kind of mechanism as a core strategy, there are also significant

differences in their techniques of revealing and unrevealing. Acconci keeps trying to

reveal his subjectivity in front of the camera and thus invites the viewer into his world;

Nauman keeps hiding himself, and in doing so, makes the viewer who wants to enter into

his world stay off the screen.

In *Theme Song* (1973), with popular love songs as its

background, Acconci picks up lines of song and connects

them with his dialogue: "I'll be your baby, I'll be your baby

tonight, yeah, yeah." He tries to seduce the viewer, promising

Figure 3.4.4 *Face-Off* (1972) by Vito Acconci

to be honest and begging the camera/viewer to join with him,

to come to him, "Why don't you come here with me" …. "come on, put your body next

to mine. I need it, you need it, c'mon... look how easy it is." Acconci's invitation makes

the viewer feel as if no distance existed between them. The monitor becomes an agent of

intimate address. In *Video: The Reflexive Medium* (2008), Yvonne Spielmann says that

video is ambivalent in pretending to offer a "real" dialogue but immediately negating its possibility. Likewise, Acconci makes the camera image become as transparent as a window in his performance, denying the distance from the apparatus. At the same time, the camera image functions reflexively, like a mirror (138). However, it also presents a disingenuous intimacy that is just one-sided pure fantasy. The off screen viewer cannot coexist with him inside the screen. He begins to croon, "You are not there." Through the running time, this paradoxical gap grows as the layer of absence is revealed.

In another work, *Face-Off* (1972), Acconci listens to the recorded tape of his own monologue telling sexually intimate secrets, but he also repeatedly tries to obscure these secrets by shouting over the tape phrases, "Don't tell! Don't tell!" (Figure 3.4.4) This shows the paradoxical situation of the artist confounded by two desires: the desire to please the audience by revealing himself and the conflicting desire to protect his own ego. In this way, Acconci strategically implicates viewers in his performance; viewers await the artist's confession, but become tantalized as they realize that they may never hear it.

Bruce Nauman's approach is opposite to Acconci. Nauman uses disconnection and separation as his methodology. He takes the vision away from the viewer, and does not allow them to see him easily. As a different way of teasing, Nauman holds the viewers in front of his work. In

Figure 3.4.5
Flesh to White to Black to Flesh
(1968) by Bruce Nauman

Nauman's 50-minute 58-second videotape, *Flesh to White to Black to Flesh* (1968, Figure 3.4.5), he presents his bare torso to the camera. Nauman meticulously applies and removes layers of white and black pigment, to his face, arms, and chest. Nauman enacts a

process of self-transformation—a masque applied and removed—and the tape ends where it began.[21] This gesture can be linked to body art and the treatment of the human body as an artistic material as well as subject matter. Indeed, in this conceptual work, Nauman uses his body as an art object, executing a repetitive performance with it. Exploiting the phenomenology of the medium, including its immediacy, and intimacy, his real-time gestures investigate the very process of making art. In this work, by covering his body, he tries to make it invisible to us. However, the overall context of this covering can be interpreted as a gesture of exposing his body. Although he repeatedly covers it and hides it, his body is always seen as a bare torso.

Figure 3.4.6. *Corridor* (1968-1970) by Bruce Nauman

Bruce Nauman's *Corridor* (1968-1970, Figure 3.4.6) is a video installation with a closed circuit video camera, monitors, and a pair of long narrow corridors through which the viewer can move. At one end of one corridor, a video camera is high on the wall, while on the floor at the far end, a monitor shows the immediate image that the camera captures. The image presented in the monitor is the image of the viewer as s/he advances down the corridor toward the video screen. But the image of her/himself toward which the viewer walks is an image of her/his back. The picture of "her/himself" recedes as s/he

comes closer to her/his own reflection. The nearer s/he comes, the smaller it gets, since s/he is resolutely moving away from the camera that is the image's source. In *Passages in Modern Sculpture,* Rosalind Krauss analyzes this work, saying that it puts pressure on the viewer's notion of her/himself as "axiomatically coordinated"—as stable and unchanging in and for her/himself (1981, 241-242). This work constructs a situation of spatial closure, promoting a condition of self-reflection. In the situation of the video corridor, the viewer does not have any way to negotiate with her/his surroundings. The viewer is put in an extremely uncomfortable position. Through this system, Nauman seems to deny the subjectivity of the viewer, breaking her/his expectation.

In another work using neon tubes, Nauman explores the language system to deliver a concept similar to that in *Flesh to White to Black to Flesh.* Neon is a cheap commercial medium for outdoor advertising. It is very visible, and the content that it conveys is often cliché. Therefore, Nauman's artistic resolution opposes this situation. In his neon work, letters are reversed or rotated. In doing so, although the use of the neon medium is supposed to be easily seen even on a dark street, the viewer cannot read these neon letters at first glance. Viewers need to pay attention to be able to read it. The reading itself requires a certain amount of time and certain level of physical effort, for example, twisting your head gradually to follow the letters. Again, this piece asks the questions: What is visible/invisible, readable/unreadable, and legible/illegible?

In short, Acconci's camera is always toward him. He always aligns with the camera. Thus, he attempts to posit himself for the others who are looking at him, while Acconci himself is always inside of the intertwined gazes. Although his perspective is very subjective, it is visible to us. Sometimes, since his attitude is vile and ingenious,

viewers easily become his victims in his work. His attitude can make viewers feel guilty and angry. Again, he tries to seduce them by evoking participation. In his work, the use of video, particularly the use of a video screen becomes the shared place for meeting gazes between the viewer and himself. In contrast, Nauman's work is always favoring the viewers against him. Unlike Acconci, Nauman does not reveal himself easily to be read by viewers. However, whereas Acconci's initial gestures, which are at first opened toward viewers, are immediately and ultimately blocked and so frustrate viewers, Nauman's initial is hidden and ultimately exposed to the viewers and so can satisfy them. In both artists' works, video feedback is the shared methodology. The feedback is between the viewer and the artist. This feedback system constructs a psychological situation where togetherness and alienation, engagement and rejection, collusion and betrayal, and consciousness and unconsciousness are complicatedly intertwined.

3.5. Perception of Time and Space in Aesthetic Experience
(Temporality in Aesthetic Experiences / Spatiality in Aesthetic Experiences)

In section 3.1, I noted that the screen includes different temporal and spatial units simultaneously. With its contents in/on the screen, it takes the viewer into virtual time and space. With its specific mode of presence, the virtual experience is presented as if it is happening here and now. However, at the same time, as it is located in the physical world, the immersive experience itself is interrupted by the physical conditions of the real world, for example, by the noise outside, or noticeable flickering of screen that keeps bothering the viewer's perceptual sense, or by the stoppage of the electric power all of a sudden which turns the screen off. In order to examine this complex map of temporal and spatial perceptions from more diverse perspectives, this chapter investigates time and

space in the art and aesthetic discourses. Particularly, since most interactive art is based on an instant, real-time feedback response, this section will examine the notion of "real-time" by comparing it to the notion of "presentness" or "instantaneousness," as well as the notion of "passage (duration)." I think in real-time based interactive artworks, the viewer's interaction creates different perceptual, conceptual, and experiential experiences from the traditional aesthetic of time and space in visual artwork. Therefore, examination of what is different from the traditional media aesthetic will be helpful for further discussion, which will be discussed in the following section.

The different notions have been mainly debated in the discourse of Modernism in the visual arts, particularly in Minimalism. One of the aesthetics is "presentness," or "instantaneousness" as opposed to aesthetics of "duration." The notion of "presentness" is found in Michael Fried's account of Minimalism, and the notion of "duration" is found in Krauss's notion of "passages." Both texts debate how to look at "theatricality" within the sculptural experience, which incorporates the viewer's phenomenological experience with sculpture. These debates of "Minimalism" can be regarded either as keeping Modernism in its aesthetic quality as a continuation of the past or as expanding Modernism with new interests. Hence, I will delineate more arguments both for and against Minimalism in the context of Modernism and Postmodernism. Then, the aesthetic of "Real-Time" articulated by Paul Vrilio and some HCI research has also added its own temporal perception as a new mode of aesthetic experience.

Passages of Modern Sculpture

One of the most influential articles about Modernism in art, particularly in visual art, is "Modernist Painting," written by Clement Greenberg in 1965. Mentioning self-

referential and self-evident features as the essence of Modernism, he maintains that

Modernism uses "the characteristic methods of a discipline to criticize the discipline

itself, not in order to subvert it but in order to entrench it more firmly in its area of

competence." According to Greenberg's argument, philosopher Immanuel Kant was the

first real Modernist because the self-critical attitude began with him and he was the first

to criticize the means of criticism itself. Greenberg says, "Kant used logic to establish

limits of logic, (…) and the logic was left in all the more secure possession of what

remained to it." Thus, for Greenberg, the Modernist criticizes from the inside and through

the process itself it critiques that which is being criticized. Based on this conceptual

foundation, Greenberg argues that the unique area of each piece of art—its area of

competence—coincides with all that is unique in the nature of its medium. For example,

in the case of painting, limitations that constitute the medium of painting are its flat

surface, the shape of the support, and the properties of the pigment. Among these, the

flatness of the surface is the only ineluctable condition of painting that is not shared with

other arts. Within this scope, Greenberg analyzes the 1960s and 1970s painting trend

such as abstract painting and minimal painting. Abstract artists (eg. Piet Mondrian,

Wassily Kandinsky, Jackson Pollock, Willem de Kooning, Barnett Newman) assumed

that color and shape formed the essential characteristics of art, not the depiction of the

natural world. Minimalists (eg. Frank Stella, Ad Reinhardt, Robert Morris) approached

painting by reducing all unnecessary elements in order to emphasize the flatness and the

surface of the painting. Greenberg's notion of medium-specific formalism can be seen as

an expansion and reinforcement of the 19th century art historian Gotthold E. Lessing

(1836). Lessing viewed sculpture as static and spatial art, as pure optical forms rather than narrative.

Later on, many critiques began to overcome this classical definition of sculpture. Rosalind Krauss's analysis of Modern sculpture claims the inseparability of the temporal and the spatial contexts. In the book *Passages of Modern Sculpture* (1981), she views Modern sculpture, from Rodin to Minimalism and other expanded notions of sculptures in 1960s, as a new syntax. She insists that Rodin negates the narrative structure of classical sculpture by preventing the viewer from seeing his work in a transparent way. For instance, Rodin developed a way of emphasizing the discrepancy between the anatomical structure inside the human body and the exterior figure shaped by the artist. He also revealed the process of making sculpture through the manipulation of the sculpture's surface. Thus, the surface of the body of sculpture, which is the boundary between what we think of as internal and private and what we acknowledge as external and public, becomes ambiguous and opaque (15-37). By applying a phenomenological account to the experience of Minimalist sculpture, Krauss stresses the temporality of its perception. As an apogee of the passage of Modern sculpture "from a static, idealized medium to a temporal and material one," Minimalism threatens the disciplinary order of modern aesthetics in which visual art is held to be strictly spatial (292-293).[22]

Fried's "Art and Objecthood" and Krauss's "Passages of Modern Sculpture"

In his essay "Art and Objecthood" (1967), Modernist art critic and art historian Michael Fried claims that the attitude of Minimal art (in his essay, Fried refer to this as "literal art") is ideological; Minimal artists' sculpture depends on the experience of "theatricality" that works to the detriment of "what sculpture uniquely was."[23] For Fried,

what makes Minimal art theatrical is the literalist preoccupation with time—the duration

of the experience—, since theater confronts the beholder, and thereby isolates her/him,

with endlessness not just of objecthood but of time. This preoccupation marks a profound

difference between literalist work and modernist painting and sculpture. The experience

of the latter has no duration since at every moment the work itself is wholly manifest. It is

the continuous and entire "presentness" amounting to the perpetual creation of itself. The

result is a kind of experience of "instantaneousness." Fried argues that the experience of

presentness and instantaneousness are infinitely more acute than the experience of

duration. A single infinitely brief instant would be long enough to see everything, to

experience the work in all its depth and fullness, and to be convinced by it forever.

On the contrary, Krauss claims that Fried's account of "what sculpture was"[24] is

insufficient to find out "what sculpture is," or "what it can be." For her, sculpture has

used "theatricality" and its relation to the context of the viewer. Krauss's approaches to

finding "theatricality," more accurately, finding the context of viewers in sculptural

experience and therefore finding a phenomenological "passage," was to deconstruct, to

investigate, and to reconstruct the Modern sculpture (1981, 242). In the course of

Passages in Modern Sculpture (1981), while discussing the history and the characteristics

of modern sculpture, Krauss emphasizes the "literality" of time—the "duration" of time.

Among her analyses, she notes that one important concept representing the last passage

of modern sculpture is the literal word "passages," meaning the "passages of time" and

more accurately, the "passages of real time." Her approach to "passages" becomes a real

route to walk thorough like a corridor. She says, "Contemporary sculpture is indeed

obsessed with this idea of passage" (282). Here again, the experience in the corridor or

passage is quite theatrical and temporal. It incorporates the duration of time in the experience of the artifact. Krauss asserts that, "the images of passage, the transformation of sculpture—from a static, idealized medium to a temporal and material one" that had begun with Rodin are fully achieved in Minimalist sculpture. Through the experience in the passage, what she tries to find is a meditative effect: "In every case the image of passage serves to place both viewer and artist before the work, and the world, in an attitude of primary humility in order to encounter the deep reciprocity between himself and it" (Foster 1996).

For me, both the notion of "presentness" and the notion of "duration" are found in Lessing's *Laocoon: An Essay on the Limits of Painting and Poetry* (1836), in which he presents his notion of the process of art, which produces meaning. The notion of "presentness" seems to agree with "the pregnant moment" or "the fruitful moment" of the artist. Lessing stresses that the painter and the sculptor can only choose one moment in time to depict, and this moment must be the most fruitful and pregnant one, the one that will most engage the imagination of the viewer. On the other hand, Lessing also mentions that the observer must see more in the work of art than what is given in the fruitful or pregnant moment. It is the process of "*pars pro toto* (part taken for the whole) (Fischer and Fox 2005, 109)" and the process of producing meaning that detaches itself from the intentions of the artist and becomes instead a matter of reception. In this observer's perceiving of the process, experiential time is crucial and required. Lessing points out in subsequent passages that it takes time for the spectator to observe and reflect upon a work of art with care and attention while at the same time having an imaginative interaction with it. The artist should not interfere with this future process, nor cut it short in advance.

He explains how the most pregnant moment might be chosen and how the best effect might be achieved, mentioning ways of representation in painting and in poetic writing that could promote the greatest openness for the sake of "free rein (*freies Spiel*)" (Allert 2005). In this sense, Fried's notion of "presentness" seems to match up with Lessing's artists' "the pregnant moment" and Krauss' notion of "passage" seems to match up with Lessing's observer's "passage" of experiencing the work.

Artifacts

In her description of passage, Krauss uses Robert Smithson's earthwork, *Spiral Jetty* (1970), as a good example. Located in the Great Salt Lake in Utah, *Spiral Jetty* was a 15 feet wide, 1500 feet long passage in a spiral form. Thus, the space itself can be physically entered into. One can experience the piece by moving along its narrowing arcs toward its terminus. The configuration of the spiral form has a center that spectators can actually occupy. Yet the experience of the work leads them to be continually de-centered within the great expanse of lake and sky. Krauss explains viewers' experiences of *Spiral Jetty* as "phenomenological evidence" created by the physical experience with one's body in the actual site with its surroundings.

Another example of Krauss's passage is Bruce Nauman's *Corridor* (1968-1970). As I already described in the previous section 3.5 (refer to Figure 3.4.6), in this video installation, a pair of long narrow corridors through which the viewer can walk construct a situation of spatial closure provided with a set of camera and monitor. The camera always captures the viewer from the back; therefore, the

Figure 3.5.1. *Spiral Jetty* (1970)
by Robert Smithson
in Great Salt Lake in Utah State

viewer only sees the back view of her/his reflection from the monitor. In an interview with Nauman, Angelus says that the situation makes him doubt his physical presence: "Cameras don't lie, Here I am, I know I'm here but I'm not there. The camera says I'm not here" (Angelus 1980, 264). Nauman explains that with this piece he wants to convey two kinds of information—one kind is the information that you're given: yourself walking down this space. The other kind of information, which comes through the camera visually—is not coming together or put together" (Nauman 2003). In this passage, the viewer does not find a way to negotiate himself/herself within the situation.

I personally experienced Richard Serra's exhibition "Wake, Blindspot, Catwalk, and Vice-Versa" in Gagosian Gallery in Chelsea, New York in 2003 (refer to Figure 3.5.2. and Figure 3.5.5). Here I encountered the opportunity of the phenomenological experience of the "passage." When I entered the gallery space, several gigantic steel structures obstructed my field of vision. These tall and voluminous objects were titled *Wake, Blindspot and Vice-Versa*. *Blindspot* is composed of six plates, three spheres and three toruses. *Wake* occupies the largest space in the gallery, with its five pairs of locked toroid forms measuring 14 feet high, 48 feet long and six feet wide apiece. Each of these five closed volumes is comprised of two toruses with the profile of a solid, vertically flattened "S." *Vice-Versa* consists of one toroid pairing presented in an open configuration. My own experience with these works is still vivid in my memory. Following the long path provided by the work, I felt as if I were walking through a canyon. The massive structures were naturally orange in color because of the rust, which enhanced my feeling of walking through a red valley. The path was so narrow that only one person could pass through at a time. Overall shape was highly distorted, so it was

hard to see another person ahead or behind me. This condition of the passage led me to have a pensive experience of encountering myself. I believe this is the very kind of experience that Minimal artists seek to explore, and the kind that Krauss elaborately discusses. Mine was a totally transitional and involuntary experience that I did not expect to meet in a crowded commercial gallery on a Saturday afternoon in New York City.

In his essay in 2001, "Richard Serra: torqued spirals, toruses and spheres," Hal Foster allows us to think of the effect of subjectivity on the passage. The Gagosian gallery described Serra as an artist who expands his use of sculptural shapes and configurations that were first introduced in his exhibition "Torqued Spirals, Toruses and Spheres" in 2001 at the same place, The Gagosian gallery in New York City. In the catalogue of that exhibition, Foster writes that Serra's sculpture rarely reveals itself as a whole: "It blinds us optically—we cannot project the work beforehand—in a way that allows us to 'see' the work haptically–in the flesh, as it were" (12-13). Indeed, "There is no way to gauge the structure or the space ahead; and same goes for the skin: 'Because the surface is continuously inclined, you don't sense the distance to any single part of the surface. It is very difficult to know exactly what is going on with the movement of the surface'" (15-16).[25] Foster vividly describes the experience of walking this spiral path:

> One feels continuously dislocated—even more so with the spirals, which, unlike the ellipses, do not have a common center and are not sensed as two discrete forms. Again, even more so with the spirals, one feels that each new step produces a new space, a new sculpture, even a new body. Sometimes, as the walls pinch in, you feel the weight press down—not only of your body but also of the five plates, each 20 tons, that make up each spiral. But then as the walls open up again, this weight is somehow eased; it seems to be funneled up and away from you. Suddenly both your

body and the structure feel almost weightless—once again even more so with the spirals, as they seem to spin more smoothly, more rapidly, as you walk through. It is as if your body becomes its own roller coaster, one tracked not up and down but round and round (16).
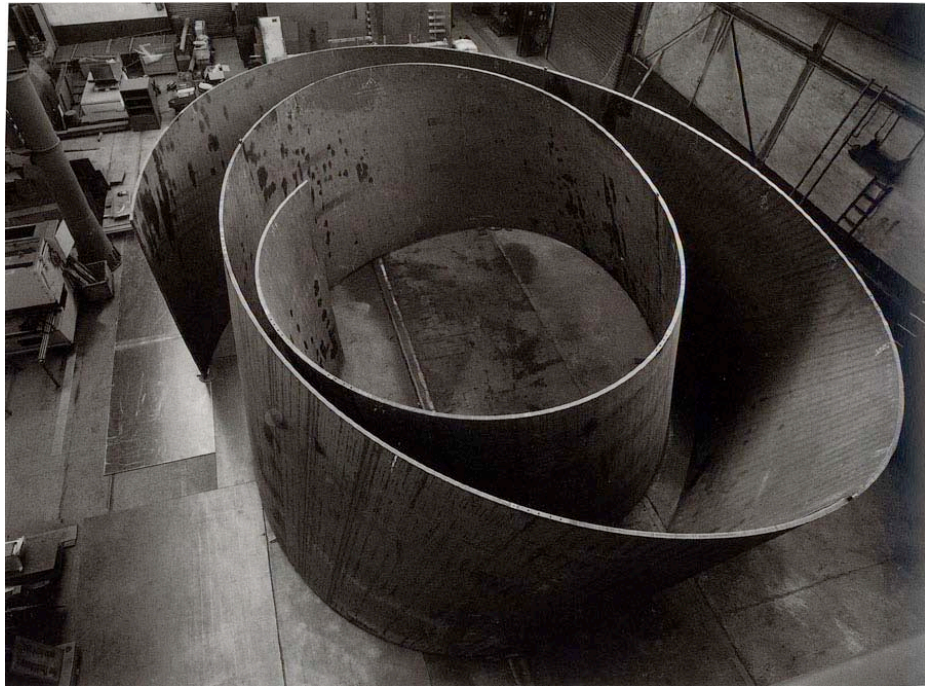
Figure 3.5.2 and Figure 3.5.3 *Torqued Spiral* (2001) by Richard Serra, Weatherproof steel, 13'7" x 40'4" x 36'
Figure 3.5.4 *Blindspot* (detail) (2003) by Richard Serra, Weatherproof steel, 14' x 60' x 29' 6" (4.2 x 18.3 x 90 m)
Photo credit: Gagosigan Gellery, Chelsea, New York.

Figure 3.5.5. Richard Serra's exhibition "Wake, Blindspot, Catwalk, and Vice-Versa" 14' x 75' x 46' (4.2 x 19 x 14 m) in Gagosian Gallery (555 West 24th Street, New York, NY 10011) in 2003

Foster compares Serra's "warped space" with the notion of Gilles Deleuze's notion of the historical Baroque in *The Fold: Leibniz and the Baroque* (Deleuze 1992, 13). Since Baroque's sensibility endlessly produces folds, which detach interior from exterior (3; 28).[26] Foster writes that even as *Torqued Spirals* and *Torqued Ellipses* evoke archaic, psychic spaces like the labyrinth and virtual space like digital "transcendence," Serra keeps critical and historical resistance from the virtuality. Serra's work serves the collapsing of physical coordinates in the interest of embodiment, placement, and context. One knows one is headed either towards or away from the openings. Together with complicated structural transparency and necessity, and its historicality in work, Foster puts it this way: "But in the torqued ellipses and spirals it serves a different function: as a grounding from which new modes of production, new spatialities and subjectivities can

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be probed, and where the complexity of social experience can be momentarily retained, not futuristically flattened" (Foster 2001, 20).

In summary, Fried's modernistic aesthetic of "presentness" and "instantaneousness" and Krauss's notion of "duration" in the "passage," provide different qualities and perspectives with which to consider our experience with the world in regard to time. The classical notion of time is relatively conceptual and ideal, therefore, it is actually close to "hyper-time."[27] Yet Krauss's notion of time is more like "live time" that the physical body and its perception can be involved in. We find that Fried's notion of "presentness" implies a penetrating observation of the "other" and an emotional feeling fulfilled after the meeting between the subject and the "Other," particularly considering the subject as a reflection of the "Other." Krauss, on the other hand, in concluding her book, *Passage of Modern Sculpture* (1981) and discussing the perception with respect to *Spiral Jetty*, conjures "involuntary memories" in Marcel Proust's novel *Swann's Way: In Search of Lost Time* in 1928. In the story, the protagonist and narrator Marcel, experiences his memories as involuntary, recalled while he is eating a Madeline. Here, Krauss concludes that while the audience is walking through the passage, they would possibly be able to recall their own involuntary memory. Perhaps Fried's notion of "presentness" and Krauss's concept of "duration" could imply the same meaning, as both transport us into a time of contemplation.

The Notion of Real Time

Having discussed the different aesthetics of how a work of art can present and provide different perceptions in the interwoven web of time and space, I also want to examine the notion of real-time present in most digital interactive media experiences. The

concept of "real time" interaction is often pursued by technologists or HCI experts. They suggest that one's experience of digital system requires fast and instantaneous feedback in order to enhance efficiency and usability. Generally "real time" may refer to "real time systems," which respond to events, or to "real time signals," which are transferred either very quickly, or even instantly, even as they happen. (e.g. real-time computing, real-time computer graphics, real time media, Real Time Messaging Protocol, and so on). According to Derrick de Kerckhove, real-time is the speed with which we can create a thought or an image. Images in real-time should be updated without a noticeable delay, and a perfect hypertext document should be linked as quickly as possible (1997). With available technologies, new media artists, particularly net artists and interactive media artists, are also dealing with this issue of speed. In the case of real-time interactive computer graphics as opposed to film, a user usually controls what is about to be drawn on the display screen. The user typically provides feedback to the system via an input device and the system decides the next frame based on this instance of action. Therefore, feedback based on interactivity becomes the main motivation for pushing real-time graphics further.

A critic and theorist of technology, Paul Virilio maintains that the logic of speed becomes the foundation of technological society, and, therefore, modern media is under siege by real-time technologies. In several of his books and articles, he asserts that the real-time electronic transmission of information, particularly the "twin phenomena of immediacy and of instantaneity," bring pressing problems to the fundamental condition of human perception (1992; 1993; 1995). In "The Third Interval: A Critical Transition," (1993, 4) he suggests that "real time" is not opposed to 'deferred time,' as electronics

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engineers claim, but only to the *present* time. By quoting the painter Paul Klee's note, "Defining the present in isolation is tantamount to murdering it," Virilio argues, "Technologies of real time kill 'present' time by isolating it from its presence *here and now* for the sake of another commutative space that is no longer composed of our 'concrete presence' in the world, but of a 'discrete telepresence' whose enigma remains forever intact" (1993). For Virilio, cyberspace is an example where the notions of immediacy and instantaneity characterize its effect on human perception. Cyberspace is based on telecommunication, which is the real-time electronic transmission of information and provides a different perspective than previous ways of communication. In "Big Optics"(1992), Virilio looks at a historic break between film and telecommunication, and defines it as a break between "small optics" and "big optics." When compared to the geometric perspective of real space, cyberspace perspective creates a "tactile" perspective: "To see at a distance, to hear at a distance: that was the essence of the audio-visual perspective of old. But to reach at a distance, to feel at a distance, that amounts to shifting the perspective towards a domain it did not yet encompass: that of contact, of contact-at-a-distance: tele-contact" (Virilio 1995). For Virilio, big optics progressively derealize the terrestrial horizon, resulting in an impending primacy of real time perspective. According to Vrilio, the negative aspect of cyberspace or real-time telecommunication is in its loss of orientation regarding alterity (the Other). In "Speed and Information: Cyberspace Alarm!" (1995), Virilio warns that cyberspace loses its relationship with the Other and with the world: "A total loss of the bearings of the individual looms large. To exist, is to exist *in situ*, here and now, *hic et nunc*. This is precisely what is being threatened by cyberspace and instantaneous,

globalized information flows." If information from any point can be transmitted with the same speed, the concepts of near and far, horizon, distance and space itself no longer have any meaning. Virilio mourns the destruction of distance. He warns of the progressively diminishing and disappearing fundamental condition of human perception, the distance between the subject who is seeing and the object being seen.

In "Film/Telecommunication – Benjamin/Virilio" (1996, or "Cinema and Telecommunication / Distance and Aura), analyzing the similar concern for radically altered perception through media experience voiced by Virilio and Benjamin, Lev Manovich claims that nothing is ever obtained without the loss of something else: "What will be gained from electronic information and electronic communication will necessarily result in a loss somewhere else. If we are not aware of this loss, and do not account for it, our gain will be of no value." In real-time experience and communication in art, the loss of distance can be directly connected to the loss of distance for reflection. Revisiting Lacan's image-screen diagram, we can conclude that the distance between the subject who is seeing and the object being seen is critical for looking at the self.

One counter example to Virilio's interpretation of real time would be a video art. Looking at video art is quite different from watching television or surfing the World Wide Web. Typical television programs or commercial websites try to catch the viewers' eyes, and if successful, they try to hold them as long as possible by instantly providing new stimulus. Our senses are easily paralyzed by their strategies. Yet video art introduces slowness. When Nam June Paik exhibited the installation *TV-Buddha* in 1974, he celebrated video art's inversion of the television experience as "boredom," by emphasizing that it is necessary for contemplation. In "The Temporality of Video Art"

(2003), Hans Belting points out that video art provides the viewer with the experience of a passage through time. Many video art pieces use boredom or a slow pace in time to give the viewer access to time. They encourage self-reflection, which opens us as viewers up to an "inner time," and in so doing, turns us away from the pattern of real time. Video artist Gary Hill once said that his work is intended to provide the paradoxical experience "of being intimate with time and estranged from it" (Belting 2003, 91). In this way, video art embodies a reflexive space of difference through the simultaneous production of presence and distance. Indeed, the relative calm, relative slowness, and relative distance provide us time for reflection. The time for reflection is a propitious moment for artists or for the audience to interpret, think about, and reckon with the sense of oneself and the world.

3.6. The Screen in the Realm of Imagination

"Aesthetic experience is imaginative. (..)
Imagination is the only gateway through which these meanings can find their way into a present
interaction: …"
(John Dewey in "Art as Experience" 1984; 221, 283)

To summarize, by borrowing Benjamin's notion of the aura and Lacan's psychoanalytic account of the double logic, this chapter examined the screen as a meeting place of double gazes between the subject and the object, the viewer and the world beyond, where desire and rejection are engaged. I have also examined different aesthetics and conceptual approaches to time and space through various media, from traditional ones such as painting, sculpture, and video art, to more recent ones such as cyberspace,

virtual reality, and real-time interactive media to investigate how each of these creates its own aesthetic distance. This examination now becomes a conceptual and theoretical basis for a discussion of the aesthetics of time and space for reflective distance in the screen experience. However, to set up this basis clearer and stronger and extend this further in the later chapters, here I would like to define several significant terms and meanings that I am using throughout my thesis. These are the terms of "the boundary object," "experience," and "imagination."

The Boundary Object

In section 3.1., I defined the screen as a boundary object and discussed what kinds of boundaries the screen is situated within by looking at the literal word "screen" (with its connotative and denotative meaning) and its physical condition (which divides or integrates several spaces and times, simultaneously functioning as mediator). Like skin, which has a metaphorical identity that divides space and material inside and outside, while remaining a component of the body, the screen has an ontological condition. With this condition of the screen, I argued that two paradoxical senses, those of immersion and rejection, are provided by the perceptual experience of the screen, and I claimed that between these two different states, the screen exists continuously oscillating in-between. In section 3.2., I then examined these immutable and transitional senses and the ontological condition of the screen by comparing Benjamin's auratic condition and Lacan's idea of subjectivity as represented in his image-screen diagram. In this sense, the screen cannot be defined from a single aspect. Rather, the screen as a physical object becomes a concept status and an experience. In other words, the static object becomes changeable as it is perceptually experienced and conceptually imagined. In later chapters,

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I will describe more about how the screen as a form and material becomes the process and the experience.

In sociology, a boundary object is a concept describing information used in different ways by different communities. This idea was introduced by Susan Leigh Star and James R. Griesemer in 1989. Boundary objects are plastic enough to adapt to local needs and to be interpreted differently across communities, but they are also robust enough to maintain a common identity across sites with integrity and enough immutable content: "They [(B)oundary objects] may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds."[28] Although my definition of screen as a boundary object does not have any sociological context, the concept that includes transitional, immutable states and open to diverse interpretations is very similar to the sociological definition of it.

Experience

Throughout this thesis, the word "experience" is used many times in different places. I would like to define the particular meanings of "experience" as I use it in this thesis.

In general, experience is a concept of knowledge, wisdom, skill, or interpretation gained through involvement in or exposure to a thing or event or gained in subsequent reflection on the thing or event. In this sense, most experience accumulates over a period of time, and it generally refers to procedural knowledge, rather than propositional knowledge. Sometimes, the word experience aligns it closely with the concept of

experiment. However, depending on the context, the meaning of experience is somewhat more ambiguous, since the meaning itself can refer to many different contexts. For example, there are physical, mental, emotional and spiritual experience(s). Depending on the immediacy of experience, there are first-hand experiences, second-hand experiences, and third-hand experiences. While a second-hand experience can be provided only from first-hand observers (or experiencers) or from instruments[29], first hand experience refers only to the experience of the "here and now." It can be valuable and privileged, and therefore potentially subjective and personal in its interpretation. Subjective experience always involves a state of individual perception based on one's interaction with the environment. This depends on the unique process of perceiving the world and of storing and internalizing it in memory in the mind or even in the body. Our senses collect data from the world, which we then process biologically and neurologically in relationship with other variables given from the world. This process is also affected by the previous experience (the process of recollecting past experiences in either bodily or mental memories). All of these elements affect our individual experience of any given situation in such a way as to render it subjective.

In this thesis, since "experience" focuses mostly on the experiencing of art, I am usually referring to the first-hand experiences of individuals. Rather than referring to the viewers' purported wisdom or knowledge, I am usually referring to their procedural knowledge through involvement in or exposure to an interactive event provided by artwork or gained in subsequent reflection on that event or interpretation of it. Here, experience refers to the phenomenological process of perceiving the work of art and engaging with it. Particularly since this thesis focuses on interactive artwork and the

relationship between the work of art and the viewer of it, the phenomenological process of engaging with the work becomes the interactive process. Therefore, experience can sometimes refer to image, perception, or view as the way we see the world or the artwork and interact with it.

Imagination

Imagination is the action or process of forming mental images, ideas, or concepts of what is not actually present to the senses; one can form pictures or ideas in one's mind. "It is accepted as the innate ability and process to invent partial or complete personal realms within the mind from elements derived from sense perceptions of the shared world"[30] and also helps lend meaning to experience and understanding to knowledge. In psychology, the term imagination is used for the process of reviving in the mind a perception of objects formerly experienced sensorally. "Imagined images are seen with the 'mind's eye.'"[31] Just as the process of imagining is related to pictures, mental images in the mind, it is also highly related to visual perception, visualization, mental simulation, and memory recollection. Imagining is often described as a "reproductive," "productive," or "constructive" process. People often think that, as conscious beings we can solve problems and get inspiration for new inventions or techniques because we have the ability to imagine.

In this thesis, imagination is used to refer to the conceptual process of artistic imagination. The screen in the realm of imagination means that imagination can create the experience of the screen more diversely and imaginatively. For artists and designers, imagination is the creative process of designing the screen experience, and for viewers/interactors, imagination is any possible productive, reproductive, or constructive

process of aesthetic experience that takes place while they are interacting with or engaged in the work of art.

As already mentioned in section 3.2., appealing to Baudelaire's notion, Benjamin claims that the perception of the aura creates a "region of the intangible, imaginative" and what Baudelaire regards as the realm of imagination is for Benjamin the realm of aura. Through "involuntary memory," as Benjamin argues, the auratic experience is the moment in which spectators can meet a reflected image of themselves, and thus, a moment of self-contemplation, a realm of imagination fulfilled by emotional feedback when they meet their soul.

The Screen as the Realm of Imagination

Screens are a typical form of remediation. Screens keep their traditional concepts and perceptibility, but simultaneously, as technologies develop, new approaches define new screen experiences. New explorations of the screen create new possibilities for perception beyond the existing condition of the screen. If the image-screen is located at the center of the double logic and provides the meeting place of two gazes—as the meeting place of the subject's and object's gaze (the person who experiences the screen and the object or situation presented by, on, or in the screen), the screen itself is located in the "in-between" of two different things, and the ontological condition of the screen is a process of oscillation between them. If we are able to look at the aura in the double logic situation, then similar to the aura, the screen itself, as the meeting place of viewing and being viewed, and of desire and rejection, becomes the realm of imagination. In the realm of imagination, screens can open diverse configurations of meeting gazes.[32] New

media screens are particularly pushing their frontiers, leading to other interpretations of this boundary and the experience at this boundary.[33]

In the dynamic topology of the screen among its various relationships, the condition of the "possible static moment" needs reconsideration. The "possible static moment" is the moment of welcoming involuntary memory and the time for contemplation and reconciliation in the reciprocal gazes. If we say that these mutual gazes build psychological interactivity in traditional art and that the center of the context of gazes has been all about the subjectivity in traditional art, then, in new media arts, the two gazes happen to meet in a very dynamic situation. Whereas in traditional art, encountering gazes between desire and rejection and between the subject and the object are silently returned to the subject, in responsive interactive art, the viewer becomes active with the work. Thus, the subject who is involved in interactive art is situated in a very different kind of context, one that can influence and form the subjectivity. The interactive context is one of two active "talking (communicating)" entities. The traditional looking subject is no longer passively standing alone in front of the object, but is kept in a situation of being urged to actively participate with another active entity, the object. The returning gaze from this object is not silent. Indeed, sometimes the gaze of the object is so strong and loud that the subject recedes into the background in order to obtain a natural and comfortable distance (space).

Virilio asserts that the immediacy, or instantaneity, of "real time" does not allow the proper distance or the experience of the present here and now. Therefore, in "real time" interaction, this immediate feedback often provides no time for the subject to engage the involuntary memory. A lack of involuntary memory results in no chance of

becoming engaged in the beloved and fulfilled gaze, but results, instead, in an abandoned gaze. In this sense, I believe interactivity in new media art needs to recover the subject, which is resting and taking a deep breath in front of the work. Austrian writer Karl Kraus says, "The closer the look one takes at a word, the greater the distance from which it looks back" (refer to endnote for citation).[34] The closer one looks at her/his own experience, the greater the distance and the wider the perspective one will get when it, one's experience, looks back. In *Art as Experience*, John Dewey writes that art experience is the one in which, "the meanings imaginatively summoned, assembled, and integrated are embodied in material existence that here and now interacts with the self" (1984, 222). If we agree with this, then new media screens need to deal with how we create and embed the proper moment to establish this distance.

Comparing the "heavy" desire of pornographic experience with the "light" (good) desire of the erotic photograph experience, in *Camera Lucida: Reflections on Photography,* Roland Barthes (1981, 59) says that the difference between these two desires may be a question of "luck," of finding the right degree of openness and the right density of abandonment. The photographer needs to find the "*right moment*", the "*kairos*[35] of desire" to a *punctum*, since "*punctum* is a kind of subtle beyond—as if the image has launched desire beyond what it permits us to see."[36] New media artists also need to find the right moment and distance of desires in their creation of screen experiences. I agree with Barthes in that for artists, finding the most optimal choice and making the best decision is probably a matter of luck. However, once we are aware of a particular distance between the two in the double logic situation, the strategies will need to include how to calculate how much distance from each end is desirable and how to

position this distance between those two ends, even though this distance needs to continue oscillating. The relatively calm time and distance will invite the spectator into imaginative and involuntary experiences. Hence, artists can try to imaginatively place the screen where it is waiting for the viewer's gaze and where it can return the warm and fulfilled gaze to the viewers as in an auratic experience. Then, the screen-media artwork will reside in an infinite space in the realm of imagination for both viewers and creators.

CHAPTER 4

PREVIOUS EXPLORATION

The previous chapter looked at the screen as a boundary object and at the experience of its double logic mechanism. It also examined the way in which various media interpret and incorporate the experience of time and space and how each of these media has developed its own psychological and philosophical aesthetics to bring reflective distance into the media experience. In this chapter, I will examine interactive media screens, particularly the screen-based interactive artwork that has been created over the past two decades. As briefly mentioned in the "problem space" of this thesis, the relationship between the virtual and the real, between the subject and object, and the mixture of different units of time and space around the new media screen become more complicated than the relationship with/around traditional screens. The greater the level of interactivity involved in the screen experience as real time feedback increases, the greater the desire for transparency—for a more immersive and transparent media experience.

4.1. Interactive Screens (Performing Mirrors and Painting Canvases)

Desire for Transparency: Mirrored Image, Real-Time Feedback

Since the Renaissance, media technologies have been developed to produce more immersive and transparent media experiences through photorealistic images, bigger screens, and more immersive sound. In "Virtual Reality-Tautological Oxymoron," Malcom Le Grice mentions that the fascination with representational facsimile and the desire to create a greater similarity between the sensory experience of the representation

and the experience of the real world are even bigger today (2002, 230). Some

applications have attempted to add more and more sensory features (the sense of touch

and even smell) to expand illusion. Many designers and technologists are searching for

ways to expand into and inhabit the virtual world with their bodies in order to achieve a

synaesthetic relationship. As a result of these attempts for transparent media experiences,

screens have become more transparent and dematerialized, finally seeming to disappear

in front of our eyes. In AR, MR, and VR works, the screen takes on different forms.

Sometimes it is merely transformed. At other times, it may even be removed altogether.

For example, many AR environments use a small screen placed just in front of the user's

eye (a screen attached in front of glasses or a HMD [head-mounted display]). Overlaid or

laid just next to each other, reality and virtuality can be seen altogether by the viewer on

this AR screen. The IMAX screen, on the other hand, surrounds the viewers in a giant

three-dimensional concave structure, a mixed version of a cinematic screen and a virtual

screen. The viewer experiences the virtual world presented on the screen in a whole

bodily experience. Holographic screens use only the photographic image of three-

dimensional impressions on/in the hologram. Later on, the realistic three-dimensional

images made with light waves are re-created on the surface. In this case, the materiality

of the screen becomes extremely thin, as if the screen's materiality melts before one's

eyes. Although the technology of the hologram or IMAX screen is not fully a digital

application, these approaches are nevertheless becoming as popular as new media screen

applications. In the book *Remediation: understanding new media*, Jay Bolter and Richard

Grusin (1999, 53) write: "Transparent digital applications seek to get to the real by

bravely denying the fact of mediation; digital hypermedia seek the real by multiplying

mediation so as to create a feeling of fullness, a satiety of experience, which can be taken as reality."

This irony becomes increasingly pronounced as the technology of interaction becomes more and more sophisticated. As the technology evolves and as the desire for transparency grows to become an increasingly "real" experience, the relationship between the participant and the reality can remain simple/simplistic. In the introduction to his book, *Artificial Reality II,* Myron Krueger invites us to, "Imagine that the computer could completely control your perception and monitor your response to that perception. Then it could make any possible experience available to you" (1991, xvi). Krueger's *Videoplace* was an exemplary work of using a computer system that responded to the users' movements and actions with the use of projectors, video cameras, and onscreen silhouettes with an artificial reality environment and technology. In this interactive environment, multi-users in separate rooms could interact with one another. Looking at the results of their actions on screen, the users interacted with onscreen objects and other users as if there was direct and tactile feedback in between. This environment provided another reality. The creators of these systems dream of creating comprehensive, shared and therefore new "realities." But "we must question the 'philosophy' behind the interface" (Rokeby 1995, 149). In the real world, our interaction with objects and with other people is very complex and ambiguous.

A situation of double logic always involves a certain structure of psychological interactivity between the subject and the object. As mentioned in Chapter 3, the screen experience in this double logic also creates a complex negotiation between these two entities. When a system monitors interactors to this extent, it has effectively taken control

of the interactors' subjectivity, depriving them of their idiosyncratic identity, and

replacing it with a highly focused perspective that is entirely mediated by the system.

Subjectivity has been replaced by a representation of subjectivity.

Real-Time Interactivity: Double Mirrors, Double Dialogue, and Collapsed Present

      A static work such as a painting or a sculpture can be looked at in two different

ways. Compared to interactive works, it can be read as authoritarian, since it refuses to

reflect the presence and actions of the spectator. On the other hand, it can be read as

complete freedom for any reflection, since it allows any interpretation by not intervening

in this consuming process—yet artists may still create some directions to guide the

subjective gaze of the spectator in advance, and thus the spectator's interpretations and

meaning-making process can be manipulated/directed by combining those elements into

the work. From the opposite perspective, an interactive work can be seen as democratic in

that it is always ready to communicate with the spectators. Or it can be seen as disturbing

if it is viewed as interfering with the interactor's subjective process of interpretation.

      Indeed, the major difference between the static work and the interactive work is in

its manner of production (creation) and consumption (appreciation). Due to the

procedural ability of computation and real-time feedback loops circling around its

interactive system, the negotiating relationship in the process of communication between

the spectator and the piece of artwork changes and becomes dramatically more

complicated. If traditional cinematic effects engage us as passive spectators, that is,

spectators through the process of identification, then the interactivity of digital media

implicates us as protagonists. The object displayed or being looked at in the previous

forms of screen is often replaced and presented with the image of the subject who is

currently engaged in the screen experience, an interactive game avatar, which represents the individual who is engaging in a virtual world interaction. In interactive media screen-based art installations, the image of the subject (spectator) captured from a real-time camera becomes mirrored images on the screen and is recognized as a split-self or a doubled self. In this situation, the process of interaction urges the subject to identify himself/herself with this object, and the distance between the two begins to close and finally disappear. The object, which in the past simply stayed there passively, is also not there, as it was "before" anymore. It keeps eliciting responses from the subject (spectator). The subject and the object continue mixing and blurring with and into each other. The gazes from the subject are also doubled and blurred within this gaze of the other (the object).

***Text Rain* (1999) and *Drawing from Life* (2001)**

Figure 4.1.1 *Text Rain* (1999)
by Camille Utterback and Romy Achituv
Photo credit: Camille Utterback
(www.camilleutterback.com)

One of most popular examples of interactive digital works that make use of the interactive screen and interactor's captured body is *Text Rain* (1999, Figure 4.1.1) by

Camille Utterback and Romy Achituv. This work uses a video camera as an input for the

system, through which viewers see a mirrored black-and-white video of themselves

captured by the camera and projected on a large screen. In this work, colored letters fall

down on the image of the viewers from the top edge of the screen like raindrops. The

letters respond to the viewers', now participants', gestures and motions: The falling

virtual letters stop when they reach the silhouette of the body, where they can be caught,

lifted, and then allowed to fall again. Text (the letters) takes on the behaviors of objects

(the images) that respond to forces in the real world, and also to the physical gesture of

the viewer. While describing this work, Utterback mentions that there is no "wrong" way

to interact with this piece. She says that, because most of one's body is visible in the

virtual space of the screen as well as in the physical space in front of the screen, and

because no complicated apparatus is involved, in this intuitive system, interactors become

"immersed." They can easily feel present in both the physical and virtual space

simultaneously, and the shifts back and forth between the two are seamless. She describes

the resulting confusion between these two spaces as "pleasurable" (2004, 221-222).

In *Drawing from Life* (Figure 4.1.2) Utterback

uses a similar interface—a video camera capturing the

interactor's body in front of the screen and its silhouette

projection on the screen–, but in this work, the

presented image of the body on the screen is filled with

transformed letters. Utterback emphasizes the easiness

of this kind of interface: "When viewers recognize that

the projected imagery is a translation of themselves,
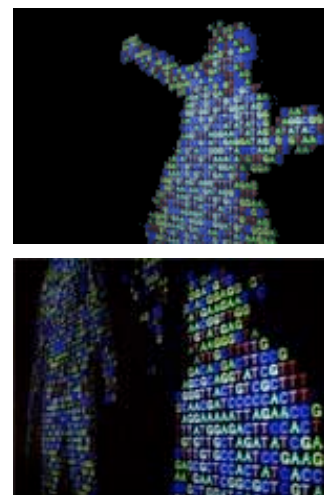
Figure 4.1.2 *Drawing from Life* (2001)
by Camille Utterback
Photo credit: Camille Utterback
(www.camilleutterback.com)

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they "test" the correspondence by moving parts of their body—tilting their head, waving their arms, etc. Once the connection is made, viewers "play" with their transformed symbolic "self" by using their physical body. The ease with which one controls one's video image is comparable to the experience of controlling ones image in a mirror" (2004, 223).

Undoubtedly, the simple and familiar physical interaction and the seamless shift between the two worlds are great keys to the success of both works. Yet, the simplicity and seamlessness of this type of work also invoke the question of how much proper distance for reflection (or flexible critical distance) interactors can get to look back on their motion and think of the reason or motivation for their action from this type of interaction. In other words, in this type of strong and seamless connection, where the system immediately responds to the interactors' bodily movement, questions arise: How much individualized experience is allowed to interactors? From John Dewey's perspective, if the work of art is recreated differently every time with every new viewer's experience (as summarized in Chapter 1), how can the aesthetic experience with the work of art be recreated differently every time?

In addition to the works just mentioned, many interactive works often make use of seamless and intuitive connections between human bodies and the symbolic systems that our bodies engage with. As I have described in Chapter 2 (in the section "Problem Space"), in my view, this kind of system typically shows multiple levels of feedback loops, first, from the narcissistic reflection provided by the camera-monitor encapsulation, which in turn provides psychological and electronic feedback on the material level of signal transmission between the camera and the screen/monitor, and

finally from the code-level feedback, which is more intensified through the real-time interaction between the two interactive ends. Interactive work is made up of the dialogue between the interactor and the system. The interactive system responds to the interactor, who in turn responds to that response. In this situation of a feedback system, as Rokeby writes, "the implications of an action are multiplied, much as we are reflected into infinity by the two facing mirrors in a barber shop" (1995, 137). In this system, "the interactor can fairly easily be pushed beyond reflection to the edge of instinction, capable only of visceral response to the system's stimuli, mirroring the system rather than the reverse" (Rokeby 1995, 142). It is like a dialogue between "two talking entities" (Lee, 2006) with both sides talking simultaneously in this dialogue. It hints at the situation of Nancy Holt speaking and hearing her words in a slight delay while wearing the technician's headset in Richard Serra's videotape *Boomerang* (1974).[1]

My question regarding whether flexible distance is possible in the viewer's experience with the interactive system seems somewhat related to Matt Gorbet's question regarding *Text Rain.*[2] He asks, "What is the depth of content that can be expressed, in view of the apparent interaction constraints of such body-centric work?" Although his comment goes more toward the depth of content per se, this question can also be linked and extended to the depth of subjective experience. Utterback (2004) once said that a distancing apparatus exists in both *Text Rain* and *Drawing from Life*, that abstracting the live image of interactors into letters is intended to distance the connection between the reflected images and bodily motion so that through this process, viewers become more aware of the discrepancy between the abstraction and their bodies. Perhaps the discrepancy created from the abstraction helps to foster critical subjectivity. However, for

the interactor who is still looking at her body revealed as a silhouette (or shadow) kind of image, which is not showing the "real" details of the body's appearance, the images on the screen can sometimes create a more immersive mode than the actual presentation. Therefore, from the moment the interactor enters the installation space to the moment she steps out from it, the immediacy and the narcissistic mode compel her to make more and more hectic responses to each new reaction. Perhaps once we enter into this kind of space, we are already accustomed to no expectation of any break, similar to when we hit the play button in the game Tetris, which means we are now ready to struggle with those endlessly falling blocks until the game ends.

Image-Interface, Body-Interface

This narcissistic performance with other new media objects on the screen is described by Lev Manovich in this way: "This analysis (referring to Krauss's claim of 'the video as a narcissistic medium') can also be applied to many interactive computer installations. The user of such an installation is presented with her own image; the user is given the possibility to play with this image and also to observe how her movements trigger various effects. In a different sense, most new media, regardless of whether it represents to the user her image or not, can be said to activate the narcissistic condition because they represent to the user her actions and their results. In other words, it functions as a new kind of mirror that reflects not only the human image but human activities" (2000, 235). Manovich goes on to say that this relationship of the user/player to the image in video artwork is similar to the relationship of the user/player and the screen in new media artwork, particularly with interactive computer installations. Image becomes an image-interface that functions as a portal into another world: "Like an icon in

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the Middle Ages or a mirror in modern literature and cinema. Rather than staying on its surface, we expect to go 'into' the image. In effect, every computer user becomes Carroll's Alice" (2000, 290).

The notion of image-interface, particularly the notion of human face or human body image as an interface, is interestingly discussed in *New Philosophy for New Media,* by Mark Hansen and Tim Lenoir (2004). They maintain that new media art easily reinserts the body and the face into the circuit-connecting affectivity. The digital facial image (DFI), or the image of the human body, because of visual and psychological attraction or affect from the images, often appears as an image on the screen at the same time as an interface. Discussing Bergson's definition of affection, and Deleuze's interpretation of it through the close up image as a cinematographic image such as Eisenstein's film, Hansen argues that in the experience of the DFI, the face becomes the catalyst for a reinvestment of the body as a rich source of meaning and as a precondition for communication.[3] Thus, the DFI effectively forms "the vehicle of contact between our bodies and the domain of information" (130). Thus, affection as interface exploits the potential of the image at the same time as it virtualizes the body: the crucial element is neither image nor body alone, but the dynamic interaction between them. However, in the mirror-like reflective screen, with the image of a user's face and body in front of the camera, a counter-result exists. The flip side of these works is that viewers do not need to interact intentionally; they (can) simply respond to the artwork as the artwork responds to them. In the mirror-like screens, which involve a simple, clear interaction between the two worlds around the screen, "boredom" follows quickly. Hansen and Lenoir also point out the problem posed by the digital processes of image production that utilize affection:

"(By contrast,) the DFI deploys affect to entirely different ends: rather than a transcendence or suspension of individuation, what is at stake in recent aesthetic experimentations with digital faciality is the catalysis of an individuation that utilizes affectivity to engage with the digital processes of image production. That these works confront the participant with affection-images *generated entirely through digital process* has the effect of reversing the Deleuzean schema rather than a drive toward autonomy of the image as the expressed of affect, what becomes urgent in these cases is the forging of contact—any contact—with the bizarrely "alien" image (and the radically inhuman universe of information it materializes). Here, in short, the autoimmunization of the affect-image is *given at the outset* and serves as the catalyst for a new individuation, a virtualization of the body that 'responds,' as it were, to the problematic posed by the digital image. (*New Philosophy for New Media* by Mark B. N. Hansen, 136-137)[4]

I believe these affection-images in the reflective screen somewhat relates to the context of the new media trend toward pursuing transparency and mixed subjectivity.

The discussion of the affective image-interface could be closely linked to the phenomenon of the interactive work that uses the interactive screen as a video painting with a digital brush. This kind of work also uses the camera-body-screen interface (The camera captures and responds to the interactor's body and reprojects the direct reflection of the body on the screen), but in this case, it uses a painting-canvas metaphor as/for its interaction and representation. Whereas the above works by Utterback use an instant mirroring screen, affection image interface works use a somewhat more distorted process, one in which the interactor needs to reveal the images.

Easel (1998)

At first glance, Danny Rozin's *Easel* resembles the traditional painter's easel. A canvas is mounted on an easel frame, and there is a paintbrush attached to it. However, instead of using real paints, Rozin's brush applies a virtual image from live video sources fed by a camera. Since the camera points to the interactor who is standing in front of the canvas, the screen canvas becomes the canvas for a self-portrait of the interactor (Figure 4.1.3). According to the artist, this draws "*myself* as a source revealing my face and body."[5]

This work takes advantage of the temporal modes of video, which change over time: every new stroke brings a new frame of video, and each long stroke reveals a full, continuous frame. This interactive system also provides various modes of video. Dipping the brush into one of the three different cans on the easel triggers a different video feed. This gesture mimics the painters' action of changing the color of paint on their palette. With another video source, interactors can reveal the surroundings of the space because a new

Figure 4.1.3 *Easel* (1998)
by Danny Rozin
Photo credit: Daniel Rozin
(www.smoothware.com)

action (dipping the brush in the new can) will trigger another video feed from a camera pointing at the ground. The other source is linked to a live TV, and Rozin says, "You never know what will come, thus it brings always a surprising result." Despite several video sources in *Easel*, I think that the main mode is still focused on the interactor drawing the portrait picture of the interactor and the surrounding view, which also

includes the interactor. When two different strokes meet together on the canvas screen, and when certain temporal gaps are revealed between the video strokes, the resulting feeling is sometimes that of an impressionistic style of brush stroke. However, the result of painting is inevitably very realistic since the source comes from real video.

With a simple setting, this interface successfully provides the interactor with the chance to be a painter who draws his/her own portrait and the surroundings. Also, by mimicking the traditional and familiar painter's gestures and behaviors and by using traditional tools, viewers can easily grasp the idea of how to access and interact with this system. However, the lesson that the viewer "learns" is, at best, a simplistic one. The same criticism I have for *Text Rain* applies here. This kind of closed loop, immediate stimulus-response piece does not grant the interactor enough distance, psychological distance, to fully engage the viewer in self-reflection. Whereas this work achieves a quick and easy method for interaction, for me, it trades off many things: The real enjoyment and pleasure of painting, that which comes from the physical process of manipulating real materials and different colors of paint, as well as the process of communicating with oneself through thoughtful and interchanging gazes with the world, both seem compromised and even "cheapened." Also the difficulty of painting that comes with the process of struggling to find one's own styles of brushstrokes, to express one's own idea, or to represent one's own mental images in a visual form through repetitive trials and errors, is gone. These real world experiences are simply replaced with an easy and convenient process of revealing the video captured from cameras.

The next examples are of expanded experimentation with the digital brush. The concept is somewhat related to Rozin's *Easel* in the sense of using a painter's canvas

metaphor, but in these works, representation on the screen as a response to the interaction is not revealed as a direct reflection of a face or body figures. It is more like the idea of "paint-by-numbers" on the virtual screen. Two works will be examined here: *De-Viewer (Zerseher)* (1991-1992) by Joachim Sauter and Dirk Lusebrink and *I/O Brush* by Ryokai. First, with *De-Viewer (Zerseher),* I will look at the how the paint-by-numbers-type of digital painting defines the interactors' perception and behavior through the programmed code and creates a simple and direct mirroring experience. And in a later section, by looking at *I/O Brush,* I will look at how the similar painted canvas work or paint-by-number screen work using a camera-screen interface can be extended through the abstraction of the experience.

De-Viewer (Zerseher) (1991-1992)

In *De-Viewer (Zerseher)*, a framed picture is hanging on the wall of a gallery. On closer inspection the visitor notices that the picture changes at the precise spot where he fixes his gaze (Figure 4.1.4).
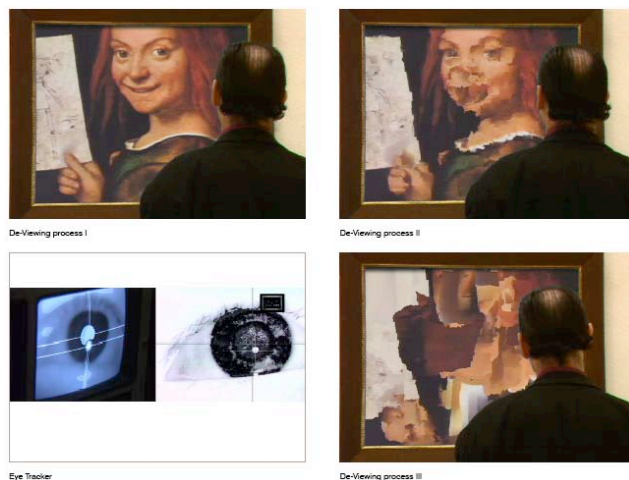
Figure 4.1.4 *De-Viewer (Zerseher)(1991-1992)*
by Sauter, Joachim. & Lusebrink, Dirk
Photo credit: ART+COM 2005

A framed canvas shows the painting through rear-projection, and an eye tracker behind the canvas tracks the precise position of the painting that the viewer's eye looks at. With algorithms applied from a graphic workstation, the picture distorts the precise coordinates of the viewer's gaze. The artists' intention is to

encourage interaction as a prime ingredient of new media. They claim, "Where it used to be the 'Old Master' who left his stamp on the visitor's consciousness, now it is the visitor himself who is in a position to alter the work of art. … It was almost as if the painter was simply exchanging his brush for the mouse. This was art with computers, not yet the beginning of computer art. The picture we have used is Francesco Carotto's 'Boy with a child-drawing in his hand' – the art world's first known depiction of a child's drawing – an appropriate metaphor for the level of sophistication of computer art at the time."[6]

Text Rain and *Easel* were created in the relatively early years in the history of interactive arts. *De-Viewer* was created even ten years before these. As the artists of *De-Viewer,* Joachim Sauter and Dirk Lusebrink say, it might be true that computer art or interactive art is still young and, thus, that it is premature to demand of it a deeper context. In "Transforming Mirrors," David Rokeby mentions that in the early years, for many people, interaction meant control and empowerment. Therefore, interactive technologies are hybrids of our desire to communicate with media as well as our desire to control it. Video games, in his example, provide a sense of power to the participants, but, as Rokeby puts it, "what is actually offered is the amplification of a gesture within a void, a domination of nothingness, the illusion of power." Rokeby adds that, rather than question the level of domination, in order to make the interactive experience richer, we need to understand that interaction is about encounter rather than control (1995, 149).

Interactive System: Control / Freedom, Simple / Ambiguous

In the interactive system, the reactive behavior is defined by a computer program, which is written in advance by the artist, and every time any viewer participation occurs, the computer program is enacted for the spectator. In other words, although the work is

enacted and completed by interactors, the programmed code defines the interactors'

perception and behavior. Depending on the level of defining control and freedom, the

system can be looked at differently by each interactor and can generate different

experiences for them. Sometimes the system is too complex for the spectator to develop a

specific expectation or purpose. In such cases, the interaction becomes ambiguous.

Sometimes the system is too simple, and thus the interaction itself becomes simple. For

instance, the fluxus artist, John Cage's silent composition, *"4'33,"* demonstrates how an

unintentional approach, or the use of indeterminacy or open-possibilities in a work relates

to the audience's perception and interpretation. Ironically, when the system allows wide-

open interaction with no significant constraints, the interactor usually has an unsatisfying

feeling. However, when the interactor's sense of control of, and therefore personal impact

on, an interactive system grows, she often feels empowerment and thus, freedom, even

when her impact on the system is limited.[7]

Audiences enter into the system with some level of expectation, and they want to

get an immediate sense, proof, that the work is interactive. If their expectations are

rewarded, they are easily satisfied. Rokeby (1995) mentions that constraints provide a

frame of reference, a context, within which interaction can be perceived (140) and that

the complexity of the relationship between the interactors and interactive system is not so

much a function of the complexity of the system, but of the complexity of the participants

themselves: "By increasing the amount of filtering that is applied in the perceptual

process that the interactive system employs, the designer increases the reliability of the

resulting information and therefore the unambiguity of control, but at the same time, the

richness of that information is reduced" (149). When the audiences' expectation is not

met, they soon turn skeptical and critical of the system. They think the system itself is ambiguous. Rokeby says that there is a threshold of feeling ambiguity and certainty (unambiguity) for audiences. The less distortion there is in the piece, the easier it is for the audience to identify with the responses of the interactive system. If the level of distortion and complexity rises beyond an interactor's ability to lose him or herself in the mirror, it may become too difficult for him or her to identify with the responses of the interactive system. Therefore, the interactive artist must strike a balance between the interactor's sense of control, which reinforces identification, and the richness of the responsive system's behaviour, which keep the system from becoming closed" (148). This is reminiscent of the notion of creating "balance between the transparency and opaqueness, immediacy vs. hypermediacy" as Bolter, Gromala, and Grusin claim in their book *Remediation; understanding new media* (1999).[8]

This discussion leads me here to a look at another current trend in many art installations. As technologies develop and computers get faster, many artists create systems that can generate their own images from a program. This type of work can be categorized as "paint by number," or digitally simulated images. Yvonne Spielmann explains it as the digital image in "matrix phenomena": "Digital technology can use the potential from constructing unlimited variability, which allows it in the digital mode of presentation to express pictoriality through unrestricted flexibility in the digitally constructed space" (2008). Therefore, "The more use is made of programming functions in electronic manipulation, the more comprehensively can preceding pictorial forms be technically manipulated in all possible ways, which means technically simulated under computing specifications" (4). What I have seen in many art installations is, again, that

this simulated image is being connected with the image-body-screen. With more complex

programming and digital processing now, more complex and fluid pictoriality can be

created on the screen, and when this is combined with the live image of the interactor

between the camera and screen, again the narcissistic mode becomes significantly

intensified. For instance, *Swarm* (2002), by Daniel Shiffman is an interactive video

installation that implements the pattern of flocking birds as a constantly moving brush

stroke (Figure 4.1.5). The artist says, "Taking inspiration from Jackson Pollock's 'drip

and splash' technique of pouring a continuous stream of paint onto a canvas, *Swarm*

smears colors captured from live video input, producing an organic painterly effect in

real-time."[9] *Alluvial* (2007) and *Untitled 5* (2004) by Utterback also show such a

painterly effect.[10] Despite the high level of fluidity and charm and even immersive

attraction on the screen, this type of work often provides the viewer with a relatively

narrow range of perception. The user interaction in this system can be left as either

vague, simple, or even without meaning.
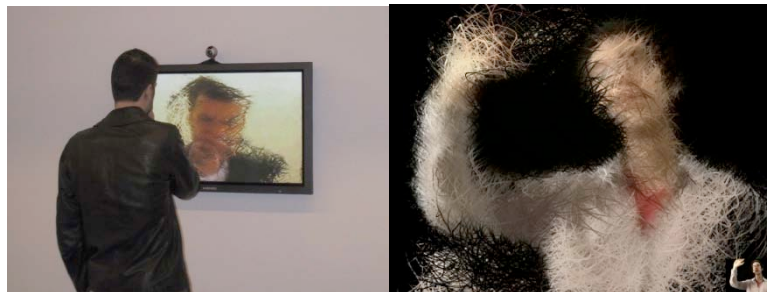
Figure 4.1.5 *Swarm* (2002) by Daniel Shiffman
Photo credit: Daniel Shiffman (www.shiffman.net)

As *De-Viewer* results in only a simple response from the viewer, blocking any

interpretation of his or her encountering experience, this kind of digitally simulated

image on the screen remains as a simple narcissistic interactive experience. Although the

image is not re-projecting a direct reflection of the interactors, the direct and immediate

response of the interactors' images and their movement are still represented as a

mirroring effect with slightly more complicated texture. The digital images are generated,

reconfigured, and displayed in real time. Thus, any difference in time and space plays a

role in the way the medium presents its image. Therefore, the reflection possibly evoked

from this digitally simulated image can stay on the screen without going into any further

realms. Again, the screen is merely a digital mirror.

Wooden Mirror (1999)

Figure 4.1.6 *Wooden Mirror* (1999)
by Daniel Rozin
Photo credit: Daniel Rozin (www.smoothware.com)

In Daniel Rozin's *Wooden Mirror*, several hundred pieces of wood that comprise the screen respond to the movement of the viewer in front of the work (Figure 4.1.6). A tiny camera is hidden at the center of the screen to track the viewer. Every time a single movement is made in front of the camera, the interactor's figure and movement are captured and reflected on

the screen through articulately changing wooden pixels–each individual pixel is rotated a

small degree. The shadow created from the angle of the pixels represents the reflexive

images on the screen. Generally this mirror captures and reflects movements, but

sometimes when a static object stays in front of the mirror, an image with a little more

detail can be reflected. The most aesthetic concept of this work is the metaphorical

transformation of mirror. A mirror is usually a reflective material, but in this work the mirror is replaced with a none-reflective material, wood. This became possible with the help of technology. The synchronized mechanical movement of the wooden pixels, along with the noise made by their movements, creates a certain aesthetic scene in this work.

Both *Text Rain* and *Wooden Mirror* were created in the relatively early phase of interactive media art. Therefore, the achievements of both works are very meaningful and influential. Particularly the historical innovativeness of these works, which deals with the interactive screen, suggested many intriguing features and methodologies to use as interactive techniques in art. As a result, many artists who followed often use this mirror or reflection metaphor for their interactive techniques. In galleries and museums, we still see many screen-based interactive works of art tracking a user's movement in physical space with an embedded camera and then re-projecting the captured images into the virtual space. As Rokeby says, the metaphor of the mirror is used as a technique of expression. "While all interactive works reflect interactors back to themselves, in many works the idea of the mirror is explicitly invoked. The clearest examples are interactive video installations where the spectator's image or silhouette becomes an active force in a computer-generated context. (…) In such a work, the content is contained in this difference between the gesture and its transformed or recontextualized reflection" (Rokeby 1995). The works described thus far are examples of the use of the interactors' bodies, either as a real image or at least a silhouette or shadow, for their projection image. The interactor's body becomes a medium or conduit in these interfaces that connect the camera and the screen through the presentation of images. On the screen, the body has been understood both as a physical structure and as an informational pattern.[11] These

types of interfaces easily compose the immersive environment. Looking at the image of themselves on the screen, the viewers feel narcissitic, attractive, and easily engaged. This is the reason why many cameras face the interactors in interactive art installations. Based on the visual information created by the viewers themselves, these works can easily involve a close interaction between the viewer and the artifact and between the virtual and real worlds. Viewers get to understand this interface relatively easily as Utterback says, "like looking at the mirror and behaving in front of it" (2004) In this situation, viewers are plunged into narcissism from the reflection of themselves.

In "The Construction of Experience: Interface as Content" (1998), Rokeby mentions that a limited representation of the user is inevitably reflected back to the user, modifying their own sense of self within the simulation. Thus, the interface becomes a distorting mirror. By thinking of the difference between mirror and distorting mirror experiences, and revisiting the fundamental questions regarding a subjective realm for reflection, we might be able to continue to think of these notions for design practice. The following example demonstrates a concept similar to that of digital painting with a digital brush, using a camera-screen interface. In this case, however, the camera does not face the interactor; it faces ordinary objects.

I/O Brush **(2004)**

Strictly speaking, *I/O Brush* by Kimiko Ryokai et al. is not a work of art. The creators of this work themselves say that it is a new "tool" for drawing that seeks to encourage young children to explore colors, textures, and movements found in everyday materials from their immediate environment by picking them up and drawing with them. *I/O Brush* looks like a regular physical paintbrush, but it has a small video camera with

lights and touch sensors embedded inside. As a result, sampled sources captured by this

camera become the special "ink" on the canvas (Figure 4.1.7). As a tool, *I/O Brush*'s

potential is in its idea that young children can transform concrete and familiar material

into abstract representations in visual art projects and that, therefore, children can learn to

represent their ideas on paper and reflect on their thoughts through abstract

representations.

If we can say that action "causes" and that

results "affect," then we might say that in the

process of interaction, the creator often uses

abstraction to create a sense of distance for the

viewer in order to provide her with a means to

reflect on her thoughts. In this sense, a digital

brush proves a useful method for providing

immediate transmission without any delayed time.

Perhaps the process in *I/O brush* requires higher

abstraction than does *Drawing from Life* or *Text*

Rain. Since interactors need to have more specific

Figure 4.1.7   *I/O brush* (2004) by Kimiko Ryokai,
Photo credit: Kimiko Ryokai

intention and purpose, and each step of their process requires that they reflect on their

actions by anticipating the abstsract image that each action will ultimately create. Digital

artists who use the camera and screen interface can think about this temporal and

perceptual distance for their design.

To summarize, several early screen-based interactive art installations are good

examples of the interactive screen reflecting the interactor's body, which is standing just

in between the camera and screen. In these works, the mirror-like reflection is widely explored. Among these art installations, we can find two big approaches, one using the interactor's body as a silhouette or shadow with the body's "performance" represented on the screen as in a mirror. The other exploits the painting canvas metaphor by using real-time video. Both of these techniques have limitations in creating a reflective experience. New media screens, however, as a boundary on the realm of imagination, can explore more diversely, the tension and relationship between the interactors and their reflection.

4.2. Design of Screens in Aesthetic Distances (Window and Mirror)

As mentioned in the section "Screen as a Boundary Object" (Chapter 3.1.), the Albertian notion of the painting is one that often refers to a window that offers the viewer access to the world beyond. A "window" is a thing that we look "through." The window metaphor is repetitively used in media to achieve conceptual transparency in an experience. The name of the Microsoft operating system is actually "Windows," and it implies a utopian dream of journey toward the world beyond or a fluid journey between the different worlds without any barrier. The "mirror," on the other hand, is literally what we are looking "at" or "into." The mirror is a material or object that makes us look at the self by reflecting our image on its surface. In theories in psychology and philosophy, the mirror experience implies the experience of identifying the self. Jacques Lacan reminds us that self-consciousness and self-reflection, which is in part a construction of the ego, can be established through the mirror stage.

If the screen invites the viewer to look at the world "through" the window, the screen (window) is transparent. If the screen allows the viewer to look "at" himself and reality "in" the mirror, the screen (mirror) is opaque, since it is reflective and bounces

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back the image. In this way, the relationship between the window and mirror is also related to the concepts of illusion and reality. In new media, because of its fundamental property of interactivity, the relationship between reality and illusion, and opacity and transparency becomes more complicated. In *Windows and Mirrors: Interaction Design, Digital Art, and the Myth of Transparency*, Jay Bolter and Diane Gromala (2003) discuss the transparent optic (invisibility) and opaque optic (visiblity) for new media design and new media experience through the metaphor of "windows" and "mirrors." The concept of "transparency" is to look through the medium, and "hypermediacy" is to look at the medium in new media. If the immersive experience to the virtual world is connected to transparent experience, agency and hypermediacy are linked to the way in which the interactor's look is controlled. Hence, Bolter and Gromala suggest that interactive digital design needs to establish a rhythm between the two strategies of transparency—made possible by a mastery of techniques—and reflection, as the medium itself helps us understand our experience of it. Clearly, good design and experience of/with the screen could be articulated as interplay between window and mirror. To take this a step further, with artistic imagination, the interactive screen could suggest the experience of a mirror but not that of a direct reflection. It could suggest a window but not one that is a transparent gate. As in Magritte paintings, which we have looked at, the transforming mirror would reflect the viewer's backside of themselves and a window would deliver the viewer to a world whose meanings are infinitely opening. To illustrate, I would point to two interesting paintings by Rene Francoise Magritte, both of which subvert the general implication of the metaphors of window and mirror here.

Mirror but not as a direct reflection, and window but not as a transparent gate

The surrealist works of Magritte display amusing juxtapositions of ordinary images, and the effects of his works of art provide puzzlement, mystery, or bewilderment to their viewers. In Magritte's 1963 painting, *The Telescope (La lunette d'approche)* (in Figure 4.2.1), there is a casement window with two panels of glass. Through the glass, we can see fleecy clouds in a serene blue sky. One of the panels of the window is shut and the other is slightly ajar, opening into the room. But through the

Figure 4.2.1 *The Telescope (La lunette d'approche)* (1963), by René Magritte

opening between the two halves of the window, what we see is darkness. If the artist's representation of the window is right, we should see a continuation of the scene in the space between the windowpanes. In *Art and Cognition: Integrating the Visual Arts in the Curriculum* (2002)*,* Arthur Efland asks, "Did the artist make a mistake? Did he forget to finish this work? If not, is there a logical explanation for this illusion? What could Magritte have had in mind when he painted this picture?" Magritte challenges the notion that a common sense of representation is to reality as the window is to the world outside it. Through the illusion "both asserted and denied in the placid but disturbing terms," he tricks our eye to read the sky both as space and as flat surface, that is, as something seen

both *in* and *through* the window. "Signs he uses are not transparent, but opaque—or as infinitely empty as the black void between image's window pane" (Morgan 1997, 147).

In another painting created by Magritte, *Not to be Reproduced (La Reproduction Interdite)* (see Figure 4.2.2), a man stands before a mirror showing his back to us. However, similarly to *The Telescope*, this work also provides an unusual feeling to the viewer. In the mirror, we expect to see the face of the man who is standing in front of the mirror, but the reflection is not his face but his back to us. Inspired by this paradoxical image, Mark Young (2006) says in his poetry, "Magritte says it is not to be reproduced though he reproduces it anyway. We do not see the

Figure 4.2.2 *Not to Be Reproduced (La Reproduction Interdite)* (1937), by René Magritte

face. Magritte does not produce it. Or reproduce it. Is not reflected in the mirror for what comes back from there is not mirror-image but reproduction. Almost as if we were peering over a shoulder only to see the shoulder that we were peering over. But it is reflection." In the painting, Edgar Allen Poe's book, *Adventures of Arthur Gordon Pym* is on the mantelpiece and it is partially reflected on the mirror. Maybe only through this book on the mantelpiece can we recognize the image in front of him as a mirrored image. Young points out that this book is about an imaginary journey: "Magritte's painting is a journey of imagination about what happens between two points that are the same point

though there is distance between them. He says it is not to be reproduced. It is reproduced here."

At first look, Magritte's paintings show a mirror or a window as representational images, but when we look at them closely, they reveal that they are not just simple representations of a window and a mirror. They are a distorting mirror or transformed window. If we expect a certain image from them, it is due to our habitual expectation and desire for it. Each painting requires a suspension of belief, creating its own unique atmospheric pressures, an awakening of surprise. His images threaten the viewer with the abyss of meaning, suggesting that signs and meanings are incongruous. We can see that the dark gap between signifier and signified is in transit in our consciousness as seen from his famous painting *The Treachery of Images* (1928–29) showing an image of a pipe and the text of "*Ceci n'est pas une pipe (This is not a pipe).*" The moment of puzzlement, bewilderment, or confusion results when our habitual experience and expectation are betrayed.

The moment of this bewilderment is the moment when seams fall apart and when the viewer can get an uncanny and disruptive feeling. At the same time, the moment when we find this glitch and rupture can be a pleasing moment in the aesthetic journey. Efland says that works of art often make heavy cognitive demands on thinking. Such works awaken

Figure 4.2.3 *The Treachery of Images* (1928–29)
by René Magritte,
Image copyright:
Los Angeles County Museum of Art

intellectual inquiry for thought that does not begin in the abstract, but with images directly sensed or recalled in memory: "Abstraction is an 'achievement of the

imagination,' and the meanings derived from this effort may bear on our lives in the social and cultural worlds we inhabit" (Efland, 2002).

Both Magritte paintings suggest that the possible realm of imagination may be to look at mirror but not as a regular mirror and look at the window but not as a regular window. This is to think of the mirror but not as a direct reflection and to think of the window but not as a transparent gate. This could be the apparatus to form an appropriate distance from which to look at the object apart from symbolic meaning.

Reflection and Reflexiveness

Indeed, whether the meaning of window and mirror is approached strategically or not, artists often use opaque windows and distorting or transforming mirrors as methodologies or as intriguing concepts. Thus, sometimes the meaning of windows and mirrors is mixed or intertwined. Also sometimes the difference between the reflection and reflexiveness is found in different artistic methodologies in several contexts. For example, in 1978, as discussed in the previous chapter, Krauss looked at video as a reflective medium. In her essay, she compares the autoreflection of the video effect to the reflexive effect in other arts. But in 2008, Yivonne Spielmann defines the video as a reflexive medium in her book *Video: The Reflexive Medium*. Perhaps the meaning could be intermixing or changing since the media experience keeps evolving. Since I think it will be important and meaningful to understand the meanings of two words from their literal meanings, I have examined the literal meaning of "reflection" and how it is different from the literal meaning of "reflexiveness." This process is not to argue about which usages are more appropriate, but to find a more meaningful approach for a reflective practice in experiences with works of art.

If the word "reflection" is searched in Merriam-Webster dictionary and Wikipedia, we can find the following results. I only picked several meanings that seem relevant to this examination.

Reflection, Reflexion (Etymology: an alteration of reflexion, from Late Latin reflexion-, reflexio (act of bending back, from Latin reflectere)

The first several meanings are related to physics 1) the return of light or sound waves from a surface; 2) the production of an image by or as if by a mirror; 3) the action of bending or folding back. Several other meanings are related to philosophical and psychological attitudes or processes. 6) a thought, idea, or opinion formed or a remark made as a result of meditation; 7) consideration of some subject matter, idea, or purpose. As a psychological process, "reflection" shares a meaning with "introspection," which mental self-observation, the analytical reporting of cognition or conscious inner thoughts, desires and sensations. It is a conscious, mental, and usually purposive process relying on thinking, reasoning, and examining one's own thoughts, feelings, and, in more spiritual cases, one's soul. It can also be called contemplation of one's self, and is contrasted with extrospection, the observation of things external to one's self. Introspection may be used synonymously with self-reflection and used in a similar way.

In this regard, the words ***Self-Reflection*** and ***Self-Examination*** include: 1) a reflective examination (as of one's beliefs or motives): introspection, and 2) examination of one's body especially for evidence of disease. When we mention "human self-reflection", it is the capacity of humans to exercise introspection and the willingness to learn more about our fundamental nature, purpose, and essence. The earliest historical records demonstrate the great interest which humanity has had in itself. Human self-

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reflection invariably leads to inquiry into the human condition and the essence of humankind as a whole. Human self-reflection is related to the philosophy of consciousness, the topic of awareness, consciousness in general, and the philosophical mind.

On the other hand, if the word "Reflexiveness" or "Reflexivity" is searched in the same dictionary:

Reflexiveness (Etymology: Medieval Latin reflexivus, from Latin reflexus)

1) a: directed or turned back on itself; also: overtly and usually ironically reflecting conventions of genre or form <a reflexive novel> b: marked by or capable of reflection : reflective; 2) of, relating to, characterized by, or being a relation that exists between an entity and itself <the relation "is equal to" is reflexive but the relation "is the father of" is not>; 3) of, relating to, or constituting an action (as in "he perjured himself") directed back on the agent or the grammatical subject; 4) characterized by habitual and unthinking behavior.

Also, reflexivity, in sociology, has a meaning of an act of self-reference where examination or action 'bends back on,' refers to, and affects the entity instigating the action or examination. In brief, reflexivity refers to circular relationships between cause and effect. A reflexive relationship is bidirectional; with both the cause and the effect affecting one another in a situation that renders both functions causes and effects. Reflexivity is related to the concept of feedback and positive feedback in particular. In mathematics, if a relation is reflexive, all elements in the set are related to themselves. For example, the relations "is not greater than" and "is equal to" are reflexive over the set

of all real numbers. Along this line, **_Self-Reflexive_** means, 1) marked by or making reference to its own artificiality or contrivance e.g. self–reflexive fiction.

Through this research, we can see that "reflection" or "reflexion" is based more on the physical process of returning light or waves from the surface or the production of images by the mirror. Also because of its physical meaning, the metaphorical meaning relates to a psychological process of awareness, consciousness that includes philosophical consideration, meditation, and construction of ego or self. On the other hand, "reflectiveness" or "reflexivity" is based more on the inter-relational situation, both the cause and the effect affecting one another in a situation that renders both functions into causes and effects.

From this stance, the video medium as a reflective medium in the essay "Video: The Aesthetics of Narcissism" (1978) by Krauss, can be understood better. In the middle of this essay, questioning herself, Krauss compares autoreflection of video effect to the reflexive effect in other arts: "Isn't the mirror reflection variations on the reflexive

Figure 4.2.4 *Flag* (1954-55),
by Jasper Johns
Encaustic, oil and collage on fabric
mounted on plywood.

Image copyright: The Museum of
Modern Art, New York.

mode in which contemporary painting, sculpture, and film have successfully entrenched themselves? (183-184)" Exemplifying with Vito Acconci's *Center* (Figure 3.4.1) and Jasper Johns's *Flag* (Figure 4.2.4), Krauss discusses that reflexiveness (*Flag*) is the "fracture into two categorically different entities that can elucidate one another insofar as their separateness is maintained, (184)" since it uses "the synonymy between an image (the flag) and its ground (the limits of the picture surface) to unbalance the relationship between the term picture and painting" (184).

On the other hand, mirror reflection (*Centers*) implies the vanquishing of separateness. Its inherent movement is toward fusion. "The self and its reflected image are of course literally separate. But the agency of reflection is a mode of appropriation, of illusionistically erasing the difference between subject and object" (184). In *Centers*, "There is no way for us to see *Centers* without reading that sustained connection between the artist and his double. So for us as for Acconci, video is a process that allows these two terms to fuse" (184). It is dédoublement, or doubling back, and the mirror reflection of absolute feedback is a process of bracketing out the object. "One could say that if the reflexiveness of modernist art is a dédoublement, or doubling back, in order to locate the object (and thus the objective conditions of one's experience), the mirror reflection of absolute feedback is a process of bracketing out the object" (184). For Krauss, video's real medium is a psychological situation that withdraws its attention from an external object—the Other—and invests it in the Self. This suspended space is the space of narcissism, and "Narcissism is characterized, then, as the unchanging condition of a perpetual frustration" (185), and "the feedback coil of video seems to be the instrument of a double repression: For through it consciousness of temporality and of separation between subject and object are simultaneously submerged. The result of this submergence is, for the maker and the viewer of most video art, a kind of weightless fall though the suspended space of narcissism" (186).

She mentions that although the implicit idea refers to the same thing in both reflection and reflexiveness—both are cases of consciousness doubling back upon itself in order to perform and portray a separation between forms of art and their contents, between the procedures of thought and their object—, the differences are total. The

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difference between reflection and reflexiveness is that the former "moves toward an external symmetry; whereas the latter is a strategy to achieve radical asymmetry, from within" (183). In the repeated self and dedoublement, the question of Self-sameness, or the samenesss of difference seems important. If there is a potential of difference contained in "inter" or "within," the self would create differently. In the digitally simulated situation, when intermediality and interactivity is applied, the Self becomes indistinguishable from the 'double,' and inner difference disappears.

As Krauss finds the unchanging symmetry in video's reflection when it is compared with painting, Spielmann finds extreme identicalness in the numerical multiplication of digital simulation when it is compared with video. As I have said, as the medium evolves, the perception and interpretation of the medium seem to evolve along with it. Interestingly, the innate seam in the reflection, which eventually makes the difference, was long ago expressed in a Greek myth, in the stories of Narcissus and Echo.

Narcissus and Echo

"Transforming Mirrors" (1995) by David Rokeby raises numerous questions about the condition of reflection and distorted mirroring, particularly, through the observation and comparison of the Greek myth of Narcissus and Echo. In the following section, by reusing the story of Narcissus and Echo in *Metamorphoses* by Ovid (2004), and McLuhan's text, which are referred to in Rokeby's text, I will continue to examine the relationship of autoreflection as dedoublement, which vanquishes separateness, and reflexiveness, which maintains differences and separateness. I will also apply the notion of Lacan's double gaze here at the end of the text.

In Greek mythology, Jupiter, the king of the Olympians and known for his many love affairs, sometimes uses the beautiful young nymph Echo to distract and amuse his wife Hera with long and entertaining stories. He then takes advantage of these moments to ravish the other mountain nymphs. When Hera discovers the trickery she punishes the talkative Echo by taking away her voice, except the ability of foolish repetition of another's shouted words. All Echo could do was repeat the voice of another.[12]

When Echo sees Narcissus in the forest and falls in love with him, she longs to address him but is unable to speak first. When Narcissus finally hears footsteps and shouts, "Who's there?" Echo answers, "Who's there?" And so it goes, until finally Echo shows herself and rushes to embrace Narcissus. He pulls away from the nymph and vainly tells her to leave him alone. Narcissus leave Echo heartbroken, and she spends the rest of her life in lonely glens, pining away for the love she never knew, until only her voice remains.

The Narcissus story continues after the Echo story. "Narcissus glimpses his image in a pool of water, and falls in love with himself. He does not initially realize that it is his own image, and falls into despair that the youth in the pool does not return his love." Here, Rokeby notes that the name "Narcissus" is derived from the Greek word narcosis (numbness) by quoting McLuhan's text about the Narcissus in *Understanding Media* (1995); "This extension of himself by mirror numbed his perceptions until he became the servomechanism of his own extended or repeated image. The nymph Echo tried to win his love with fragments of his own speech, but in vain. He was numb. He had adapted to his extension of himself and had become a closed system" (41). McLuhan stresses that the sense of the Narcissus myth results from false recognition. What he means by "the

extension of the sense" is a mechanism of "self-amputation" that works by countering an excessive stimulus. He says that such amplification brings irritating pressures and is bearable by the nervous system only through numbness or blocking of perception. Self-amputation forbids self-recognition. "The principle of self-amputation as an immediate relief of strain on the central nervous system applies very readily to the origin of the media of communication from speech to computer" (42-43).

In this context Lacan's important statement can occur, "*I see myself seeing myself.*" He claims two dimensions in narcissism. It is always founded on a misunderstanding of the structural integrity of the subject. Therefore, this contradictory effect causes tension and threatens the subject's image of unity (Taylor 2003). Lacan's uncanny effect of gaze includes erotic drives in that the subject perceives her own unity within herself and her corporeal image, but at the same time it also includes aggressive breaks in that the subject's perception of unity finds the disunity in her image that she is faced with (Lacan 1978, 81).[13]

As another extended thought, Rokeby also suggests thinking about two different kinds of reflection from the Greek myth. If the Narcissus story in the pool is "the perfect mirror-like, synchronous reflection," Echo's speech is "delayed and distorted reflections." He suggests that we look at Echo's reflection in a slightly different context. "The echo is, to some extent, an original sound, and therein is the magic and charm of it. It is not merely a repetition of what was worth repeating in the bell, but partly the voice of the wood; the same trivial words and notes sung by a wood-nymph" (Thoreau 1910). "While the unmediated feedback of exact mirroring produces the closed system of self-absorption (the reflection of the self is re-absorbed), transformed reflections are a

dialogue between the self and the world beyond. The echo operates like a wayward loop of consciousness through which one's image of one's self and one's relationship to the world can be examined, questioned and transformed" (Rokeby 1995, 146).

Through the study of reflection and reflexiveness, and the two dimensions of self-amputation from the repetition of the sameness and delayed or distorted reflection, the interactive-screen based art experience can be looked at again. How can the experience become the experience of transformed reflection like in Echo? How can the dedoublement become a constructive dialogue between the self and the world beyond? While thinking about the reflection of Echo, I think of the minimal difference that begins vibrating from the minimal gap of space or time delay. The innate and very minimal seam in the reflection that eventually reveals the difference.

Différance and Inframince

In the essay "Différance" (1984), Derrida indicates that différance plays on the French word "différer" which means both "to defer (to temporize, as temporization)" and "to differ (to be not identical, as spacing)." "One is the other in différance, one is the différance of the other" (1984, 18). A number of heterogeneous features in this word generate and govern its textual meaning. Relating to deferral, the first notion is that words and signs can never fully summon forth what they mean, but can only be defined through appeal to additional words, from which they differ. Thus, meaning is forever "deferred" or postponed through an endless chain of signifiers. Relating to difference, the second notion concerns the force, which differentiates elements from one another and, in so doing, engenders binary oppositions and hierarchies, which underpin meaning itself. Derrida says, "If, by hypothesis, we maintain that the opposition of speech to language is

absolutely rigorous, then *différance* would be not only the play of differences within language but also the relation of speech to language, the detour through which I must pass in order to speak, the silent promise I must make; (...)" (1984, 15). "And on the basis of this unfolding of the same as *différance*, we see announced the sameness of *différance* and repetition in the eternal return" (1984, 17). "According to Derrida, différance itself is a "quasi-transcendental" concept[14], insofar as the difference between words both engender meaning and forever defer meaning: Therefore, différance serves as both the condition of possibility and the impossibility of meaning."[15]

The horizon of the infinitely other, the difference between the same and the other, resembles the situation of self-reflection.[16] *Différance* is negation, rejection, which would then come to protect, postpone, or reserve itself.[17] In "Freud and the Scene of Writing" in a book *Writing and Difference,* (1978) Derrida says that difference "is thus delay which is in the beginning. Without which, *différance* would be the lapse which a consciousness, a self-presence of the present, accords itself. To defer (différer) thus cannot mean to retard a present possibility, to postpone act, to put off a perception already now possible" (1978, 203). In "The Authority of Drawing: Hand, Authenticity, and Authorship" (2006), Michael Wetzel writes, "Derrida's designation of the minimal gap as différance has a predecessor in Marcel Duchamp's concept of inframince, which may be translated as 'water-thin' or 'infra-small', 'infra-thin' or 'infra-minimal' (as opposed to 'ultra-')" (56). The inframince qualifies a distance or a difference that we cannot perceive, but that we can only imagine.

Critical Distance

Reflection in physics is the return of light or sound waves from a surface. In acoustics, a critical distance means the distance (measured from the talker) where the direct speech and the reflected (or reverberant) speech are equal in intensity. Critical distance suggests the distance that separates us from our encountered object in order to measure that distance and to articulate that stance. Therefore, for reflection, a critical distance is required. While looking at the Echo experience and the minimal gap of différance, in real-time and interactive communication—the situation of instantaneity and immediacy—, and in the intensified closed feedback loop, I think that we may get the critical distance to look back on ourselves from a very minimal gap (distance/delay) or minimal difference.

What I see from the Vito Acconci's or Bruce Nauman's videotapes is this double side of Narcissism (refer to section 3.4 in this thesis). Perhaps as a performer in between the monitor and camera, and in the "flow" of construction and the reconstruction of images, Acconci or Nauman might feel the erotic drives to his own subjectivity. But what we can also see from their videotapes is their strategic distance in their use of the medium. They fully use the mechanism of video as narcissistic medium that delivers this mirror effect to the viewer, and at the same time, they also use the disunity of the mirror effect to provide tension for the viewers. This tension causes the viewer to look back on his or her subject image through the image of the artists. From its never-ending reflective loop created by the videotape over the length of video, the tension of in and out, opening and closing is returned to the viewer. They can always enter in and come out from its loop flexibly. While explaining *Boomerang*, Krauss mentions that it simultaneously opens the plane of expression and the plane of critical reflexiveness; "to how long it takes

for its receiver to get the 'point.' Latent within the opening situation of *Boomerang* is its own conclusion; when that is reached, it stops" (1978, 187). Although the artist uses the tape's length to create the discourse, to shape and develop an argument for its receivers to get the "point," but for the receivers (audiences) when its aesthetic fullness is reached, it is the moment of its own conclusion.

In the process of designing an interaction or designing interfaces, the sustainable feedback system is important, but we also need to open this closed feedback loop to leave room for users to communicate their experience with the world. Therefore, the viewers are able to achieve an imaginative space and time in their interactive experience. While engineers strive to maintain the illusion of transparency in the design and refinement of media technologies, artists and designers explore the meaning of the interface itself, using the various transformations of the media experience. The window-mirror experience, as an imaginative realm, does not necessarily require a big change. This experience could be made with just a minimal gap of experience like Echo reflection. Although it begins from the inframince, it could deliver a deferred meaning infinitely. Through screen-based artwork, I have tried to create this inframince. It is a journey of finding the "in-between" experience (refer to my artist statement, also refer to my first solo exhibition). As I have already examined, this could be a way to expand or open the multiple layered closed-loop system.

As mentioned earlier, finding the in-between experience can be a matter of luck, as Barthes says (refer to section 3.7.) or it can exist only in the imagination as Duchamp's inframince means itself. But Niklas Luhmann also says in his book *Art as a Social System*, "a work qualifies as art only when it employs constraints for the sake of increasing the

work's freedom in disposing over further constraints" (2000, 35). When we look at the

history of art, we can see that the constraint of work has actually required more artistic

imagination and brought more possibilities.

Mirror but not as a direct reflection and window but not as a transparent gate II

Figure 4.2.5 *Take your time* (2008) by Olafur Eliasson
Photo credit: P.S.1 Contemporary Art Center

Thus far, I have discussed the mirror, but not as a direct reflection, and the

window, but not as a transparent gate, as in Magritte's paintings. By comparing the

meaning of reflection and reflexive through Jasper John's painting and Acconci's video, I

also discussed the little delay, or interstice or seam that makes different perceptual

experiences through the notion of Derrida's concept of différance and Duchamp's

concept of inframince. Through these discussions, I've tried to expand the notion of

window and mirror to the possibilities of reflective experience with mirrors and

transcendental and imaginative experiences through windows. Rokeby's article

"Transforming Mirror," which describes his conceptual and critical approach to his interactive installation, becomes a good conceptual and supportive example of this.

Recently, I have encountered two pieces of art that provide the transforming mirror experience and the experience of a blind window, one that did not function as s a transparent gate. In the fall of 2008, P.S.1 Contemporary Art Center in Long Island City, Queens, New York presented an exhibition "Take Your Time" with Olafur Eliasson's work. The P.S.1 Contemporary Art Center website introduced the artist's large-scale immersive environments, installations, sculptures, and photographs as works that elegantly recreate the extremes of landscape and atmosphere, "as they foreground the sensory experience of the work itself."[18] In his work, "Eliasson recontextualizes elements such as light, water, ice, fog, stone, and moss to create unique situations that shift the viewer's perception of place and self. By transforming the gallery into a hybrid space of nature and culture, Eliasson prompts an intensive engagement with the world and offers a fresh consideration of everyday life."[19]

When I visited the third floor of the center, I came across *Take your time* (2008)[20]. It is a giant mirror that is slightly convex and is mounted slightly slanted on the ceiling, and is slowly rotating (Figure 4.2.5). The overall experience made me little bit dizzy. While looking up and seeing the environment continuously changing, I actually lost my balance. It was a mirror, but by putting the mirror at a different degree, Eliasson created a constantly changing perception for the viewers.

I had a very different experience when I encountered two photographs, in the book *Window | Interface* (2007), by Sabine Eckmann and Lutz Koepnick. In the book was Jeff Wall's photographic work entitled *Blind Window* (*No.2 and No.3,* Figure 4.2.6

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and Figure 4.2.7 respectively). Wall's images show windows but not ones that we can look through. They block our view and invite us to "sites of 'non-site'" (86). In one of the book's essays "The Aesthetics of the Interface," Koepnick writes, "Wall's camera captures a world whose denial of fenestral looking—the shutting down of framed views onto anything at all—radiates disaster triumphant. … But in the end, we encounter all this only as a pale substitute for what the images no longer show: the perspective through a window on to a world in which life and matter might unfold and thus engage our imagination, our affect, our hope for a different future" (2007, 35-36). In

Figure 4.2.6 *Blind Winow, No. 2* (2000) by Jeff Wall

Figure 4.2.7 *Blind Winow, No. 3* (2000) by Jeff Wall

the same book in another essay, "Seeing and Performing," Sabine Eckmann writes, "Windows and screens in the artworks discussed in this essay are engaged as tools in order to foreground the limitations of pure vision. As such, they demonstrate the insufficiency of relation to the world through framed and fixed images alone, through mechanisms that provide static and stable surfaces from which to contemplate ourselves" (2007, 85-86).

Like the window and the mirror in Magritte's paintings *The Telescope* and *Not to be Reproduced,* which I discussed earlier in this chapter, Eliasson's mirror shows a mirror but not as a direct reflection and Wall's windows show windows, but not as transparent gates to look through. Like Duchamp's concept of the inframince and Derrida's concept of différance, the very "in-between" can reveal and finally create the difference in artistic exploration. Indeed, many artists explore the metaphoric change of the mirror, such as a slowly rotating mirror, broken mirrors, transforming mirrors, and so on. They all question how they can manipulate the viewer's gaze and interpretation to reflect the surface of that gaze for their self-contemplation.

4.3. Screens in the Notion of Passages (Screen in Involuntary Memory)

This chapter will continue to look at screen-based artwork, particularly screens which reveal the notion of passage, therefore evoking involuntary memory in their perceptual experience. The works described below are not examples of interactive media work, but they are fairly recent work using new media technologies. By examining these works and analyzing the experiences that each instills in viewers, this part will discuss how the media experience can create different spatial and temporal perceptions.

Jim Campbell's LED Works

Jim Campbell's LED screen works are composed with a matrix of LEDs in rows and columns. Each discrete LED screen becomes a display sometimes for a static image and sometimes for moving images. For the moving images,

Figure 4.3.1 *Motion and Rest #5* (2002)
by Jim Campbell
Photo credit: JimCampbell.tv

Campbell shows a short sequence of video, which has either calm audio that the viewer can hear only just in front of the screen, or no audio at all.

Campbell's LED screens incorporate several layers of abstraction. The matrix, using several hundred LEDs, displays very low-resolution images with each individual LED becoming an individual pixel of the image. Thus, if the viewer looks at the screen at a very close distance, the image or the movement of the images

.3.2 *Motion and Rest #5* (2002)
by Jim Campbell

are seen just as an abstract image. Only the discrete individual LED comes into the eyes. But as the viewer steps away and gains distance from the screen, the display gradually presents a relatively detailed part of the larger image, making the larger image more recognizable/identifiable. By stepping back and forth from the screen, the viewer can find his/her perception slowly changing and become either abstracted or immersed into the contents. Since the screen does not show as much as an image on a TV screen, we feel that all the details that are present in the individual identities of the persons in the video are grayed out, and we naturally gain a certain perceptual and aesthetic distance from the scene. Campbell's series work, *Motion and Rest,* displays the abstracted walking movement of a disabled person (Figure 4.3.1, Figure 4.3.2). Campbell comments: "Using techniques of very low resolution, the gait of each person is distilled from other personal traits. (One starting point for these works was Muybridge, but unlike Muybridge, the clothes and hairstyles and gender et cetera of these figures are gone. Only the gait remains.)"[21]

Campbell uses the video particularly to elevate the contemplative interpretation of the viewer. The simple and solemn content of man walking with a cane or the steps of a library seem to elicit from the viewer a sympathetic view or a memory of being there and then. Although with a

Figure 4.3.3 *Church On Fifth Avenue* (2001), by Jim Campbell

very specific title revealing the specificity of the place such as "Church on the Fifth Avenue" or "Library (New York Public Library)" the viewer can assume that the scene in the image is decisively captured and prepared, at the same time the viewer can perceive that the video always keeps a relatively objective distance from the scene. Again as a result of Campbell's objective and abstractive techniques and his use of an angle and the perspective, the overall viewer experience begins to vacillate between the present and memory, between specific and general.

Sometimes Campbell puts a panel in a semi-transparent or diffusing material in front of the screen to blur the screen. This also elevates the abstraction and presents a metaphorical transition from a digital representation to an analog one, evoking the poetic vibration between blurry and

Figure 4.3.4 *Library* (2004) by Jim Campbell
Photo credit: JimCampbell.tv

distinctive, static and moving, permanent and transient. For example, *Church On Fifth Avenue* (2001), a matrix of 32 x 24 (768) pixels made out of red LEDs, displays a pedestrian and a traffic scene in NY from an off street perspective (Figure 4.3.3). With a

sheet of diffusing Plexiglas angled in front of the grid, as the pedestrians in the work move from left to right, the figures gradually go from a discrete representation to a continuous, blurred one. *Library* (2004) is composed of a high-resolution photogravure of the New York Public Library, printed on rice paper and placed in a Plexiglas frame suspended in front of an LED surface containing a 25-minute loop video of low-resolution moving images (Figure 4.3.4). Indistinct images of birds and people appear to move in and out of the library and across the façade. Through the low-resolution screens with or without different materials such as Plexiglas positioned in front of the screens, Campbell experiments with different distances between the screen and the viewer's perception. Through diverse layers of abstraction, sometimes Campbell's works lead the viewer to an immersive and/or meditative feeling and involuntary memories.

Chartre Bleu (1983–1986)

Another work that leads the viewer to a passage of time was one that I saw at the Grey Art Gallery of New York University. It was an early winter day in 2003 when I visited the gallery in a class tour group. I had no idea what we would see that day. I discovered that when there is no expectation about a work or no pre-knowledge of the work, a chance to have a fulfilling, meditative experience from the artwork—an involuntary memory—becomes more easily possible. The exhibition was titled "Everything Matters / A Retrospective for Paul Kos." I just slowly walked to the corner of the last

Figure 4.3.5 *Chartre Bleu* (1983–1986), by Paul Kos

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room in that exhibition. At first, I did not quite realize that what I was seeing was an exhibited piece of art because it looked like a normal window through which daylight was coming. But soon I began to think that it was unusual to have that kind of stained glass window in this kind of gallery space. I was right! What I was looking at was a piece in the exhibition. It was a video installation entitled *Chartre Bleu* (1983–1986). As soon as I realized this, I was taken to a level of deep, endless contemplation.

In *Chartre Bleu,* Kos stacks twenty-seven video monitors (9 high and 3 wide) in order to comprise an architectural twenty-seven-channel stained glass window (see Figure 4.3.5). With these monitors, he recreates the experience of a towering cathedral window. On the monitors, videos compressed into twelve minutes play the passage of one day in Chartres. In "Us and Them," John Haber, who reviews galleries around New York City online, writes, "One may enter a room flooded with light. As one waits for something to happen, almost imperceptibly it changes. As afternoon and evening fall, a growing darkness heightens the lead tracery. It clarifies the delicate images before sinking them again in obscurity. Then immediately they grow light once more. … *Chartres Bleu* should take anyone out of a narrow perspective for twelve minutes, if not longer. Then again, art may always sit uneasily beside notions of us and them" (Haber, 2003). Twelve minutes in real-time may not be that long, or it could be long. But in this work, the slow transition happening over the twelve minutes was enough time to deliver a holy (sacred or divine) state in which to think about the world, which changes from moment to moment and by itself. This state of holiness is not a certain one that belongs to religion. It comes from the momentum that the viewer perceives the whole rest of the world around her. It was the momentary feeling of "presentness."

Listening Post, **Ben Lubin & Mark Hansen**[22]

     Listening Post is a multimedia installation (net art project) by a sound artist, Ben Rubin, and a statistician, Mark Hansen. This work shows virtual conversations from real public Internet chat sites in a public space. A suspended, curved display grid with more than 200 small rectangular electronic screens provides a immersion into the more than thousands of fragments of texts continuously gathered in real time from unrestricted Internet chat rooms, bulletin boards, and other forums (see Figure 4.3.6). Each piece of incoming text is organized according to different statistical criteria; excerpts may be chosen based on word counts, common phrases, or shared subject matter. An audio component alternates musical passages with a vocalization of the captured messages. The result is that random topics emerge and change from day to day, hour to hour; in effect creating an almost biorhythmic visual and sonic response to global conversations.
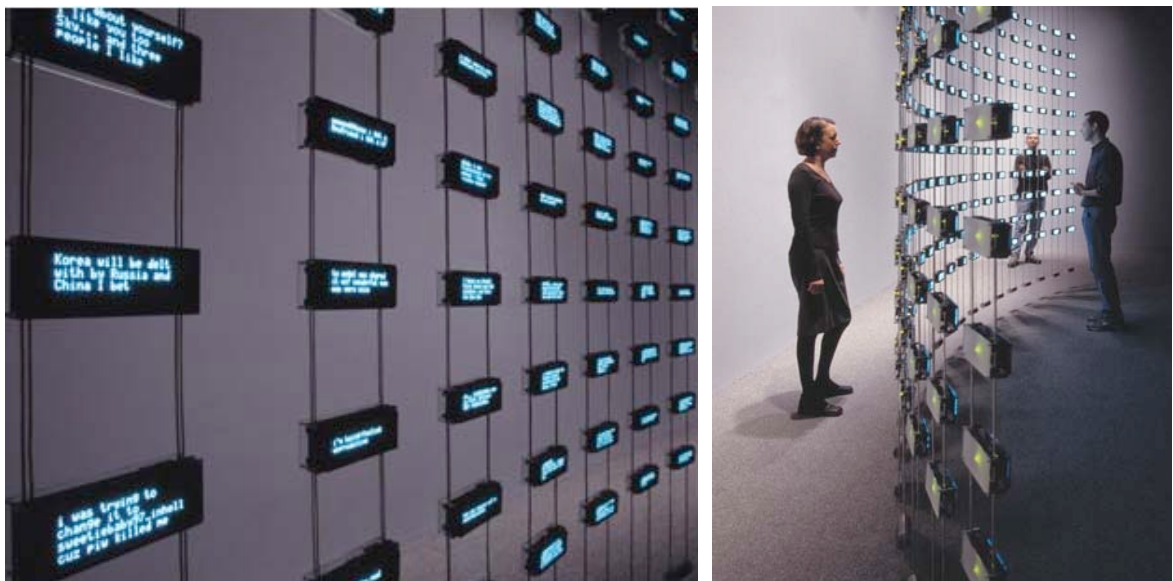
Figure 4.3.6 *Listening Post*, by Ben Lubin & Mark Hansen
Photo credit: earstudio.com

This project shows the dynamic fluidity of the contents and the immediacy of virtual communication. The immediacy and continuous flowing topic seems to represent the superficiality and simulacrum[23] of the virtual world on the net. Nobody knows where text comes from, which enhances the anonymous feeling we have of the online conversations. The suspended display, which is dissociated from its conventional on-screen presence, also enhances this floating feeling. As Auslander puts it, "The environment is restful and meditative; the ever-changing spoken and written messages are alternately touching, amusing, and disturbing. (…) At another moment, you may be offered numerous meditations on an entirely different subject or no single subject at all" (2005). Indeed, this project offers a very delicate boundary feeling, which makes the audience feel that they are either in a very private space or in the public space or both at the same time. By looking at the words in the virtual communication, the viewer or the audience can feel somewhat as if they are wiretapping or eavesdropping on other people's very private communication. However, at the same time, the overall meditative mood in the public gallery space introduces slow contemplation into the personal time experience outside of real time. This mode of self–reflection opens up the possibility to lead viewers into their own "inner time."

4.4. My Previous Screen Work

For about fifteen years, I studied painting and the history of art in an art-focused middle and high school and in an undergraduate and graduate painting department. Interestingly enough, if I look at the paintings I made before, I can find an on-going interest that I still try to implement in media art installations. One of paintings I made in those days is *Chair/Man and Man/Chair* (1998, Figure 4.4.1). Here, through the

relationship between the chair and man, and between the cardboard layer that I attached

on the canvas surface and drawn layers with yellow color pigment, I was trying to ask:

What is the top layer? In the right side, is it the person who is drawn on top of the

cardboard chair? In the right side, is it the chair drawn on top of the cardboard, which is

cut as human figure? Or is it the person who is cut in the cardboard layer? It is not just a

relation between the visible and the invisible. It is more like a conceptual recognition of

spaces and layers. My approach to the surface of a painting canvas is more like a field of

cognitive process. The recognition of the screen includes the margin as its edge, and the

boundary experience "in-between" the screen surface and color pigments.
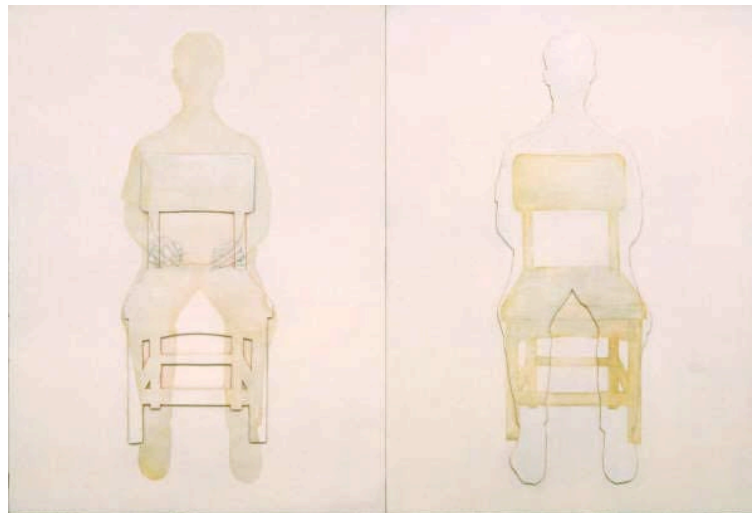
Figure 4.4.1 *Chair/Man, Man/Chair* (1998), oil on canvas (225 * 145 cm),
by Hyun Jean Lee

By the time I created this painting, I also created a video installation *the Fire -*

recognition of fire space (1998) that simulates fire by combining video images with a

four-sided pyramid like a 3-D sculptural screen (Figure 4.4.2). Looping video images of a

fire burning furiously down to ashes are projected onto this pyramid from three different

directions. When I installed this in a gallery space, I saw several viewers stretching their

arms over the fire in front of this work, as if they felt actual heat from this virtual

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campfire. The reactions from the audiences led me to question the relationship of the virtual and physical worlds, and the way in which viewers experience and identify with a work.

Later, I called this piece a three-dimensional video screen work, since the physical structure functions not only as a surface for video projection, but as a three-dimensional shape. The screen then expanded to an architectural size environmental space inviting audiences to enter into its space. Architectural screens began to expand the concept of sculptural screens from the object alone to an environment that invites viewers to walk around inside the space of the screen.
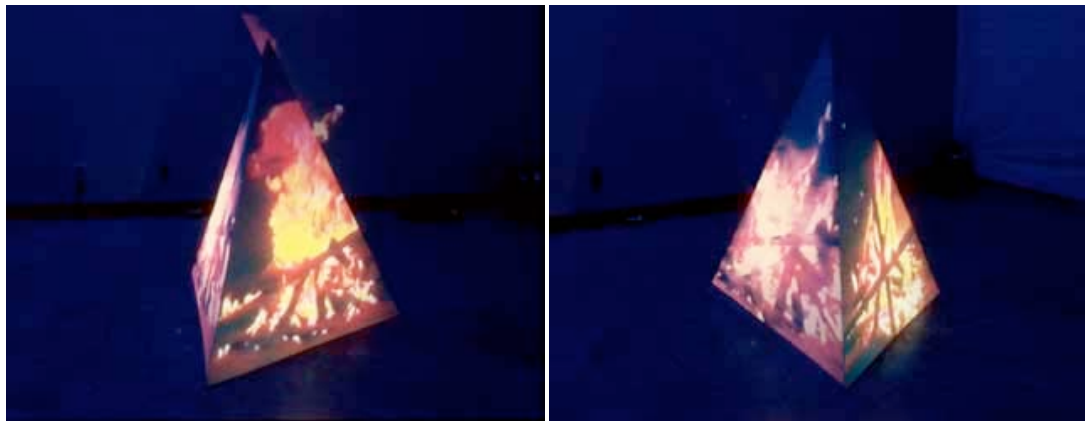
Figure 4.4.2   *the Fire - recognition of fire space* (1998), by Hyun Jean Lee, video installation

Three-dimensional Screens

This section introduces the concept and perceptual experience in the three-dimensional video screens with the exemplary work, the *Waterfall* series and *the Willow tree*.

Waterfall & the Willow tree

In *Waterfall 1* (1999, Figure 4.4.3) and *Waterfall II* (2000, Figure 4.4.4), hundreds of paper boxes and seven tons of newspaper are selectively stacked to compose a valley. At

the center, boxes are piled to form a stair-shaped screen, onto which waterfall videos are

projected with sounds of falling water. When they stand in front of the waterfall, viewers

feel as if the water is flowing towards them due to the illusion created by the 3-D screen.

These larger scale environments invite viewers to come and enjoy both the actual

(physical) space, as well as the imagery space, which is the space of/within the image.

Figure 4.4.3 *Waterfall I: with Boxes* (1999), video installation
Installed at Sampio Art Factory, Yicheon, Kyunggi-do, Korea
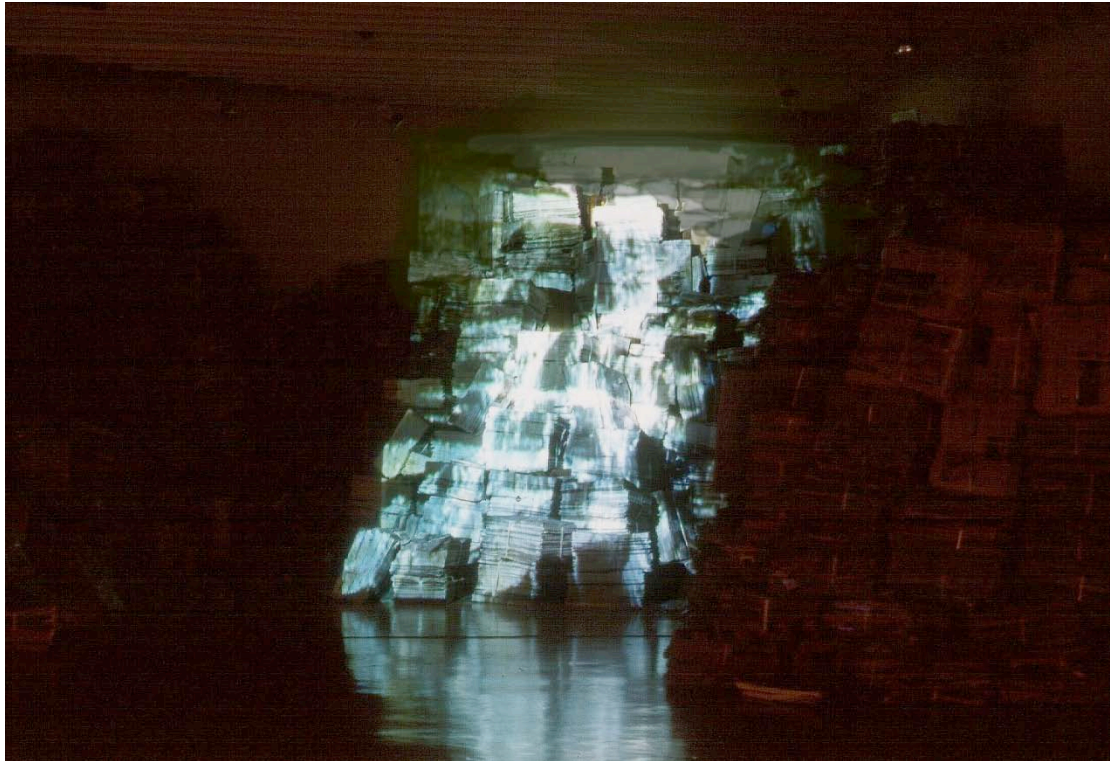
Figure 4.4.4 *Waterfall II: with Newspapers* (2000), video installation
Installed at "Virtually Yours" exhibition at Sejong Art Gallery, Seoul, Korea

For an interweaving map of present and past, experience of real time and
memory, *the Willow tree* and *Waterfall* series of video installations create three-
dimensional screen spaces that include the viewers physical body experiences. Here,
virtual and physical realities are juxtaposed together, and the screen becomes more
materialized.

In the video installation, *the Willow tree* (2000), thousands of ribbon tapes
suspended from the ceiling are moved by a soft wind blown from a concealed fan. The
moving image of willow trees is projected onto the ribbon tapes, and viewers walk
through the willow leaves, hearing locusts singing. In the space composed, viewers are
engaged in the work and feel like the virtual tree is being moved by the wind (refer to the

Figure 4.4.5). Based on my own experience of passing under some willow trees on my way home every day, I wanted to provide viewers with a chance to experience the present of "my" willow trees in the wind and through this experience lead them to their own involuntary memories of real trees and wind the way that Marcel Proust finds the past with the *Madeleine* (Proust 1928).
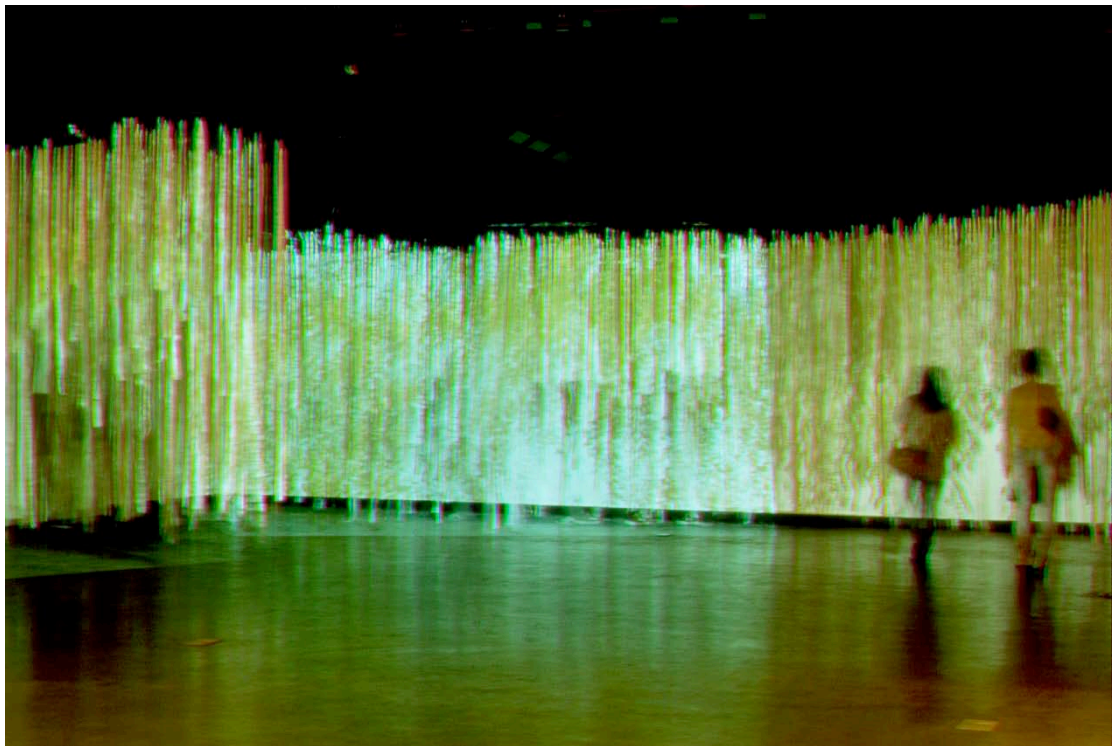
Figure 4.4.5 *the Willow tree* (2000), video installation
Installed at "Turn Around at 'the Between'" exhibition (Hyun Jean Lee's first solo show)
at Insa Art Space, Seoul, Korea

Projection Installations and Moving Screens

After integrating the virtual and the physical space through three dimensional video screen works, although I was satisfied with the results that came out as they were, at the same time, another question occurred to me. What if the viewer inside the screen could actually communicate and interact with the piece? I began to expand not only my programming ability but also skills at physical computing to create more advanced

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interactive art pieces. Although the medium was changing, I wanted to continue to explore the in-between experience that can be provided by the screen. By that time, I had already created a single-channel video work titled *Corresponding* (Figure 4.4.6). It was an important piece for me because it gave me the idea for the movable screen as an interactive screen in the future.

Corresponding

Figure 4.4.6 *Corresponding* (originally made in 2003 and re-edited in 2005)
Single channel video, sound, 6min 55sec

Corresponding to sound
Corresponding to direction
Corresponding between the turning face images
And turning screen on which the images are projected

In *Corresponding*, several layers of corresponding relationships are created. At first, a woman's head in the video image turns back and forth from left to right, in correspondence to the direction of a sound that comes alternately from the left or right channel. As the head gradually intensifies its motion, and when the motion looks as if it is under the law of inertia, its images slowly become distorted. Over the distorted images, viewers see the images of the screen edges revealed and realize that this distortion is actually created by the projection image on the screen that moves in correspondence to the turning head's direction. The images of the screen edges are actually another screen inside the video frame. This moment is the momentum of the viewers' perception, switching from ordinary video screens to virtual images. Viewers become aware of the virtual screen captured by a physical screen. As time passes, the viewers see that the image and sound, and image and screen are corresponding to each other. Also the viewers realize that their experience has shifted from real to virtual. The turning head video image and the background screen behind the head image share the same turning axis. The turning direction is elaborately synchronized during both the shooting and the editing process. This work aims to show action and reaction, motion and emotion, presentation, expression and representation, temporal and spatial experience in a gradual process.

This work was created three years after the three-dimensional screen works. Although its format has changed from video installation to videotape (single-channel video), this work continues to conceptually and perceptually explore the screen space as a planar surface with its frame as a border. It shows the screen inside the screen. It also aims to shift our perception by gradually revealing the gap between the projected surface and the surface of illusion as the conceptual realm. Therefore the virtual space, which is

inside the screen, becomes situated in a more physically spatial context. In this sense, the virtual space begins to share its context with the physical world. Later, this idea enabled me to conceive of the concept of movable screens and study the relationship between the projection space and the virtual space with a series of video projection installations, *Corresponding III*.

<u>*Corresponding III*</u>

Corresponding III (2005, 2006, 2008) is a two-channel video projection installation exploring the vibration of the subject and the "in-between" space. As with my previous work, this project continues questioning three-dimensional screens and moving screens and continues thinking of the screen plane as a perceptual space. With the spinning dancer video series, I have experimented with the relationship between image and afterimage. In this way, I have looked at how the space that the video images create can be expanded beyond the spatial context of the screen.

In *Corresponding III*, the two-channel-videos shot from two perspectives, the front and the back of a spinning female dancer, are projected on a flat screen either from two directions or one direction but with a little gap in between. Even though it is projected on a flat screen, because of the spinning image in the video and the context of its projection, the
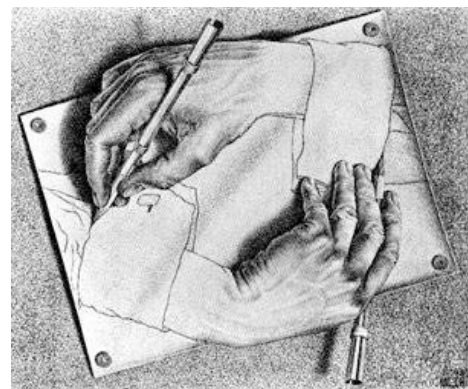
Figure 4.4.7 *Drawing Hands* (1948)
by M. C. Escher
Lithograph, 28.2 × 33.2 cm

overall scene creates a perceptual feeling of three-dimensional space. Thus far, this work has been displayed in galleries three times, and each time I installed it differently. In the

first installation in 2005 at Whitebox gallery in New York (Figure 4.4.9), the front scene image and the back scene image were projected from two opposite directions onto the same screen. The overlaid image created a perceptual gap, revealed through the images which were repeatedly spinning and trying to grasp the other side, but which could never meet. Conceptually I imagined creating a scene like that of Escher's work of a hand drawing a hand from this effect (Figure 4.4.7).
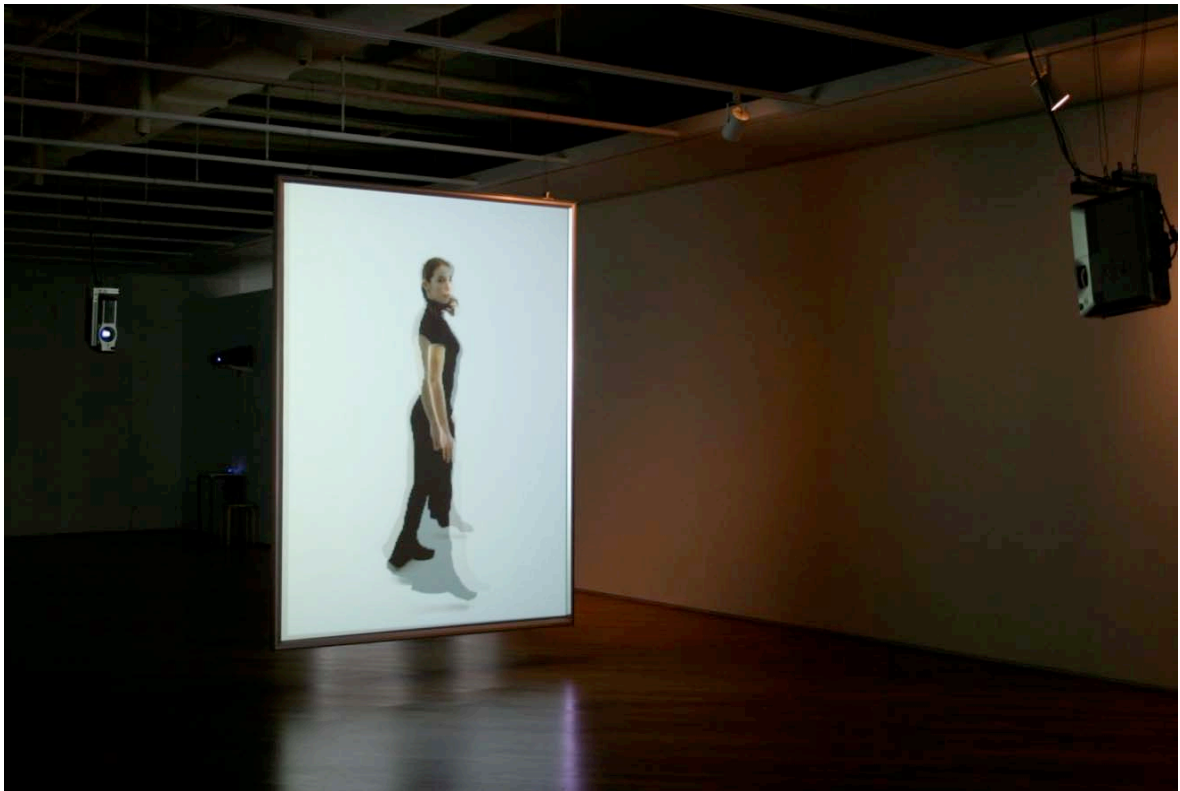
Figure 4.4.8 *Corresponding III* (2008)
Two-channel video projection installation, 4min 33sec
Installed at the show "Corresponding" (Hyun Jean Lee's second solo exhibition) at Songeun Gallery, Seoul, Korea

The dancer spins staring at the camera lens, but in video she also looks like she is staring at herself. The scene looks like a mirror reflection, but it is not an actual reflection. In this work, the image (or the subject) encounters her own images as if she is talking to herself. This situation of the two corresponding reflection-like images also

reflects a narcissistic feeling of an alter ego when she looks at herself. In the second installation at the Dalton gallery in Decatur, Georgia in 2006 (Figure 4.4.10), the images were projected from two projectors set left and right at a distance of about one meter. With this two-person image, which looked like a mirrored image in which two figures face each other from left and right, the entire space was converted into something like a circular space. As its third display at Songeun Gallery in Seoul, Korea in 2008, this work was set up similarly to the first setup. The projected images were superimposed on the screen from front and rear sides (Figure 4.4.8). However, this time I tried to display the images a little bit differently from the first one. On one side, the image was flipped in a horizontal way and projected with/on the normal image on the other side. Thus both images spun together this time in the same direction, but the mirrored image showed the backside and the front side of the dancer together simultaneously. Since the body was almost superimposed without revealing much gap in the space, it created a more perceptually calm image-space than the first setup, which always looked as if the images were heading toward each other by turning in other directions. But the very little split revealed between the front and back image created the very moment of seeing the split-self. Through the study of the relationship between projection space and images, two different perspective images of the same object (the dancer) created the feeling of a continuous circular space. And the planar screen surface where she spun delivered a feeling of depth.

Figure 4.4.9 *Corresponding III* (2005)
Two-channel video projection installation, 4min 33sec
Installed at "Eight Korea Artists" exhibition at Whitebox Gallery, New York City, New York
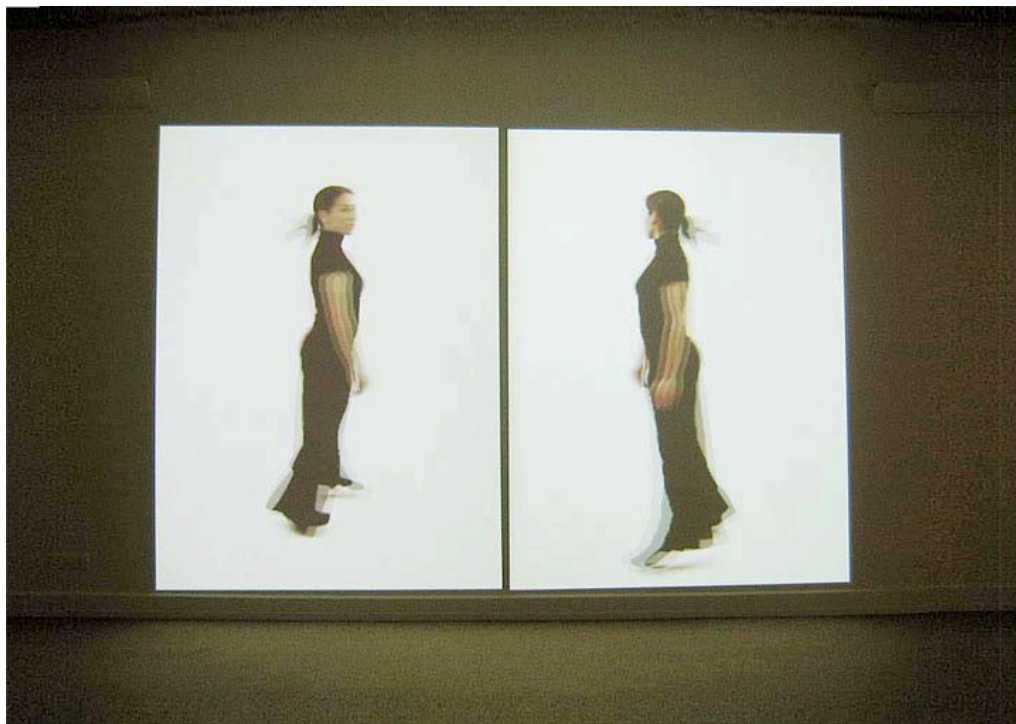
Figure 4.4.10 *Corresponding III* (2006)
Two-channel video projection installation, 4min 33sec
Installed at "Pink Day and Azure Night" exhibition at Dalton Gallery, Agnes Scott College, Atlanta, Georgia

CHAPTER 5

ARTWORK EXPLORATION

From the static canvas to moving image screens, the screen has been a space of representation and expression for artists and designers. When I first became interested in video as an artistic medium, my conceptual interest and approach to the screen were very much related to the notion of form and interface to display visual content. But from form and interface, my screen work has also gradually expanded to incorporate conceptual thoughts to create for the viewer a phenomenological, psychological, and philosophical experience.

This chapter describes how my screen exploration—design practices and screen-based interactive artwork—has been developed and expanded. This discussion will focus particularly on how I have created these works in order to incorporate the idea of critical distance into interactive screen experiences through movable screens as screen objects and responsive space screens as screen experiences. However, section 5.1. begins with a discussion of the notion of screens as interface and experience.

5.1. Screens as Interface and Experience

This section will first investigate the conceptual framework of the screen as physical form and content. For this, it will examine a few works of abstract expressionism and minimalism in the visual arts in the late 1960s and early 1970s to look at how artists have interpreted and responded to their specific medium as a form, and developed their own approaches to the medium as content. Then I will discuss the meaning of interface and the way in which it, through interaction, can connect the

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physical realm with the digital realm, the viewer with the world/space. These preliminary

examinations will help in looking at my screen practices—three-dimensional screens,

movable screens, and responsive space—as a form and interface, and in examining how I

have developed these screens as process and experience that incorporates the viewer's

imagination.

Screen as a Form and Content

In *Windows and Mirrors*, Bolter and Gromala mention that structuralists tend to

think of form and content as separate but that designers tend to think that form and

content are never separate (2003). I also think that content follows form and form follows

content, that their relationship is organic and dialectic. In this section, I introduce analyze

the screen as the dialectical relation of form and content, and as interface and experience.

Minimalism was a stream of artworks and an approach that actively responded to

the medium as an artistic form.[1] As Clement Greenberg claims in "Modernist Painting" in

1965, as a reaction against the painterly forms of Abstract Expressionism, Minimalist

artists respond to the very specific condition of the medium. For example, in the case of

painting the subject is reduced to its most fundamental features only to reveal the two-

dimensional surface of the canvas. A Minimalist's medium-specific artwork is often

regarded as a very formal approach and thus it may seem indifferent to any other issues.

In general, Minimalism features geometric, often cubic forms purged of all metaphor,

equality of parts, repetition, neutral surfaces, and industrial materials. But even in this

medium-specific, form-oriented reading, we can think Minimalists' interest in form is

another aspect of their interest and idea of content. Thus, the form becomes their means

of expressing and representing conceptual thought and the perceptual world, and these

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overall processes not only reshape the meaning of their work, but become the content. Foster says "Many modernists were committed to geometry—the squares of Malevich, the grids of Mondrian, the cubes, cylinders, and spirals of Tatlin, and so on—and many minimalists appeared to take this commitment to the limit—to reduce the object to its formal essence" (2001, 7). For this reason, Minimalism is often regarded as the epitome of modernist purity. But Foster argues that this reading is mostly mistaken since Minimalists deployed pure forms, in order to show how they are transformed by our impure perception, complicated as it always is by embodiments, placement, and context (2001, 7).

Figure 5.1.1 *Die Fahne Hoch!* (1959)
by Frank Stella, Enamel on canvas.
Photo creds: Frank Stella / Artists Rights Society
(ARS), New York (http://www.arsny.com)

Figure 5.1.2 *Double Vee Pinstripe* (from 1960's)
by Frank Stella

What this means is that, for a Minimalist painter, the canvas becomes the representational space of their notion of the painted canvas. If we see Minimalist painter Frank Stella's irregularly shaped canvas (Figure 5.1.2), we can see that multiple repetitive lines start from the shape of canvas and gradually but regularly move to the

other side or to the inner space. The width of stripes in the painting was determined by the dimensions of the canvas support (the lumber that is visible as the depth of the painting when viewed from the side). Therefore, the structures on the front surface of the canvas were not decided to be entirely subjective, but were pre-conditioned by a "given" feature of the physical construction of the support. But at the same time, the surface with stripes is also a representation of the artist's philosophical and aesthetic interpretation of the painting's space. The repetitive lines starting from the shape of the canvas show how the formal structure blends and intermingles with the imagery on the canvas surface.

Minimalist sculptor Robert Morris's "indifferent" object in the gallery space (e.g., the *Mirrored Cubes* made with mirrors, Figure 5.1.3) also presents his notion of sculptural space. His sculpture is seen as simple as are other minimal artists' works. The Minimal artists' use of industrial material is often referred to as a non-subjective approach. From such work, we cannot find any human touch in the same

Figure 5.1.3 *Mirrored Cubes* (1971), by Robert Morris

way that a sculpture made with clay reveals the personal touches of the sculptor. In this way, Morris's *Mirrored Cubes* seems not to include the subjectivity of the artist. But his notion of and reaction to sculptural space, which incorporate the spectator in the space where the sculpture is and his/her movements as an extended space of the sculpture, can be revealed more obviously due to his non-subjective manner. He was actually very interested in revealing phenomenological experience with the sculpted object or situated objects in the space. Though this space, he tried to take viewers to meet their mind and

body as "I" and also as "me." As the viewer walk around the situated object in this space, he can perceive an unfolding gap between "I" and "me" in real-time.

> The perception of space is one of the foremost "I" type experiences. In the recall and reflection of that type of experience the "I" is transmuted into the domain of the "me." Memory is the operative element here. The dimension of time keeps the "I" and the "me" from coinciding. In the relatively immediate perception of objects – encounter followed by assessment and judgment – there is little stretch or gap between the two modes. Spatial experience, requiring physical movement and duration, invariably puts a stretch between the modes (Morris 1978, 51).

Abstract expressionist Jackson Pollock's dripping canvas (Figure 5.1.4) is normally categorized as literal "expressionism," and as a very subjective type of painting. Compared to the industrial material that Morris uses, Pollock's canvas is filled with his personal traces and touches. However, this kind of

Figure 5.1.4   *Lavender Mist: Number 1* (1950)
by Jackson Pollock

painting can also be read as a response to the surface of the canvas. To drip the paint in this way, he must have decided to lay down the canvas. It was already a significant reaction against the traditional approach to the painted canvas, which is normally set up vertically on an easel. It is a reaction in favor of the surface of the canvas. Some may say Pollock's painting is not a direct illusion of reality since it is not depicting anything, and thus, it is not a representational painting. But his painting surfaces, composed of illusionary effects through the depths and layers of pigment, can be seen as a representational space revealing the process of the artist's performing gestures and the

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process of the paint itself as a layered material. Therefore, Pollock's painted surfaces

become the space of representation and expression. The perspective to look at the

relationship between form and content, reality and illusion is highly dialectical. It is

similar to the way we look at the relationship between time and space; we cannot think of

them as separate and individual matters.

Screen as Interface

In the past several decades, as computational media have gradually become more

involved in people's everyday life experience, research about the relationship between

interface and experience and the interaction between human and computer have also

grown. In her Ph.D. thesis (2005), Ali Mazalek examines the *interface* from a

philosophical and general perspective to our current perspective, in other words, from the

way we perceive the world and act within it to the way we control and display

information in a digital interface. First, she argues that for philosopher Immanuel Kant,

the concept of space and time is basically the concept of *interface*. Kant observes that the

world is objectively different from the way it appears and that knowledge of the world

(and the objects within it) involves a unification and synthesis of this data in the mind,

data based on preconceived sensory forms such as space and time. An object is

understood not as a thing-in-itself, but only as it appears to us by means of these a priori

forms. Thus for Kant, space and time are the filters or *interfaces* through which reality is

perceived—they mediate and translate the knowledge of the world. On this basis,

Mazalek says that the concept of *interface* can be widely applied to the translation of

many different kinds of physical and sensory data such as books or musical instruments.

In the 1960s, when computer scientists designated the planes of interaction within

computing systems, the term *interface* moved into common usage. In these computing

systems, interaction refers to the interaction between different parts of the computer

system, between a computer and a person, and between the real world and the digital

world. She points out that in a digital world, because of its malleability and invisibility,

our interactions with it are necessarily mediated through different kinds of *interfaces*,

constrained by the *interfaces* presented to us within specific interactive environments and

applications.

> The controls and displays of digital information shape the way we
> understand it and what we are able to do with it. As a result, the way in
> which we understand the computer as an appliance or tool or even as a
> social object is directly tied to the current state of digital interface
> technologies rather than to their full or future potential. Emerging
> technologies are the confrontation between what existing technologies
> present as feasible and the idea of what might eventually be possible, and
> as such technological progress constantly redefines the relationship
> between the two (17-18).

Mazalek's discussion of *interface* introduces the perspective of looking at the

screen as an *interface*, as controls and displays, which supports and defines the user's

perceptual modalities and modes of aesthetic experience. She also suggests looking at

how our bodies relate to the world around us through the *interface* (30).

Interface as Experience

When we look back on the period when the most generic computer interfaces,

those which made a connection between humans and computers, were being developed,

we realize the extent to which philosophical and phenomenological notions, as well as

imagination with regard to perceiving the world, were all integrated into the concept and design of the interface. This is because the interface itself exists for the mediated experience. In "The Ultimate Display"(1965), Ivan E. Sutherland, the inventor of Sketchpad, an early predecessor to graphical user interface (GUI), dreamed of an almost transparent, unmediated interface: "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. … Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked." Sutherland's idea of screen as interface is one of almost disappearing toward the virtual worlds inside, and the virtual world becomes palpable. In contrast, Douglas Engelbart, who invented the first computer mouse in the 1960s, seemed to focus on the interface as tool, medium, and conduit. Unlike Sutherland, Engelbart envisioned the interface as "an artificial limb bridging, but never closing the gap between the organic and the artificial— a performative space that provided the possibility of insight and self-transformation" (Koepnick 2007, 29-30). As the first mouse made it possible to reach virtually through the computer interface to manipulate information, Engelbart's innovation of direct manipulation through graphical user interfaces (GUI) also allowed even a nonspecialist to interact intuitively with the virtual world through the interface. Both Sutherland and Engelbart envisioned that the user could employ computing technologies to develop new ways of thinking to explore his or her own identity.

Whether the notion and experience of interface (or the experience of screen as interface) is transparent or not, the interface exists as a medium and therefore becomes

the experience. In *Windows and Mirrors*, the aesthetics of opaque and transparent experience is determined by whether the interface becomes immersive and fades into background, or if it is revealed and recognized by the viewer and claims/demands his/her attention. Philosopher Martin Heidegger also points out that we have different ways of orienting ourselves toward objects. He mentions this kind of experience with interface shifting back and forth from *ready-to-hand* (*zuhanden*) to *present-at-hand* (*vorhanden*). When we act through the mouse connected to my computer, and the mouse becomes an extension of my hand, the mouse is *ready-to-hand.* Yet, sometimes when the mouse becomes the object of my attention and consciousness as it reaches the edge of mousepad, so that we are reminded that it is an object that is required for my activity, the mouse becomes *present-at-hand* (Dourish 2004, 109-110). In this sense, if our experience with a transparent interface is close to the *ready-to-hand* experience, then the experience with an opaque interface is close to a *present-at-hand* experience.

Movable Screen as Tangible User Interface and Experience

During the last decade, a wave of new research on human-computer interaction (HCI) has been developing ways to link the physical and digital worlds. Several major research themes include augmented reality, mixed reality, ubiquitous computing, pervasive computing, wearable computing, tangible user interfaces, and so on. Dourish mentions that whether it is ubiquitous, pervasive, wearable, or tangible computing, the research has moved in the direction of an embodied interface, a tight coupling between perception and action (120). These domains seek to seamlessly integrate the digital and physical worlds in order to enable sensory-rich interactions with digital information within a broad range of contexts and environments (Mazalek 2005). Among these

different kinds of interfaces, whereas GUI makes a fundamental distinction between "input devices" such as the keyboard and mouse as *controls*; and graphical "output devices" like monitors and head-mounted displays, as the synthesis of visual *representations*, tangible user interfaces (TUIs) explore the conceptual space opened up by the elimination of this distinction through the seamless integration of *representation* and *control* (Ullmer 2001; 2002). Tangible interfaces, in particular, are characterized by the coupling of controls and representations of digital information within manipulable physical artifacts, surfaces, and spaces (Ullmer 2001; 2002).

As a video and installation artist with a background in painting, I spent long years in front of a canvas mixing colors on the palette and leaving diverse brush strokes on the canvas field. Thus, when I began to work with video and new media, I always regarded the screen as another type of the canvas. It has never been just a displaying device showing only the virtual world for me. It is a more like a form and a material, a process and an experience. Although electrons, bits, and codes may be regarded as materials in the digital world, none of them is visible to our eye unless represented as a pixel, and none of them are tangible to our hands to grasp. Thus, for me, the physical materiality of the screen becomes more important. Like clay for sculptors and pigment for painters, for me who mixed color pigments in the painting palette, the physical frame and plane of the screen provide a materiality that I can play with. Thus, I would say my approach toward the TUI is more to seek to link digital worlds and physical worlds through the screen experience using the screen as both a material form and a medium.

Screens are always a display and interface, but not always an interactive interface. While experimenting with movable screens, I came to the idea of looking at the screen as

an interface that is controlled by and linked with the viewer. This gave me a fresh perspective to look at my idea of the screen as an interactive interface and display. Since the digital content in virtual worlds could be connected with the physical world via screens, the "in between" of the virtual and the real worlds, the very materiality of screen, became their conduit.

5.2. Case Study 1: Movable Screens for Doubling Effect

The pieces of work described here for movable screens do not use a web-cam interface to track the user's movement in front of the screen. Since I thought that direct mirroring was too easy, even narcissistic and therefore dangerous, in order to create my own screen exploration, I intentionally avoided using the camera-screen interface that would track interactors in front of the screen and present them on the screen for only a while. Instead, by moving the very interface of the screen, I tried to create meaningful interactions between the screen and the users/viewers.

The first case study introduced here is the movable screen. Movable screens have been explored as one way to use the screen as a display and as an interface simultaneously. Sometimes we can find that the screen itself is used as the very device for interaction or connection between these two worlds, for example, a touch screen. However, compared to touch screen interfaces, the movable screen can provide a stronger sense of tangibility. Also as an interface, the very surface or the physical frame of the screen is a medium to manipulate the digital contents of/in the virtual world, or to connect the physical world and the virtual world. A moveable screen can allow the viewers more familiar, intuitive, social, and playful interactions, and by combining the sense of seeing and touching, it can augment their perceptual experience.

In the following section, I will investigate several related works that exploit the idea of physically manipulating the screen as an interaction methodology. Some of them are developed as artistic applications and some are developed as design and technical experimentation. Again in these works, we find that the direct interaction of the viewer with the screen can support familiar and intuitive interaction and a tight coupling of the physical and digital worlds. My intention for this coupling of virtual and physical worlds through the movable screen is to get the resulting synchronized effect. Two worlds that are synchronized and linked can double the perceptual experience. At the same time, although the tight connection between the physical and the virtual world can be enhanced with this synchronized effect, this does not necessarily mean that the coupling is designed to support a seamless and fluid experience. I also aim to open a poetic gap with this coupling. Sometimes, the projected image on the physically tilted screen can generate a distorted image. Or the physical condition of two screens placed back to back inevitably includes an invisible moment while it is spinning. The following section examines the basic ideas of the movable screen as a doubling space and how this poetic gap is manifested in each individual work.

5.2.1. Related Work

There are many works that explore the screen itself as an interface. They are often either touching or manipulating the surface of the screen or controlling the frames of the screen to interact with the contents displayed on the screen.

Khronos projector (2005-2006) by Alvaro Cassinelli is an interactive art installation that allows people to explore pre-recorded movie content in a new way through screen interaction. Unlike the traditional movie experience, which forces us to

adopt a point of view both in space and time, in *Khronos projector,* by touching a deformable projection screen, the user is able to send parts of the image forward or backwards in time (Fig 5.2.1.1). In other words, by interactively reshaping a two-dimensional spatio-temporal surface that "cuts" the spatio-temporal volume of data generated by a movie, the user gets the feeling that she is sculpting the space-time "substance" with her own hands (Cassinelli 2006). *Khronos Projector* unlinks space and time in a pre-recorded movie sequence, enabling an infinite number of interactive visualizations.

Figure 5.2.1.1 *Khronos projector* (2005-2006) by Alvaro Cassinelli

Although it cannot change the nature of the pre-recorded events, it can change the perspective and the way we perceive their temporal relationship. In this system a "tangible" human-interface tightly combines the visual display and the sense of touch (Cassinelli and Ishikawa 2005). Although I did not have a chance to experience this work myself, it seems that interactors may have the feeling/perception/experience that they are actually touching the entrance surface of a time-tunnel as we may have seen in a scientific fantasy film such as *Ghost* or the *Back to the Future* series. Here the surface of the screen becomes the interface.

In another interactive installation, *66movingimages* (2002), Christian Ziegler has installed his journey along the famous Route 66 as an interactive road movie (Figure 5.2.1.2). By using a linear navigator, the road from Chicago to Los Angeles becomes a spatial interface. "The motorized screen that is mounted on an 11-meter long rack can be

controlled by the viewer. When the monitor is in motion or stopped, what [the viewers] see are spatial and temporal images from a filmic map."[2] These images are prepared on

Figure 5.2.1.2 *66movingimages* (2002) by Christian Ziegler

two different channels: When moved, the film reproduces the spatial image metamorphoses on channel 1. When the screen is static, the viewers see the scenic documentary taken on Channel 2. The viewer navigates right through to the single-frame level of the film. Here, moving images are images which the viewer moves (Shaw and Weibel 2003). Both *Khronos projector* and *66movingimages* utilize the methodology of moving timeframes for their virtual interaction, but the controlling interface of this is none other than moving the screen itself. Here the screen functions as an interface as well as a display.

Another enjoyable project using the screen as a navigable interface for a display is *The Drift Table* by the Equator IRC (Figure 5.2.1.3).

Figure 5.2.1.3 *The Drift Table* by the Equator IRC

The Drift Table is a coffee table with a built-in porthole that allows people to slowly drift over the English countryside from their own home. Adding weight causes the table to speed up and "descend" towards the landscape below. The interesting feature of this table is that the progress is slow.

Figure 5.2.1.4 *The Key Table*
by the Equator INC

According to the creators of this work, traveling from London to Devon may take days. *The Drift Table* is intended to suggest that technology does not need to be simply task-oriented in ways users may expect. Rather, this piece is intended to open new design spaces for technologies as supporting exploration, curiosity, and contemplation, rather than task. According to their user observation (user study), *The Drift Table* suggests the power of strategies that explicitly challenge users' interpretive processes (Sengers and Gaver 2006).

Similar to *The Drift Table, The Key Table* was designed to support a simple interaction: load sensors supporting the tabletop measure the force with which things are placed on it, and a wirelessly linked picture frame that tilts according to its force –force equals angle of picture frame (Figure 5.2.1.4). Unlike other HCI types of design, neither work is designed to have a functional intention. Claiming that any HCI interactive design (task-oriented design) could also create room for interpretation or reflection, Sengers and Gaver use both *The Drift Table* and *The Key Table* as their exemplary works. While the behavior of this table is clear, how users should make sense of this behavior is not clear. As non-functionally oriented design experimentation, these works are intended to leave open room for interpretation (Sengers et al. 2005). With both tables, the screen is used as an interface, but it formulates the viewer's interpretation through a non-intentional usage of interface.

Technical references:
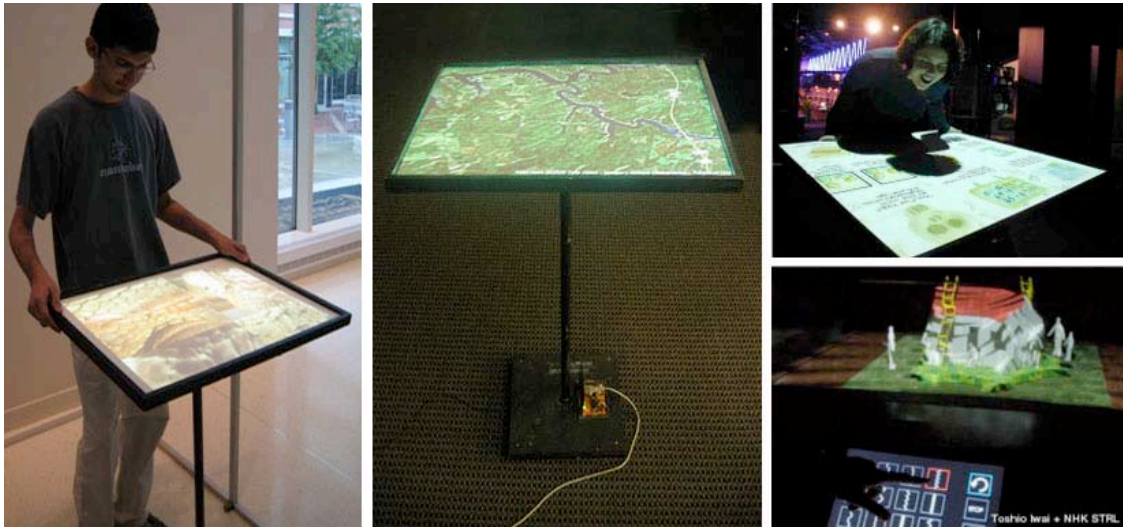
Figure 5.2.1.5 *BioBrowser: bug crawl* (2006), by Khandelwal, Madhur., Hyun Jean Lee, and Ali Mazalek. (Left)
Tiltable Maps (2006), by Lee, Hyun Jean., Madhur Khandelwal, and Ali Mazalek. (Middle)
Tilty Tables (2000), by Xerox PARC, (Right/Up)
Morphovision (2005), by Toshio Iwai and NHK Science & Technical Research Laboratories, (Right/Down)

This is a bit different note but worth briefly introducing here. After making the tilting screen and the spinning screen in 2003-2004 at the Interactive Telecommunications Program at New York University, since 2005 with my colleagues I have added several functional applications on top of these screen interfaces: for example, *BioBrowser: bug crawl*, and *Tiltable Maps* for the tiling table (Lee, Khandelwal, and Mazalek 2007), and *3D Visualization in Museum Display* (Lee, Goel, and Mazalek 2007) and *SpinSpace* for the spinning screen at the Synaesthetic Media Lab, at the GVU center, Georgia Institute of Technology. We have also conducted design research and observed user interaction with these platforms. Based on our research, we have found several works which are related to the movable screen technically or methodologically. Firstly, a very similar work that uses a tilting table screen for its interface is the *Tilty Table* of Onomylab, originally created by Xerox PARC.[3] Like our *Tiltable Maps*, the table surface displays maps or text, and by tilting the tabletop screen, the viewer can navigate the

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content space.

     Morphovision (2005), created by Toshio Iwai and NHK Science & Technical

Research Laboratories, could also be a reference work for the spinning screen.

Morphovision is a display system that interactively transforms and animates a 3D solid

object before our eyes. In this system, a model house is rotated at high speed, and is

illuminated with special lighting from a digital projector. This enables the model to be

distorted into various shapes (Fukaya et al. 2006).[4] The fact that it makes a perceptual

visual effect through the spinning device is, in a sense, similar to the spinning screen,

particularly *Cross-being: Dancer,* which will be introduced later in this chapter.

5.2.2. Movable Screens: Doubling Effect

     The movable screen idea was based on the idea of forms as interfaces, but I have

extended the concept of the screen from the form as interface to the contents as

experience by exploring three types of works. The following section will briefly examine

the conceptual background for how I conceived of a movable screen as a space for artistic

representation and expression.

     In Chapter 2, I claimed that screen-based interactive media experiences consisted

of multiple levels of complex closed feedback loops and that by manipulating the

boundary conditions of the screen experience, we could open or expand these loops and

provide critical distance for reflection for the viewer. As one way to open and expand this

loop, I suggested that this new perceptual experience for the viewer could be provided by

a "doubling effect," which paired and layered the physical and virtual worlds through the

screen interface. At the same time, through the gap slowly revealed from the tight

coupling of these two worlds, the feeling of the closed-loop could be expanded or

opened. The following is a detailed description of the conceptual idea of the doubling

effect on the movable screen.

Interactive Movable Interface for Perceptual Experience

If I think of a conceptual model of virtual space, real space, and screen space,

each seems to have its own dimension and depth as a space. The physical space of the

screen is planar and normally static. The virtual world, which is presented "on" this

planar screen, our eye or mind, can navigate "in" the space. Through this process, in my

conceptual model, the screen can begin to reside in a three-dimensional space. If I draw

this conceptual model, the screen space seems to divide the physical space and the virtual

space by existing in-between them. If the screen itself could be moved in this "in-

between" space freely, it could possibly blur or intermingle the boundary of the virtual

and the real (physical) spaces and therefore mix these two worlds. Depending on the

experience formulated by the screen, the screen experience can be extended from a two-

dimensional to a three-dimensional one. By positioning my conceptual model of the

screen in between these different layers of heterogeneous realities, the screen creates a

blurred or intermingled experience "in" and "between" the virtual and the physical. In

this model, the screen begins to fluctuate and oscillate, creating a new expression and

perceptual experience.

Based on this conceptual model, I have constructed several interactive screen

artwork pieces that use a "movable" and "manipulable" screen. The physical

manipulation of the movable interface can generate certain physics, which then cause its

digital content to change in correspondence with it. Therefore, the digital content follows

the state of the physical form. The result that can be conceived via this kind of pairing of

physical and virtual (digital) worlds as form and content is called a "doubling effect."

This term is used to mean a pairing or matching of the two separate but corresponding

layers of the physical and the virtual worlds.

The perceptual images or space of a spinning object can be enhanced through and

in a spinning screen interface. Similarly, three-dimensional virtual space can be more

palpable or tangible when it is displayed on/in a three dimensional display. Since these

scenarios are based on a perceptual experience, the effect of this doubling cannot be

imagined just in the brain. It is experienced only through the actual interaction with the

interface while seeing the corresponding contents.
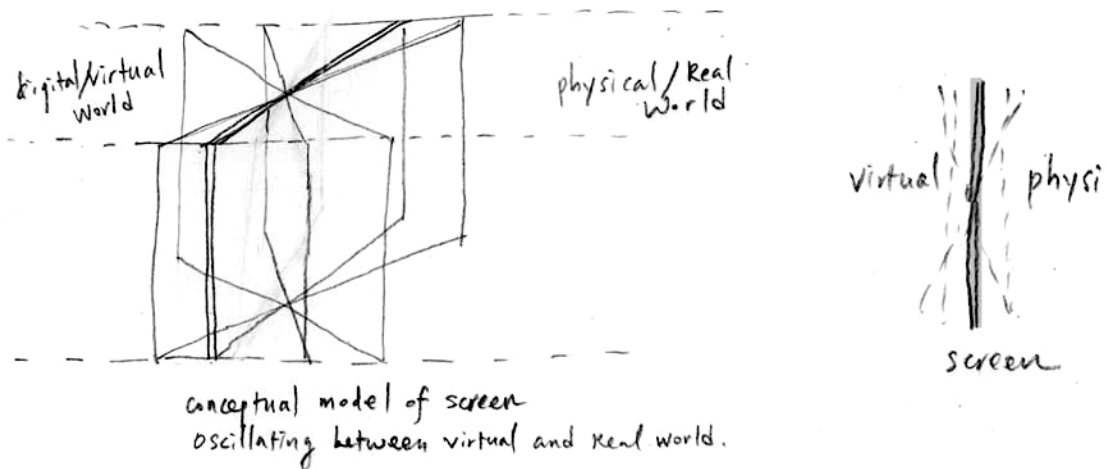
Figure 5.2.2.1 Sketch: Conceptual model of screen oscillating between virtual and physical/real world

My first intention for this coupling and doubling is to get the synchronized effect.

Two worlds synchronized and tightly linked can double the viewer's perceptual

experience. If the doubling becomes more seamlessly synchronized, the perceptual

experience will be intensified. However, at the same time, as an artistic exploration, I also

intend to leave any possible poetic gap that may be generated from the coupling. Sometimes from the projected image on the screen, the physical angle of tilt can generate a visible gap between virtuality and reality. Or the physical condition of the screens placed back to back inevitably includes a moment of invisibility when it shows the side edges while it spins. When the seam is revealed and is seen to be apart from the synchronized layers, a poetic feeling will follow from the gap. Also, since the virtual space does not normally have any materiality, it is, therefore, intangible. By pairing or doubling the virtual layer with the physical layer through the screen, particularly through the frame and plane of the screen, this exploration can also provide a perceptual and conceptual feeling that the digital space has become tangible. For example, the perception of a spinning object can be enhanced through a spinning screen interface and the perception of a tilting object can be enhanced through a tiltable screen interface. Similarly, three-dimensional virtual space becomes more palpable when it is displayed in a three dimensional display. Since this doubling effect is highly based on perceptual experience, it is best achieved through implementation and experience. Section 5.2.3 examines the basic idea of the movable screen as a doubling space.

5.2.3. Work Examples of Movable Screens

As described briefly in Chapter 4.4, for me the movable screen idea emerged while I was creating the single-channel video work *Corresponding.* In this work, I investigated the possibilities of the screen in motion, the moving screen–its surface and its frame both moving forward and backward inside the screen. Through this, I discovered that the movement of the screen can actually provide illusion and perceptual interminglement with reality. In this work, the sense of the physical movement of the

screen as a connection between virtual and real allowed me to think about possible new areas of screen experimentation. I began to ask what would result if the movement of the screen triggered the viewers' physical action, which was then fed back to the screen. The result of all of this questioning and experimentation lead to the idea of creating an interactive version of the movable screen.

The idea of "movable screens" was developed as a method for integrating interactivity between the work and the viewer while emphasizing the connection between virtual and real through the screen. As described in my conceptual model of screen space, the screen exists between the virtual world and the real world where the viewer is located. Spatially, the movable screen stands in physical space. However, the movable screen exists between physical and virtual space and commingles and blurs the boundary between them. When the viewer moves the screen, the virtual image follows, reacting to the movement. In screen-based experiences, the screen itself can become the physical device used for interaction. The "move-ability" of the screen affords interactivity between the screen artifact and the viewer, and between the virtual space and the physical space. In this way, the virtual image becomes related to the real world in real time. Actual physical movement of the screen encourages viewers to feel as if they control and interact with the image. Therefore, they feel a direct connection to the virtual imagery.

5.2.3.1. *A BeadBall Table (A Tilting Table)*

In the interactive video and sound installation *A BeadBall Table (A Tilting Table)* (2003), a tilt-able table structure and a flat video projection screen define the physical screen. The virtual image projected onto the screen reacts to the physical condition of the table. Viewers can interact with this work by manually tilting the tabletop. As viewers tilt

the tabletop, video balls roll toward the lowest corner based on the angle and direction of tilt (refer to Figure 5.2.3.1.1). The rolling balls also generate corresponding sounds. In this work, real world physics (gravity) is applied to the virtual balls. In other words, physics in the real world affects the image in the virtual, creating a relationship between real and virtual. The short sequence of rolling ball video imagery is pre-recorded and stored in a computer, but generated and displayed in real-time according to the users' actions. In this sense, this screen shows a gap between the past and present. Projecting imagery from a fixed point onto a tilting tabletop also distorts the image seen on the tabletop screen. Adjusting the projection to parallel the movement of the tabletop proved to be a technical challenge and could be addressed in future work. However, some viewers felt that the distortion of the image revealed the poetics of the virtual and real world.
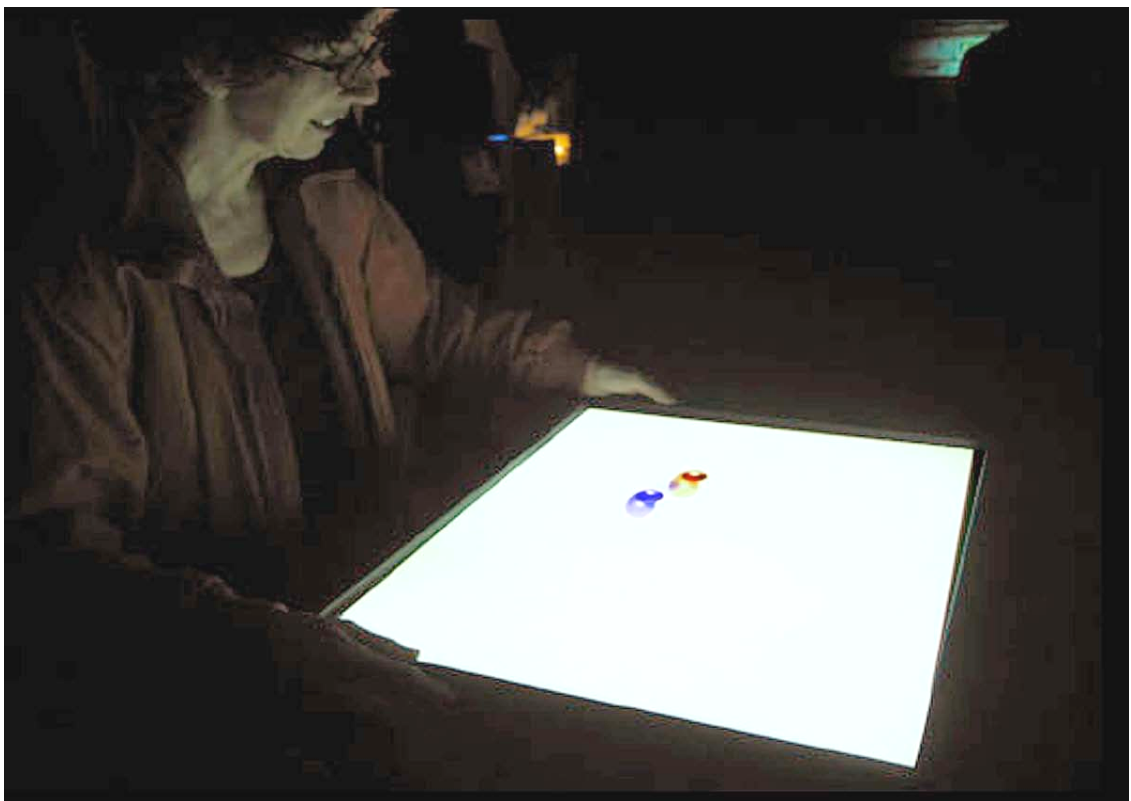
Figure 5.2.3.1.1   *A BeadBall Table (A Tilting Table)* (2003) by Hyun Jean Lee

In this tilting tabletop, a showerhead is used for the joint between the tabletop and its one-leg stand. The angle of tilt is measured using an accelerometer (a tilting sensor) underneath the tabletop. The accelerometer values are delivered to a PIC micro-controller, which converts them to MIDI and sends them on to a computer. Finally, a Max/Jitter application controls the video and sound based on the viewer's physical actions. The resulting image is projected onto the tabletop screen from an overhead video projector attached to the ceiling (refer to Appendix B and Fig B.1).

5.2.3.2. *Cross-Being: Todd (A Tilting Table)*
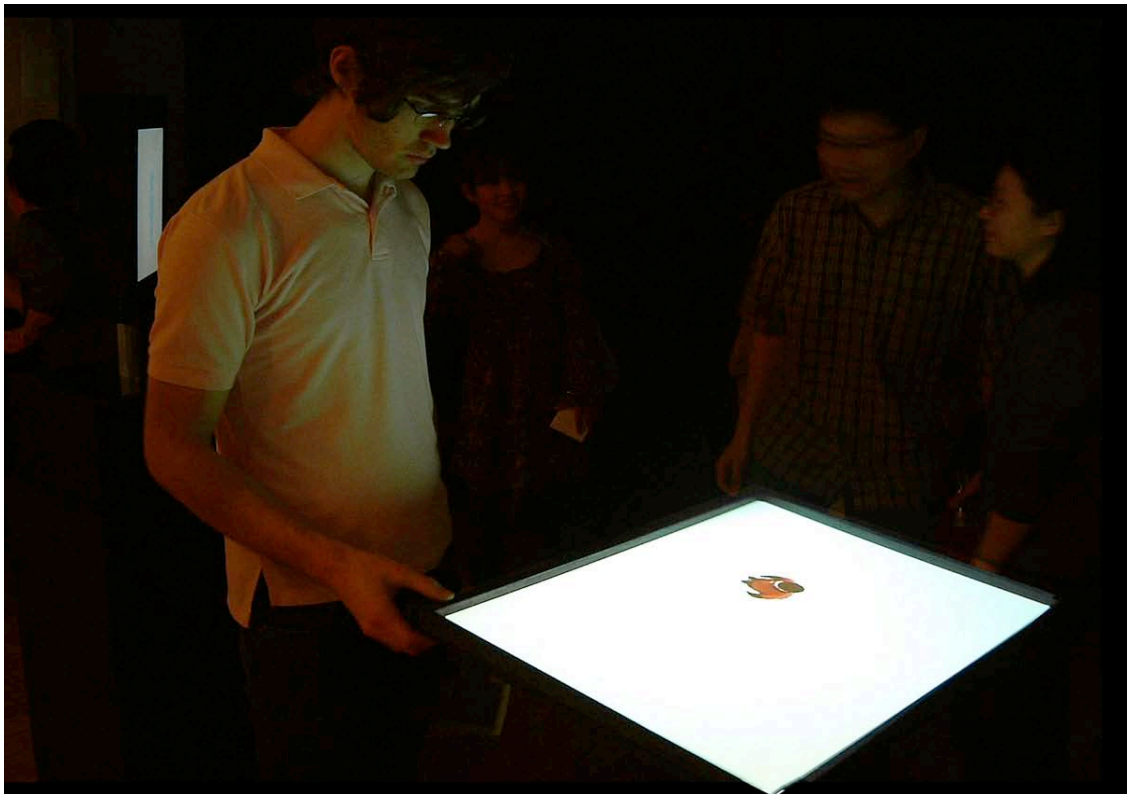
Figure 5.2.3.2.1 *Cross-Being –Todd (A Tilting Table)* (2004) by Hyun Jean Lee

Cross-Being: Todd (A Tilting Table) is the second piece created with a tilting screen (2004, refer to Figure 5.2.3.2.1). A human character, Todd, in the video moves

around on the screen following a interactor's physical manipulation of the tabletop. Todd is designed to wait until the first user comes. If a user touches and tilts the tabletop in any direction, he slides toward the lowest leaning corner of the screen. Unlike the simple ball image in *A BeadBall Table,* Todd's movements are more varied. Thus, although the concept and methodology are similar to that in the previous work, this version uses more complicated video sequences from the pre-recorded sources (refer to Appendix C). Using X, Y correlation on the screen field, the animation of Todd's movements are composited in real-time in each frame. To support diverse visual movements, several stacks of video sequences are positioned in many spots of the screen. Each time, the computer randomly chooses and displays one of those sequences.

The words "Cross-Being" are used to represent the metaphor of the living subject in the virtual world. Thus in the design process, Todd's expression becomes elaborately embedded in order to make him human and lively. For example, if nobody touches the table for a long time, he gets bored and sits, simply waiting on the surface of the horizontal tabletop screen. If the user shakes the table for a while, Todd becomes exhausted from moving too much, and finally returns to his center position, angry. Although this effect is measured and generated according to the pre-programmed system, this can be thought of as artificial intelligence embedded in the system. This kind of approach can also be explored as a way to open or expand the closed loop system in the interactive experience. In this piece, a spring is used for the tabletop joint (refer to Figure B.2). The spring's resiliency and elasticity are reflected in the tabletop, making it automatically return to the center after the user stops tilting it.
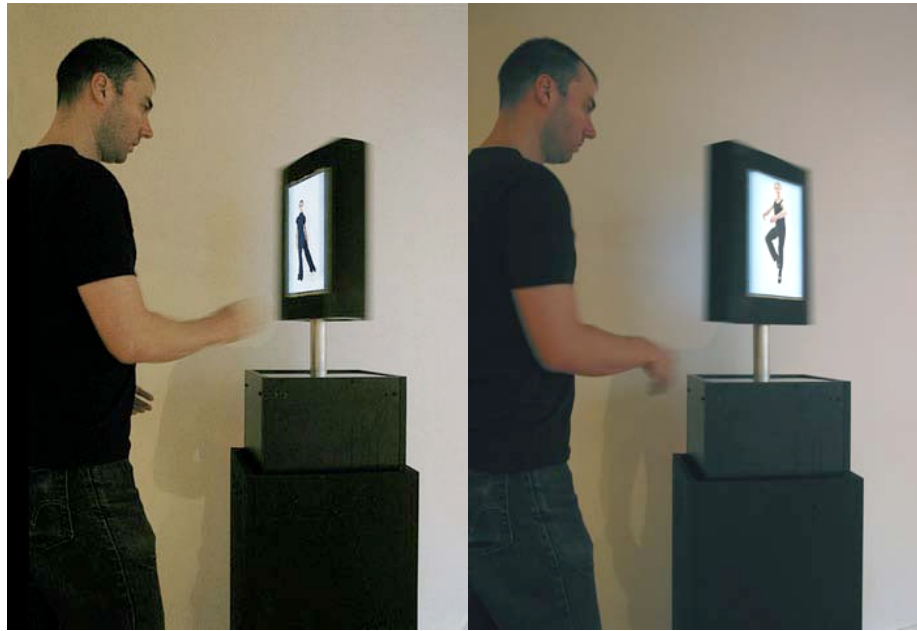
Figure 5.2.3.3.1 *Cross-Being–Dancers (The Spinning Screen)* (2004) by Hyun Jean Lee

Cross-being: Dancers (The Spinning Screen) (2004) is an interactive audio and video installation based on the spinning screen idea (Figure 5.2.3.3.1). The spinning screen was originally inspired by an old music box for young girls with a ballerina figure on a spinning plate. With this toy, if the child winds a spring, the dancer on the plate will turn as the spring unwinds. As a movable screen interface, the spinning screen, a two-sided monitor mounted on a revolving base, invites the viewer to interact with the dancer inside of the screen through the physical action of spinning the screen. Viewer interactions with the spinning screen can elicit diverse temporal and spatial responses, thereby enriching the audience's experiences. Based on the direction and speed of the spinning monitor, the displayed video dancer spins along. For example, if the monitor turns right, the dancer turns to the right as well. If the monitor stops, the dancer also stops his or her motion. In this way, the physical action of the screen can be transferred to the

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virtual imagery in real time. Slow turns allow the viewer to look at the detailed motion of

the spinning dancer. In *Cross-being: Dancers (The Spinning Screen)*, the first artistic

application created on top of this platform in 2004, there are two dancers, whose

performances are prepared in the pre-recorded video. As the spinning velocity of the

physical structure, changes, the video changes so that it looks as if the dancer alternates

from female to male. As in *Cross-Being: Todd (A Tilting Table),* the dancer is a miniature

character living inside the virtual world, and this character keeps changing his/her

identity.

Mechanically, the
spinning screen is a revolving
structure of two TFT-LCD
monitors placed back-to-back.
The base part is composed of
two gears and two revolving
shafts; the main shaft is
connected to two monitors,
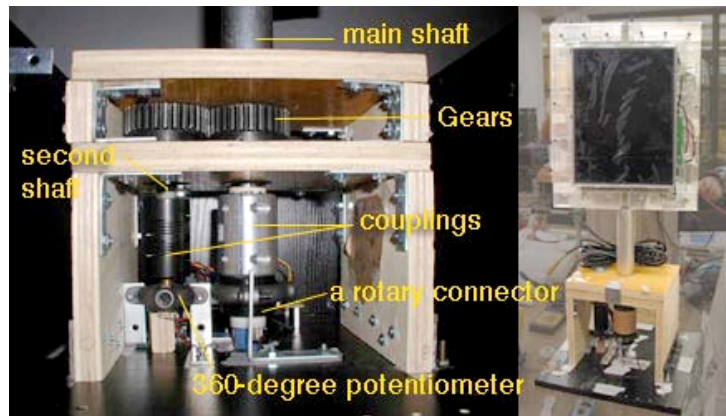
Figure 5.2.3.3.2   The physical structure of the spinning screen

while the second shaft is connected to a 360-degree potentiometer, which calculates the

direction and spinning speed of the main shaft (Figure 5.2.3.3.2, and also refer to

Appendix E). The values of the potentiometer are delivered to a computer via serial/MIDI

communication from a PIC micro-controller. To prevent the wires from entangling while

the screens spin, a rotary connector is used in the main shaft.

Through the movable screen, another possibility of creating an "in-between"

screen experience can be examined. The screen existence itself generates several

boundaries: the boundary between space and time, between virtual and real. It provides a sense of immersion for its viewer in the virtual world, but because of its physical materiality, it also blocks the viewer's complete involvement in the virtual world, simultaneously providing a sense of rejection. After experimenting with three-dimensional screens in video installations, the approach of using "movable" screens as real-time video and sound installations provides a means of connecting and blurring the existential boundaries around the screen. In this exploration of the "in-between" screen, the viewer's existence is also examined as an important element, which blurs the existential boundary of the screen. In three-dimensional screens such as *the Willow tree* (Figure 4.4.5) or *Waterfall* series installations (Figure 4.4.3 and Figure 4.4.4), the viewer is enveloped in the video image within the physical space. As the viewer walks around in the physical space surrounded by the video imagery, his/her existence itself bridges these two spaces. On the other hand, in movable screen works, the viewer's response to the work and the work's response to the viewer unfold the experience in between the two worlds. From three-dimensional screens to movable screens, the viewer's reaction to the work has changed, and the function and condition of the response has also changed, from meditative and serene with the static screen, to participatory with the interactive screen. In the earlier works, although the screen remains static, it provides a condition, which invites the viewer's response. In the later works, the viewer's response becomes a vital element, and the viewer's interaction with the screen triggers changes in the virtual image (Lee and Mazalek 2008).

5.2.4. Revisiting Movable Screens for Doubling Effect

In movable screens, the virtual and physical worlds are linked through the audience's interaction. The two separate but corresponding layers of the virtual (digital) world and the physical world are coupled and synchronized by the screen's movability. To intensify this doubling effect, therefore to double the viewers' perceptual experience, but at the same time, to find the poetic gap from this coupling, I revisited the idea of a movable screen above, specifically, *A BeadBall Table* and *Cross-Being- Dancer (The Spinning Screen)*. To further illustrate the concept of the doubling effect, I here introduce an idea for a new type of movable screen.

5.2.4.1. *A BeadBall Table* in Open GL
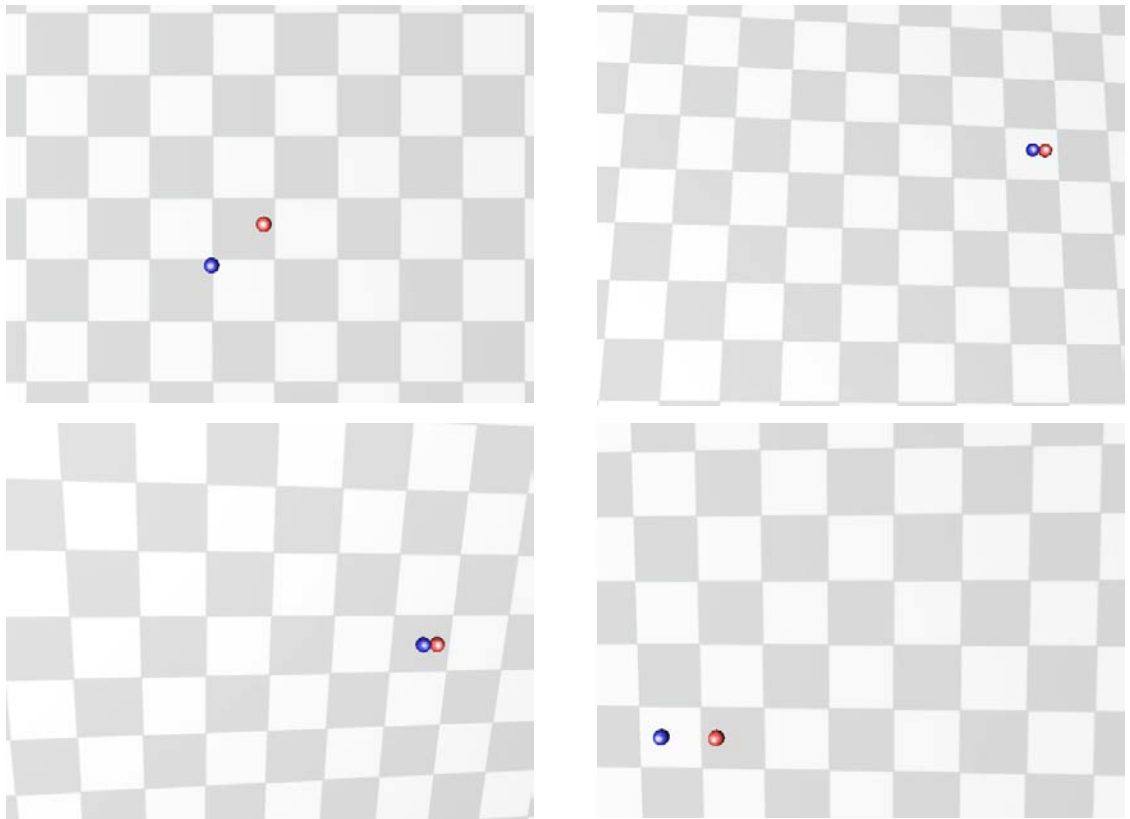
Figure 5.2.4.1   *A BeadBall Table* in OpenGL (2008)

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Based on the idea described above, I have revisited *A BeadBall Table* and *Cross-Being- Dancer (Spinning Screen)*. In order to experiment with the doubling effect of the tilting table for *A Beadball Table*, the beadball and the table plane could be created and situated in a 3D virtual space, for example, using the OpenGL computer graphic library. Based on the angle of tilt of the physical table, the (3D graphical) tabletop plane and the beadball on top of the plane would in this case move in synchrony. Since the white background used in the previous version does not provide any visible sign of the plane's tilting, the white surface of plane could be replaced a plane with a grid pattern as seen in Figure 5.2.4.1. As designed, if the tabletop is tilted, the bead balls would start to "roll" to the lowest corner of the tabletop. Depending on how the physical movement of the tabletop to the virtual tabletop in OpenGL space is mapped, the distortion can be increased or decreased. For example, if the table is tilted to the right, the virtual table `plane can be tilted right. In this case, with the doubling of the visibly distorted image through the grid pattern and the physically tilted table, the viewer's perceptual experience is significantly increased. On the other hand, if the table is tilted to the right, the virtual table plane can be tilted left. In this case, the transformation on a virtual plane and the projection of it on the physical tilted plane results in the corrected or reduced distortion between the physical and the virtual. However, since my intention of using movable table to cause a doubling effect is to make the perceptual experience doubled, I map the correspondence of movement between the virtual and the physical layers in the same direction (if the table is tilted to the right, the virtual table plane is also tilted right). If this tilting table uses the overhead projector to project the images, the poetic gap revealed between the physical table movement and projected virtual image can still exist.

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5.2.4.2. *Cross-Being- Dancer (The Spinning Screen) -* Redesigning the Spinning Screen

Figure 5.2.4.2.1   The Thaumatrope (1), The Zoetrope (2, 3), The Praxinoscope (4, 5), and The Phenakistoscope (6).
(clockwise from the top/left)

The spinning screen can also be revisited to explore the doubling effect. *Cross-being: Dancer (The Spinning Screen)* (2008) aims to create a visual illusion that takes place in between the physical and virtual worlds and between visibility and invisibility. Examining a human being's perceptive consciousness, the philosopher Merleau-Ponty (1969) says that the relationship between the visible and the invisible is not opposite. Rather, it is more the interrelationship between the "boundaries" of the inner and outer that shapes the indeterminate senses of touching and being touched, of seeing and being seen. This effect of visibility and invisibility has long been used to create optical illusions, particularly in the devices invented for moving images in the 17th and 18th

centuries such as zoetropes, thaumatropes, and phenakistiscopes (refer Figure 5.2.4.2.1). These devices use slits that regularly and repeatedly block and open our vision. Each device explores the limitations of static image representation, providing a unique physical interface structure (a spinning structure) and manual mechanical operation to create the illusion of moving imagery (Crary 1990). After these early attempts, more advanced devices for moving images were invented. For example, the movie film with a projection device (cineprojector) was invented and uniquely designed to present an illusion to the human eye: Each film reel is composed of 24 frames (images/photographs) per second of time and transforms a series of still pictures into a story of continuous motion. Similarly, NTSC type video is composed of 29.97 still images per second.
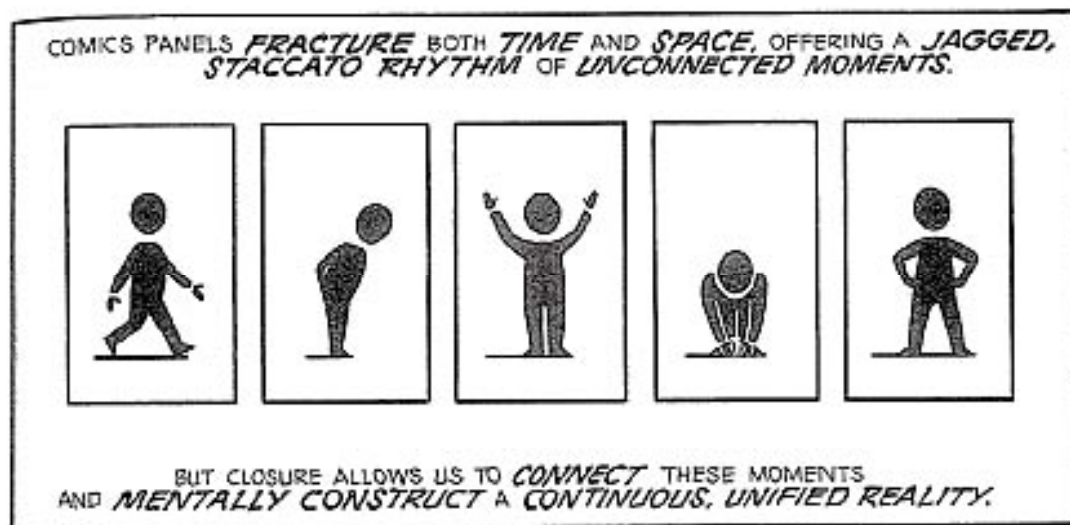
Figure 5.2.4.2.2 Scott McCloud's discussion of the gutter in between comics panel.

In *Understanding Comics: The Invisible Art* (1994), Scott McCloud, a cartoonist and theorist on comics as a distinct literary and artistic medium, says that the spaces between the comics panels, called "the gutter" by cartoon aficionados, "fracture both time and space, offering a jagged, staccato rhythm of unconnected moments. But, closure

allows us to connect these moments and mentally construct a continuous, unified reality" like a film.[5] As in film where "closure takes place 'continuously' twenty four times per second aided by the persistence of vision" in our mind, McCloud says, "the gutter plays host to much of the magic and mystery that are at the very heart of the comics" (66). Therefore, he claims that "comics is closure" which is "dancing between the 'seen' and 'unseen', 'visible' and 'invisible,' making a resonance in meaning" and invoking imagination (67).

My work continues to explore the manual operation of the physical structure as the early devices for moving images did with their structures. When a user spins my spin-able screen, the images are repeatedly shown. However, since the device has only two screens positioned back to back, it inevitably includes moments of no-visual images (invisible moments of screen viewing) in a certain amount of time, as the side part of the monitor is revealed while it spins. In addition, *Cross-being: Dancer* displays real-time digital video, which correspondingly displays the images based on the spinning speed of the screen. Thus although the invisible (side) portion remains, the visible part (screen image) "softens" this invisibility. The perceptual experience of the viewer can be moderated by the interactive relationship with the video. *Cross-Being: Dancer* is not intended to create a perfect illusion. Rather, it focuses more on the perceptual illusion interplaying between the visible and the invisible in order to create imagination in the viewer's mind.

In *Cross-being: Dancer*, the "doubling effect" is now newly explored through two separate but corresponding layers between the physical and virtual worlds by using tangible screen interfaces with processing technology. In contrast to 2-D fixed static view

screens, the spinning screen enhances the user's ability to engage with spatial aspects of the visible as well as the temporal. The temporal invisibility is controlled through the representation of the slow motion dancer, and spatial invisibility is subdued by the screen's spinning. As the viewer spins the screen, the back-to-back set of images allows the viewer to see the front-side of the dancer on one side, and the backside of the dancer on the other. (The dancer's spinning performance was captured from two opposite directions, which required two different video sources.) Thus, depending on where viewers stand, they can have multiple perspectives of the same event, thereby retaining a greater part of the original spatial context of the event. In this way, the spinning screen enables people to grasp an aesthetic and philosophical interpretation between the gap of visibility and invisibility, of physical and virtual. Since this doubling effect is based almost completely on one's own perceptual experience, it can be achieved only through actual visual and experiential observation.

New Physical Structure of the Spinning Screen

In the first version created in 2004, although the two LCD screens were placed back to back, the video feed showed only one image on both sides due to a limitation in the number of conductors available in the rotary connector. Because the rotary connector used for the spinning screen had only eight conductors, it could not transmit the two separate video signals from the computer to the upper part of the screen display. The new version of the spinning screen now makes it possible to display two separate video channels on each monitor, allowing us to finally explore the real doubling effect of the spinning screen (refer to Figure E.7 and Figure E.8).[6] Whereas in the previous version (2004), there were two dancers (a female dancer and a male dancer) performing inside

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the virtual space, in order to simplify the visible experience in the newer version of the

screen (2008), only the female dancer remains in the video and performs inside the

spinning screen.[7] *Cross-being: Dancer* continues to use the MAX/Jitter application to

manipulate the video image and sound.

Figure 5.2.4.2.3 *Cross-being: Dancer* (The Spinning Screen) (2008)
installed at "Corresponding" show Hyun Jean Lee's solo exhibition at Song Art Gallery, Seoul, Korea (July 28 – August 13, 2008)

This new spinning screen created in 2008, *Cross-being: Dancer* (2008)*,* was

exhibited in the "Corresponding" show (Hyun Jean Lee's solo exhibition at Song Art

Gallery, Seoul, Korea (July 28 – August 13, 2008) and in the Siggraph 2008 Arts and

Design Galleries "Slow Arts" section in Los Angeles (August 11 – 15, 2008). The work

matched quite well with the theme of the show, which was "Slow Art." The theme or

purpose of this show was to ask "In our digital culture, we can task simultaneously,

message instantly, and prototype rapidly, but, in doing so, do we create an oasis for

contemplation, or do we fuel a hunger for yet more speed? As technology colors all

aspects of our world, we see the inevitable pendular response in campaigns that advocate

slowness."[8] Indeed, *Cross-being: Dancer (The Spinning Screen)* attempts to invite the

viewer to think about the old technologies rebuilt now in the digital realm and take a

moment to experience his/her own slow perceptual involvement. Being able to present

the piece in both exhibitions provided me with a valuable opportunity to observe various

interactors' experiences.

Intentionally, no instruction was given to viewers to guide how they "should"

interact with this work during the show. Among the many observers and interactors, one

thing I noticed was that many people actually approached this piece with certain

expectations. When they saw the structure, most of them tried to figure out how to

interact. Some of them who seemed to already have lots of experience with interactive

screen works, tried to move their body away from the work to trigger some possible

response from the interactive system.[9] Some of them who read the title of the work

seemed to expect that the screen itself would spin. After a while, if they could not see

anything happening, they often left, assuming that the work was broken. Audiences are

still not used to touching the artwork. Some with more curiosity cautiously started to

touch the work with their hands with a certain hope of engaging with it. Then after they

found that the screen could be spun as a result of their own actions, they tried to play with

it. Although many people acknowledged that they could interact with this work, and I also observed that they hesitated to spin it very fast. Instead, many of them walked around the screen while slowly moving the screen with their hand. This slow interaction allowed them to watch the very detailed motion of the spinning dancer at a slow speed. Some of the audience members slowly turned the screen, since this allowed them to see the front side and the backside of the dancer together. After they could finally realized that what they are seeing was unexpected, most spectators kept turning and turning the screen for a while to test their eyes.

Although it presents two perspectives simultaneously while spinning, the moment that the screen shows its edge part is the moment that invisibility occurs. Some viewers seemed to expect to see more of the visual (screen) image and less of the invisible (side) portion. They appeared to expect more fluid access to the dancing images, perhaps such as those seen in the 360-degree camera spinning around the character of Neo in *the Matrix.*[10] However, by catching only repeated glimpses of the dancer's image seen in and out, and in again, some viewers tried walking around the screen to get a "better" view. It was my goal (intention) that this art piece would be something like a revival of the spinning toys (zoetropes, thaumatropes, etc) of the late nineteenth and early twentieth centuries, an interactive and digital version of the spinning toy. I hope this experience of "in-out-in" provided viewers with an experience of shimmering perceptual immersion.

5.2.4.3. *The Malleable Display*

Thus far two kinds of movable displays have been discussed as movable screens. In each case, the physical manipulation of the screen affects the content displayed on it. The movable screens serve as both input and output devices, merging the notions of

interface and display. As a new type of movable screen, I have conceived of a "malleable display" with an array of light emitting diodes (LEDs), which can be directly manipulated and deformed, and which will reflect the physical changes of the screen to the displayed media content in real-time.

Figure 5.2.4.3.1   sketch for the malleable screen

Although this idea was originally conceived around 2004, it has not been implemented because of a variety of technical difficulties and a lack of a financial support. Last several years, deformable and flexible screen displays were under development for commercial use. Some examples are OLED (Organic Light Emitting Diode) screen and the Universal Display Corporation's FOLEDs. LG-Philips and E-Ink jointly designed the display electronics and produced the final prototype to achieve the world's largest high-resolution flexible electronic paper display.[11] These products require technology that allows the screens to curve and even to be rolled up in one's pocket.[12] However, so far, these creative screens have yet to be fully developed.

Compared to the deformable and flexible display developed from industries, as an interactive artwork exploration that combines art and technology in innovative ways, my

malleable display focuses more on providing viewers with an entertaining and enriching experience by expanding their understanding of the boundary between the physical and digital worlds. This display will allow users to reshape and deform its surface in three-dimensions, allowing it to contain and deliver the virtual world in more diverse and interesting ways than traditional screens. With the doubling effect provided by this screen's movability, by shaping the frame and surface of the window to look into the virtual world, users will be able to mold and affect the virtual world directly. The malleable screen will be a place for presentation as well as representation of the virtual world that it contains.

5.2.5. Discussion and Future Directions

I have explored three types of movable screens thus far: the tilting screen, the spinning screen, and the malleable display. Each of these has been created by conceptually positioning the screen in between the virtual and the physical. Thus, I wanted the screen to fluctuate and oscillate by itself, creating a new perceptual experience for viewers by blurring or intermingling the experience between the virtual and the physical.

As I said at the beginning of this section, in order to avoid a direct one-to-one response between the interactor and the system, I intentionally avoided using a camera-screen interface. However, while developing the movable screens, I realized that these systems, which are based on sensor input, do not actually create a result that is very different from what would result from a camera-screen interface because the sensor input system also responds to each response immediately. In this sense, it is also basically a one-to-one mapping based on a closed loop system. Through the first implementation of

the movable screens, I realized that what I was trying to avoid was not the actual camera-screen interface; rather, it was the one-to-one, mirror-like reflection between the system and the interactor. The doubling effect in the movable screen experience was, thus, my approach to emphasize the perceptual experience, while at the same time revealing the gap between the virtual and real worlds.

Since the doubling effect increases the perceptual effect for the viewer, it turned out to be the right approach for the original idea of the movable screen. In future work, I might further intensify this doubling experience and the gaps between the doubled layers virtual and physical. I could also explore more diverse content for the movable screens. For the spinning screen, instead of using a spinning dancer, I may explore other visual images. Using different imagery, the gap between the visible and invisible could be approached with a new perspective and in a new context.
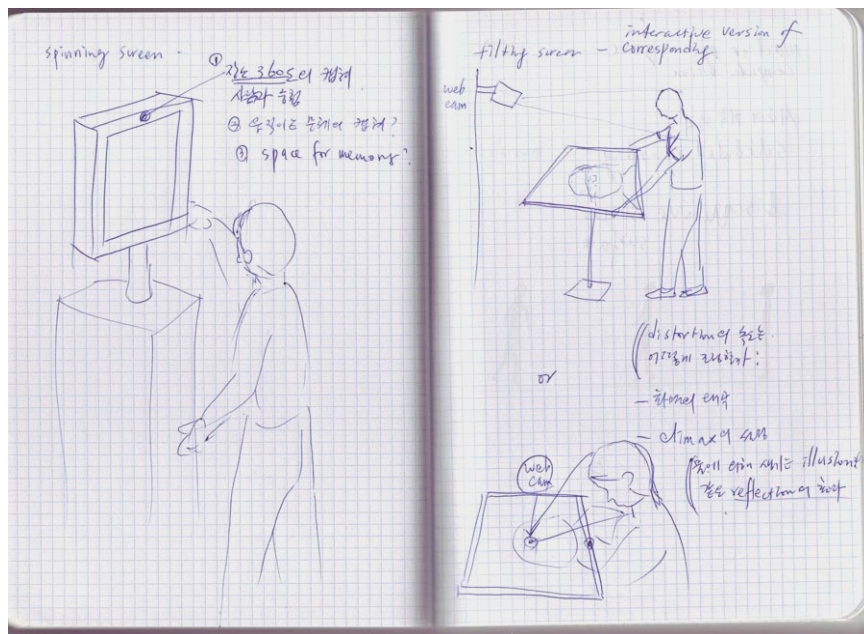
Figure 5.2.5.1   Drawing for the spinning screen and the tilting table with a webcam interface

As a final note, as I became freer in using the camera-screen interface, I also began to conceive of a way to combine the camera-screen interface with the movable screen. Figure 5.2.5.1 illustrates the idea of combining the movable screen interface with a webcam interface. The sketch on the left side shows the spinning screen with a small camera embedded inside the monitor. The camera captures the scene while the screen is spinning and feeds this image into the spinning screen. The sketch on the right side also shows the tilting table screen with a webcam in front of the table (the sketch on top) or inside the table plane (the sketch at the bottom). These display the interactor as either distorted or doubled images. I thought this could be a way to create an interactive version of *Corresponding* (refer to Figure 4.4.6) with illusion and reflection. However, I have yet to implement ideas.

5.3. Case Study 1.5: From Movable Screen to Responsive Space Screen

In 2005, I thought of creating a movable projector that could scan a big wall screen horizontally and vertically. A sensor device (e.g. an accelerometer) would measure the projector's movement and send this data to a computer, which would update the status of the images relative to the position of the projector as seen in the sketch above (Figure 5.3.1.1). In this idea, when the projector is moving, it reveals certain parts of the imagery assuming that the entire wall is the whole image. I wrote on the drawing "image out of frame/ movable screen." At that time I also thought that the entire image could be that of real candle lights that are captured by a camera in a corner of the room. Then, the slow movement of the projector would leave a flowing trace on the wall.
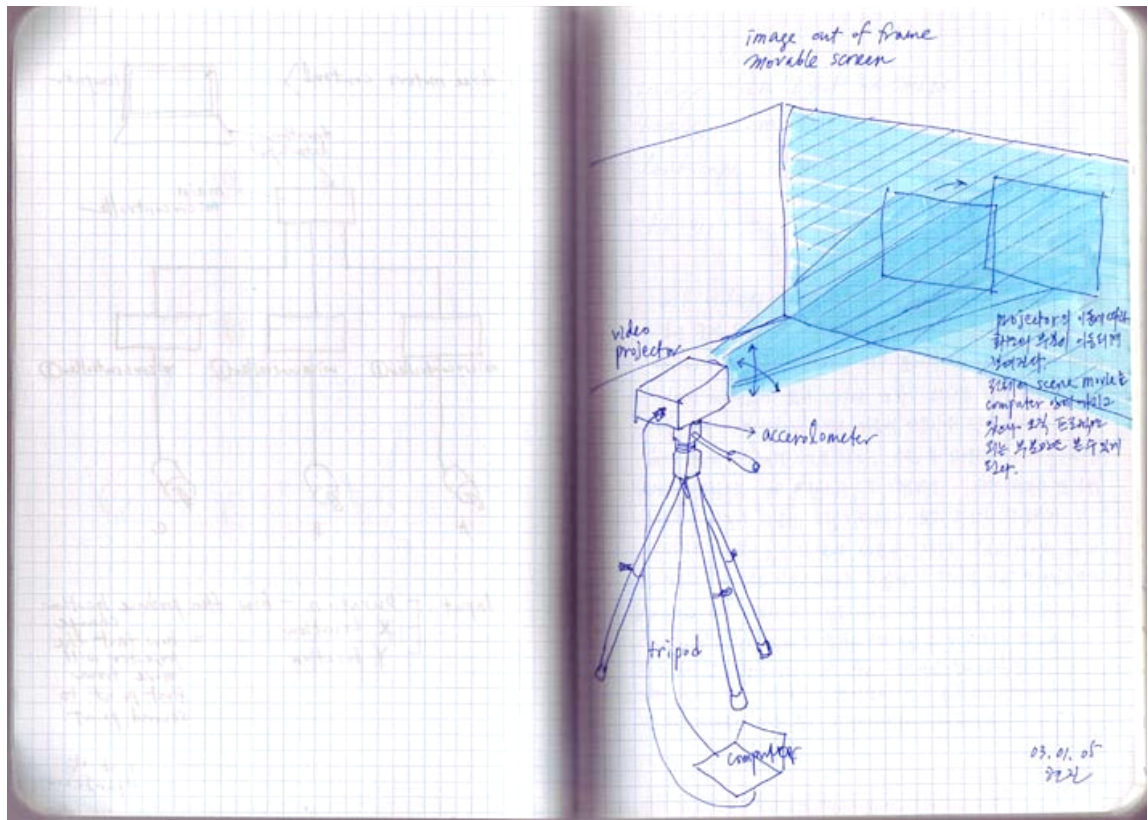
Figure 5.3.1.1   sketch for a movable projector and movable frames (2005)

In 2007, although it was not the exact implementation that I had in mind, with the help of a WiiRemote controller (a pre-existing sensing controller that can track its movement and send the sensor data to a computer via Bluetooth technology), I was able to create the similar movable image project. The project called WiiArts and this realized together with my colleagues Hyungsin Kim and Gaurav Gupta. The first WiiArts piece that traces candlelight's on a large wall is entitled *Illumination*. After *Illumination,* the WiiArts project has explored several other drawing applications using a drawing, revealing, or casting method of interaction with WiiRemotes. The shared feature of the WiiArts system is that it utilizes an open space in front of a large projection screen as a responsive and interactive space. With WiiRemotes, the interactor can make free body

movements "in front of" the screen and "in" the open space. As the users' interaction

behaviors change with regards to the screen, the meaning of the screen also changes from

that of an object (the movable screen as the object) to that of a spatially expanded screen

(the screen as a space where the interactor or viewers can move and respond). Compared

with Moons Over You project described in the next section—case study 2, which uses

responsive space as a screen, the WiiArts project serves as a screen in transition from

movable screens to responsive screens. Therefore, in this thesis, I have placed the

WiiArts project as case study 1.5.

Although the WiiRemote already has its own context as a game tool, we have also

developed the WiiArts project as an interactive design research project exploring the

inter-relationship between the human body and computational media. As the artist of this

project, my role is to incorporate reflective experiences for art applications. With the use

of wirelessly connected tangible devices in front of a big wall as a screen (expansion in

size), WiiArts pieces engage the interactors' free and natural bodily interaction in front of

the screen and help them obtain a relatively flexible physical distance from the screen. I

have explored this experience as a possibility and mechanism for fostering a reflective

and meditative experience.

5.3.1. Overview of the WiiArts Project

These days, computer games are no longer just a single genre of entertainment for

individuals. As they increasingly spread across the daily life experience of individuals,

they are also making a big impact on society, both commercially and socially. As a result,

game culture and technologies are drawing research interest from many fields such as

graphic design, computer science, and HCI. This growing attention from diverse fields is

leading the designers of mass-market computer game applications and consoles to make use of up-to-date methods of player interaction. This trend of novel interaction techniques is best reflected in the recently released Nintendo WiiRemote, which provides motion-sensing capabilities integrated into a tangible remote control device. Using the WiiRemote, game players can achieve embodied interaction within the range and accuracy constraints provided by the sensing technology. This form of interaction provides greater freedom of body movement than single-user GUI-style mouse interaction in front of a computer screen. In addition, this interface offers multi-user game experiences with the help of its wireless physical interfaces. Nintendo named the system "Wii", which sounds like "We" and is represented with a combination of two "i" characters, evoking the idea of a wireless (Wi-Fi) gaming service[13]. As Don Norman pointed out, this trend can be interpreted as a return to physical devices, where we control things through physical body movements, by turning, moving, and manipulating the appropriate mechanical devices (Norman 2007).

Whether it is a single-user or multi-user game, we found that the themes and goals of Wii games still tend to be competitive in nature. For example, even though many multi-user physical interaction-based games developed for the Wii console have a strong potential for collaborative play, they are still very goal-oriented and tend to focus players on competition, e.g. earning the highest scores. Moreover, although physical movement is the main method of interaction in WiiRemote-based video games, the actual movement in these games mimics the gestural movements in sports, for example, rolling a bowling ball or swinging a baseball bat. The direct one-to-one relationship between the real-world action of the player and the virtual action on the screen reinforces the invisibility or

"transparency" of the interface, rather than redirecting the user's "reflective" awareness toward their own body.

Making use of the WiiRemote as a pre-existing tangible and embedded interface, we explore applications that can engage participants in active and expressive art creation in a collaborative manner. Therefore, the use of the interface can be extended to non-competitive and artistic applications. We have built several WiiArts prototype applications: *Illumination, Beneath (Waldo), Time Ripples, Ripplecast, and Chromaflow*. In these applications, up to three interactors can work together to compose both images and sounds. In this chapter, after briefly looking at the possible parameters for WiiRemote interactions, I will demonstrate each of our WiiArts applications as a series of individual design experiments exploring possibilities for artistic experiences.

Interaction Parameters provided by the WiiRemote

As the primary controller for Nintendo's Wii console, the main feature of the WiiRemote is its motion sensing capability through accelerometers and infrared detection. These capabilities allow the user to interact with and manipulate items on screen via movement or pointing. Interactors use the WiiRemote to control the image through pitch, yaw, and roll, by moving their hand up/down and side to side, and by twisting their wrist. In addition to motion sensing, the WiiRemote has buttons (up/down, left/right, A/B/C, etc.) that can be used as direct inputs, e.g. for menu selection. The controller connects to the computer via Bluetooth. Based on this diverse set of interaction possibilities, we have designed several interactive WiiArts applications.

5.3.2. Work Examples: WiiArts Design Experimentations

5.3.2.1. *Illumination:* Tracing with Candlelights

    Illumination provides drawing experiences by using real-time fluid candlelight traces (Figure 5.3.2.1.1, Figure 5.3.2.1.2, and Figure 5.3.2.1.3). In its current form, the projection screen becomes a shared drawing canvas, and up to three interactors can draw simultaneously with their own WiiRemotes. The candlelight source imagery of three burning candles is captured from three cameras in real-time. Thus, the three different candlelight traces drawn by three interactors can be composed together to create a dynamic drawing. Since this drawing uses light in a dark space, the overall process of drawing provides a contemplative aesthetic experience.
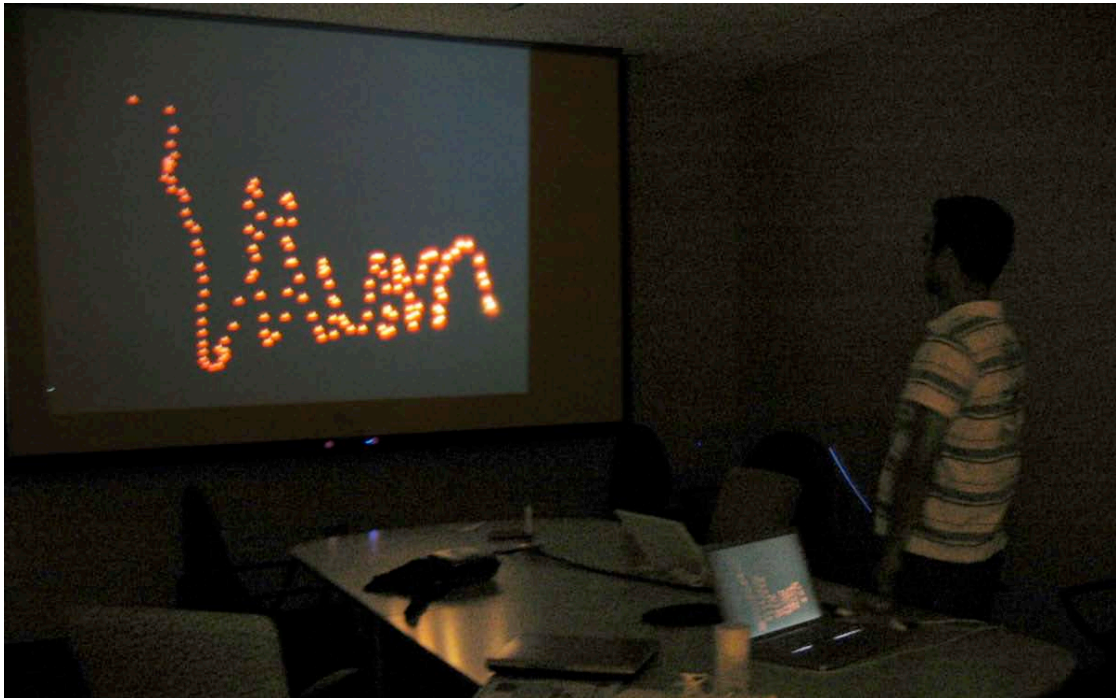
Figure 5.3.2.1.1 *Illumination* (2007) single Wiiremote interaction with a live image of candlelight

Figure 5.3.2.1.2 Live images of candlelight capture based on single Wiiremote interaction in *Illumination* (2007)

As discussed in Chapter 4, the real-time imagery captured from a camera as source for video brush or video painting has been used in many works, and in many such cases, the video camera has often focused on the interactors. Thus their own image is directly displayed on the screen, and their own faces and bodies function as an interface.

In *Illumination*, since the video camera focuses on candlelights standing at the corner of the installation space, the source image does not have a close interrelationship with the interactors. Rather than using a short sequence of video, which is explicitly selected from the environment, in *Illumination*, the source imagery captured from a static camera shows continuously changing images over time. As they connect their body movements with the traced images over time, interactors can develop an embodied relationship with the object while at the same time keeping a critical distance from the image and work. The meditative mood is enhanced by the flickering candlelight in this mode. In *Illumination,* the real-time video processing and compositing are processed in Jitter, and in the current version, in order to ensure smooth position sensing, we used only the WiiRemote's IR-sensing with a Sensor Bar.

Figure 5.3.2.1.3 Three-users interaction with *Illumination* (2007)

5.3.2.2. *Time Ripples*: Space/Time Mapping

Time Ripples is our first prototype of a real-time video-processing artwork that explores experimental time/space mappings. Viewers can point from one certain location on the projected video image to another in order to reveal different moments of time at that section of the video frame. This revealed time slice automatically shrinks as time passes, creating a ripple effect as the

Figure 5.3.2.2.1   *Time Ripples* (2007),
Screen capture based on two user WiiRemote interaction

surface returns to the original time (Figure 5.3.2.2.1). In Camille Utterback's *Liquid Time Series* (2001-2002), the viewer's body distance from the screen determines the video

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flow, varying the space/time relationship in the video image: as the participant moves

closer to the projection screen they push deeper into time, and as they move away, the

fragmented image heals in their wake. *Time Ripples* provides similar perceptual

experiences by manipulating time
within video imagery. Another related
piece, *Khronos projector* (Cassinelli
2005; Figure 5.2.1.1), manipulates time
and space in complex ways by cutting
up time and space and representing
them as having perceivable volume or
dimension. While *Liquid Time Series*

Figure 5.3.2.2.2   Three-user interaction with *Time Ripples* (2007)

and *Khronos projector* use pre-recorded video as the source imagery for temporal

manipulation, in *Time Ripples* we use real-time cameras that face different spaces. One

camera is positioned in an adjoining room, and the other camera faces the window

outside, providing a means of capturing different moments of a real-time space.

5.3.2.3. *Ripplecast*

Ripplecast (2008) attempts to provide a calm engagement and a chance to

encounter nature in an interactive media art experience. As if the interactors were

standing on the shore of a lake, the projected image of a still pond on the big gallery wall

lies waiting for viewers (Figure 5.3.2.3.1). At first, the viewers may not notice why this

image is displayed. Since it is displayed in a gallery, they may assume that it is an

artwork as part of an exhibition, but they may think that it doesn't seem to match with the

semiotical reading of art photography or art videos. Yet, still they may still discover an

open-minded feeling in front of the scene by looking at the imagery of the pond, which makes them feel as if they were in nature, in the countryside. From the moment they find three WiiRemote controllers with bright blue LED lights in a corner of the room, they can start to discover a connection between the controllers and the natural scene. A viewer may grasp one of the controllers and start to move it around as players do in Wii games. They may not get a response, since the interaction requires that they press a specific button to be able to interact with image. But occasionally some of them luckily are able to, or even accidentally, create a small ripple reflection on the surface of the pond. At that moment, they suddenly realize that they can skip stones over the still pond as if in front of water in nature.

In *Ripplecast*, the interaction with the WiiRemote is designed to mimic the movement of throwing stone that we do with our hands. Similar to the way we grip a real stone with our fingers, stretch our arms and release the stone from our fingers at the last moment, the interactor can trace a curved line in the air while holding the WiiRemote and pressing the big button on the bottom with his index finger, and finally release the button to release a virtual stone. As a result, ripples form on the surface of the still pond depending on where the interactor throws the stone. Based on the strength and degree of the throwing motion, the stone skips, making one or more hops. Certain movement, directions, and speeds are programmed to get better results. The tracking of the movement and speed of the WiiRemote is measured with its embedded accelerometer, and the data is wirelessly transmitted to a computer in a separate room via Bluetooth technology.

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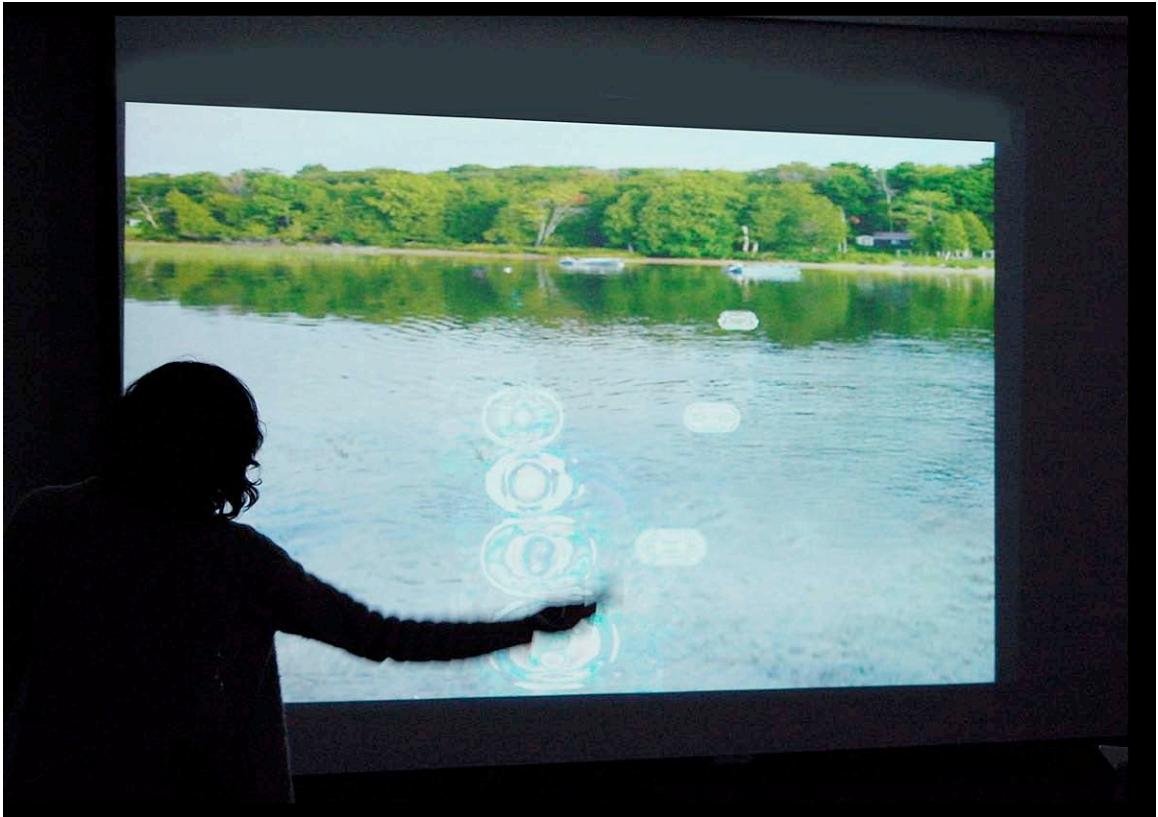
Figure 5.3.2.3.1 *Ripplecast* (2008)

In the "Listening Machines" show at Eyedrum Gallery, Atlanta, Georgia on April 24th, 2008, and in the "Corresponding" Show at Song Art Gallery, Seoul, Korea, from July 28th to August 13th, 2008, the *Ripplecast* project was exhibited to the gallery audiences. With the spacious screen, the scenery itself already provided a natural feeling. When audiences noticed that they could cast the stone to make it skip on the pond's surface, they became very excited about their unexpected experience in the gallery. Since WiiRemote interaction is easily designed and simply mimics the gesture of stone throwing, people easily followed and added their own experiences.

In order to make more bounces, people tended to make a big gesture in their interaction. However, the number of bounces is not linked only to the speed or direction of the movement. Since the WiiRemote is used at a distance from the screen and gestures

are also made up in the air, the mappings between the gesture motion and the result of the interaction are not explicitly revealed to the viewer. Rather, we aim to invoke a reflective mode of user experience by leaving an element of arbitrariness in the cause and effect relationship. This suggests to the interactors that they should look back on their body and mind from a distance, and bring their own memories and experiences with nature to their current interaction with the piece. The optical perspective created by the image and the ripples as they recede towards the horizon creates an immersive experience for interactors and viewers alike.

With the current image, ripples can bounce only below the horizon line is (in the image there are boats on the horizon and the ripples bounce only below that line). Also, when the stone bounces towards the far side of the surface, the ripples are programmed to become smaller by applying geometric perspective. This kind of mapping provides viewers with a more realistic feeling in their interaction, and thus enhances their sense of immersion. Currently, we have used a still image for the scene, but in the future it could be replaced with moving images in order to give interactors an even more realistic feeling. Also the sound of the stone bouncing on the surface of the water could be added to provide a more immersive and engaging feeling.

5.3.2.4. *Chromaflow*

Like *Ripplecast*, *Chromaflow* is another WiiArts project that draws ripples on the screen. The interaction and program use exactly the same methodology as *Ripplecast*, but while *Ripplecast* emphasizes self-reflection through the experience, *Chromaflow* instead promotes a more collaborative interaction between users. In this work, each person's WiiRemote draws single colored ripples. When each stroke with the WiiRemote is made

and a virtual water drop is cast on the surface, it bounces several times as in *Ripplecast* like a splash. Currently, this application supports interaction for up to three people at a time. Thus, if three interactors work together, they can cast ripples in three different colors from three WiiRemotes. The ripples cast by the interactors start to flow on the surface of the screen, and when they spread and diffuse near other ripples, they start to mix, creating a colorful window as seen in Figure 5.3.2.4.1.
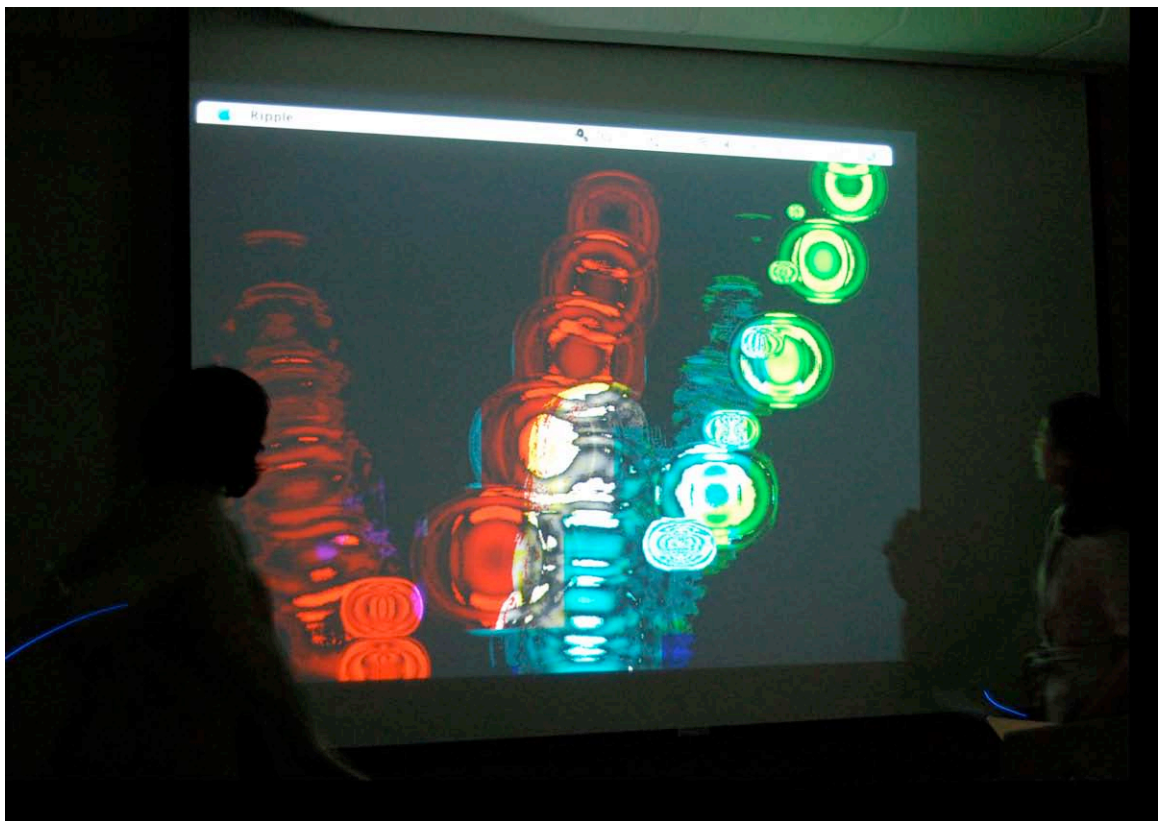
Figure 5.3.2.4.1 *Chromaflow* (2008)

Sometimes ripples are dropped at unexpected locations, much like occasional random drops in watercolor drawings. This kind of effect can bring about unpredictable results created only by chance. *Chromaflow* may remind one of Jackson Pollock's drip

paintings in the sense that the audience can draw abstract images with ripples through diverse and active body gestures. Unlike Pollock's canvas, which was placed on the floor, the canvas screen in *Chromaflow* is set up vertically on the wall. Also in *Chromaflow,* the shared canvas becomes an open field for the creation of many different kinds of abstract visual works. Similarly to *Ripplecast,* the position of where ripples drop on the surface are mapped to the WiiRemote interaction in a way that gives the look and feel of arbitrariness. This is because the gestures with the WiiRemotes are made in open space; thus, every time a movement is made, its direction or position is made a little bit differently. With the waving colorful water surface on the screen, the audience becomes immersed in a calm and reflective mode.

5.3.3. Viewers Experience and Future Direction

People who have experienced Wii games easily interact with the works of WiiArts; therefore, we can say practice can help to make a fluent and freer interaction. On the other hand, in the cases of *Ripplecast* or *Chromaflow,* we observed that even children who are 3-5 years old could enjoy the works. Although they could not make multiple bounces, they were able to move their arms and behave like an adult with WiiRemotes, and have fun with the ripples made (dropped) on the surface. This is perhaps because WiiRemote interaction itself is intuitive and simple enough to follow, and the interactive pieces are designed to be easy to learn.

In movable screens, individual sensing systems are embedded in each movable screen structure, which prevents multiple user interaction at the same time. But in WiiArts, we noticed that while the participants seemed to enjoy the reflective and meditative mode, when they played or interacted together with others, they very clearly

enjoyed sharing the experience with each other. The WiiArts project uses interaction with WiiRemotes, which use integrated sensing with an infrared and an embedded physical sensor (an accelerometer) inside the WiiRemote. The captured data is transferred wirelessly via Bluetooth. In this way, the interaction of the viewers can involve interactive feedback loops that are different from computer vision sensing via attached camera and thus suggests different ways of interacting that can allow them to look back at themselves in their interaction. For example, through the slightly arbitrary relationship of the user's interaction in front of the screen and the result of that interaction, these works experiment with expanding or opening the feedback loop. If the cause and result of an interaction are too loosely linked, the viewer cannot get a real sense of the interaction. On the other hand, if the links are too tight or too obvious, the viewer either quickly becomes bored with the interaction or cannot escape having a narcissistic experience. Also, although the viewer may become involved in a strong sense of experience through interaction with the system, he cannot achieve a critical distance in this responsive system. By using the more natural and freer interaction allowed by the Wii system and with more arbitrary mapping between the action and results, I have tried to suggest a new kind of feedback loop in its interactive relationship.

The WiiArts project anticipates a responsive surface and a large display. The wall surface on which the images are presented allows us to continue our exploration of the screen display, and, with the interactive aspect (the interactivity made through the screen), we continue to explore the concept of movable screens. In addition, a large screen allows for multiple interactors and, therefore, the possibility of a shared experience.

5.4. Case Study 2: Responsive Screen-Space

for Manifold Spatial and Temporal Mapping

In 2002, when I created the installation *the Willow tree*, I was satisfied with the result of the work. As intended for three-dimensional screens, the dual space and time of the virtual and real began to co-exist simultaneously, and it was the viewer's existence
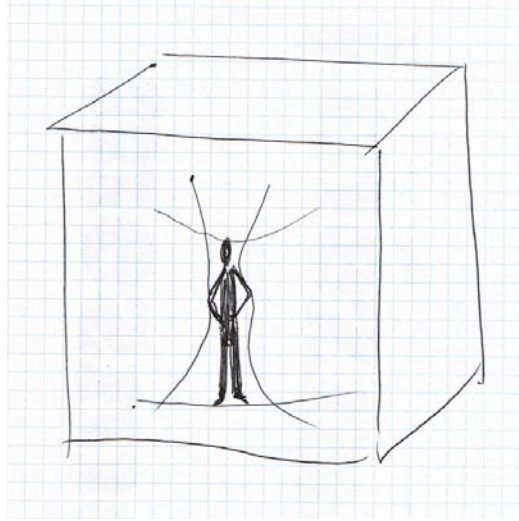
Figure 5.4.1 Concept drawing for responsive space

inside the virtual imagery that became the connection for this. As the viewer and the work (the screen) were tightly linked, I began to form other kinds of questions: What if the virtual imagery can "re-act" to the viewer's reaction. If artwork allows "interactivity," how will the relationship between the virtual and real be mixed? If the viewer's physical action can be included in the virtual imagery and trigger some events in virtual space, will this promote the concept of the "in-between" screen even further? The concept of movable screens as interactive screens has been explored and developed as a result of these questions (as discussed in the previous chapter). However, while working on the movable screens, I have also wanted to continue exploring the idea of an expanded screen

space as I did in *the Willow tree* and *Waterfall* series of works. I think that the size of the screen itself can create a different perceptual experience for the screen viewers, and that space experience can instill a very natural and immersive feeling and interaction in the viewers. Therefore, I wanted to continue experimenting with large screens as an interface as with the WiiArts project. I thus began to develop the idea the "Responsive Space Screen." The responsive space-screen extends the concept of "screen as interface," but now the screen becomes a space rather than an object. In other words, if in the movable screen, the screen is an object-interface, in the responsive space screen, the screen becomes a space-interface. Also in the responsive space screen, the screen becomes a three-dimensional one (a room-sized or environmental-scaled one) so that the viewer's bodily interaction "in front of" the screen or "in" the screen can be more natural and free.

Technically, the responsive space screen uses computer vision technology to sense the viewer's body movements in the space. To present the viewers movement on space, the screen needs to display virtual imagery as reflection. This camera-tracking methodology is the camera-body-screen interface that, until now, I have been reluctant to use. Therefore, I had to develop two principles to escape any possible direct mirroring effects in this responsive screen experience: 1) The virtual imagery reflection is not necessarily a mirror-reflection of the viewer's body movement, or a representation of the viewer's image, and therefore, 2) manifold spatial and temporal mappings are required. I use the phrase "manifold spatial and temporal mappings" to mean an imaginative way of mapping with multiple space and time elements. With flexible and diverse mapping methodologies, several different times or spaces can be combined together, which does not happen in the real world. With the virtual imagery, the viewer experience can be

represented in manifold time and space fields. In this section, the first work developed

with this idea is the project, *Moons Over You*. However, before describing it, I will

introduce several screen ideas that were prepared and developed in order to create *Moons*

Over You.

5.4.1. Responsive Space Screens

Several years ago, I conceived of the concept of a responsive space screen. Although I didn't call it a responsive screen, many screen work ideas have resulted from this notion, and some of them have included interactivity as a part of the screen experience. The idea of the large screen and the interactive screen remained as sketches in my drawing book. A drawing created in 2000 (Figure 5.4.1.1) also
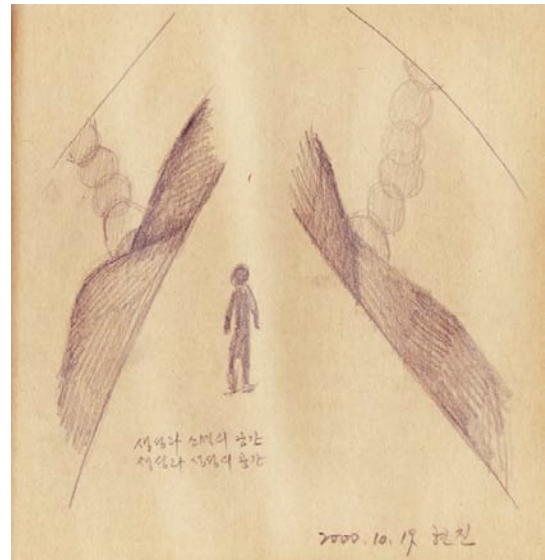
Figure 5.4.1.1 *The space of becoming (formation) and dying-out (destruction), the space of multiple becomings* (2000) by Hyun Jean Lee, Sketch drawing

showed one of the ideas using a large screen display. By this time, I had thought of

creating a screen space with two large wall screens facing each other. The viewer can

walk in-between these two screens, where the screen on one side shows the moving

images of a sun rising, and the screen on the other side shows the moving images of a

sunset. Therefore, the viewer finds him/herself in a poetic space created by encountering

of two times of sunrise and sunset, which will never happen as a real world experience. In

the corner of the drawing, I wrote in Korean, "생성과 소멸의 공간 / 생성과 생성의 공

간 (the space of becoming (formation) and dying-out (destruction) / the space of multiple

becomings)." I imagined two walls which do not have a wide distance between them. And through the narrow, corridor-like space, the viewer can walk forward and backward, and the movement of the viewer can make the sun follow him/her. The sketch drawing (2003, Figure 5.4.1.2) also shows another idea for a screen set in which two times encounter each other at a physical connecting line. In this drawing,

Figure 5.4.1.2 *Two times encounter each other* (2002)
by Hyun Jean Lee
Screen set sketch

instead of two walls facing each other, I thought of two screens that are leaning on each other like a tent shape. Thus the sunrise and sunset images are actually overlaid and connected with each other in the space.

Around the time I was creating the installation *the Willow tree* in 2002, I also had several other ideas for a large screen display. Similar to *the Willow tree,* the screen envelops the viewer, but with its surrounding shape. As seen in the drawing created in 2002 (Figure 5.4.1.3), I conceived of a cylinder type of screen that could surround the space, with multiple suns rising together on the screen. In the

Figure 5.4.1.3 *Multiple Suns Screen Set*,
Drawing (2002) by Hyun Jean Lee

drawing next to the screen image, I wrote, "The screen should provide a natural feeling like one of the ZKM projects that I saw in the "Nam June Paik and Media Art" symposium[14]. Although I didn't specify it in the drawing, the ZKM project refers to Jeffrey Shaw's work, *Place – Ruhr* (Figure 5.4.1.4)*, which used a cylinder screen. Unlike *Place – Ruhr*, I imagined that the entire screen should display the sky images seamlessly as its background, without revealing any distinctive gaps between the images, which, however, would come from different projections. I also imagined that the sun would rise up and down independently according to the movement of the viewer who is walking around in the space.

Figure 5.4.1.4   *Place-Ruhr* (2000)
by Jeffrey Shaw

Along with the idea of responsive screens as a space-interface, the above drawings directly influenced the project *Moons Over You*. At first, I imagined that one person would be in the space to experience the poetic situation of two encountering times, that of Multiple Suns Rising in the above sketched work. However, with the help of newly developed technology, I have been able to imagine multiple viewers interacting in the space (Figure 5.4.1.5 and Figure 5.4.1.6).

5.4.2. Related Work

The name and concept of "responsive space screen" are influenced by Myron Krueger's "Responsive Environments" (2002) and Marcos Novak's idea of "Liquid Architecture" (2002). In "Responsive Environments," Krueger says, "The responsive environment has been presented as the basis for a new aesthetic medium based on real-

time interaction between men and machines. In the long range it augurs a new realm of human experience, artificial realities which seek not to stimulate the physical world but to define arbitrary, abstract and otherwise impossible relationships between action and result" (104). Krueger composed the environment "in which a computer perceives the actions of those who enter and responds intelligently through complex visual and auditory displays" (106). An example of this is *Videoplace* from 1970. In "Liquid Architectures in Cyberspace," Novak explains that his concept of "liquid architecture" is "an architecture that breathes, pulses, leaps as one form and lands as another. ... whose form is contingent on the interests of the beholder; it is an architecture that opens to welcome me and closes to define me; .." (2002, 272). My concept of the "responsive space screen" takes both of these notions and moves toward the screen space as an organic space, and as a ubiquitous and pervasive environment. In this section, I examine related art and design applications that incorporate interactive tracking technologies and multiplayer game design research.

5.4.2.1. Responsive Screen

There are many tracking methods that trace the audience either in front of a display or in the space, and many such systems require extra gadgets or specially designed tags for the viewers, such as the head-mounted display in Augmented Reality applications, and embedded RFID tags or fiducial markers. However, in order to solicit natural and embedded interactions, I am
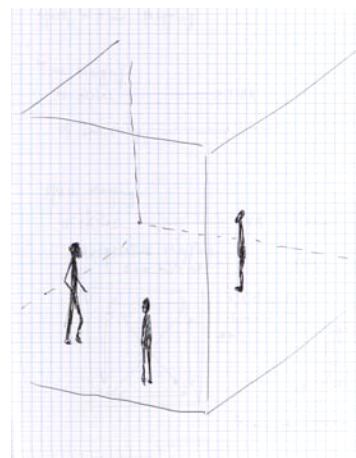
Figure 5.4.1.5   Concept Drawing
for the Responsive Space Screen (2007)

particularly interested in systems that track the audience in an open space without any

cumbersome attachments or devices. Therefore, while developing the *Moons Over You*

project with the help of Chih-Sung (Andy) Wu,

we adopted computer vision technologies to

realize the ideas of the responsive screen.

Before I explain *Moons Over You* installation,

I examine related works, such as art and design

applications that incorporate interactive

tracking technologies and game design

research whose goal is shared display and

shared experience in a game setting.
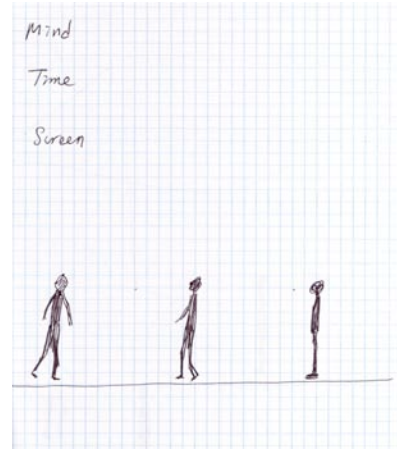
Figure 5.4.1.6   Concept Drawing for the Responsive
Space Screen – "Mind, Time, Screen" (2007)

Artwork applications using human body movement tracking technologies in space

Shadow (2004), an interactive installation by Adam Frank and Zack Booth

Simpson, projects a disembodied, autonomous, human shadow on the ground by using

real-time video sensing technology[15]. When a participant enters the dark installation

space, she sees a large empty area on the floor, lit with projectors. As multiple

participants walk into the lit area, their shadows are cast on the ground. Interactors soon

notice another disembodied shadow slowly entering the lit area. Depending on the speed

of motion of the interactors, the virtual shadows follow, retreat, approach, merge or

disappear. These autonomous shadows create a sense of presence and absence, while

merging the viewers and artwork into one entity in the real and the virtual. On the

surface, this work looks similar to *Moons Over You*, however, the disembodied shadows

seem to produce a ghost-like, scary feeling rather than a poetic and meditative feeling.

The tracking can sometimes give interactors the sense that they are under surveillance.

An example of a surveillance-oriented installation is *ACCESS* (2003)*,* housed at the

ZKM museum in Karsluhe, Germany and created by Marie Sester. It tracks anonymous

individuals in a public space with a robotic spotlight and an acoustic beam system. Since

the tracking system can be manipulated over the Internet, the relationship of tracking and

person being tracked is not apparent. Even the person who is in the spotlight cannot be

certain that she is being watched. This context makes the structure of *ACCESS*

intentionally ambiguous. Without any awareness of being controlled, the interactors often

turn the tables on the spotlight by following it, which makes the act of being surveilled

fun.[16] However, when they notice that they are being observed by a remote viewer, the

experience becomes ominous and frightening. Again, in *Moons Over You*, we try to

embed and even hide our tracking system in order to construct poetic experiences, not to

make viewers feel that they are being watched.

In this sense, the Barbarian Group's interactive installation, *Grass* (2006),

provides an apparent and more playful experience with its tracking system. The camera

seamlessly tracks the movement of the audience in front of the screen, which is a 45 feet-

long interactive wall displaying a field of grass. Visitors to the installation can make the

grass sway by walking in front of it as if their movements generate a virtual breeze. The

tracking and its presentation, and the physical and virtual worlds, are seamlessly linked.

Since these relationships are fully revealed, it does not give the interactors the feeling of

being watched. However, since the mapping of the virtual and the real, and of the

interaction and response are too obviously linked, it does not support meditative and

reflective experiences, which is our goal.

5.4.2.2. Large Screens: Shared Experience and Shared Display

In this section, I examine related research addressing a shared screen display for shared experience (as with a movie audience). I also review large screen display experiences related to game design.

Some of the examples mentioned in Sections 5.3 and 5.4 use a large screen-space and interactive tracking to incorporate and display the interactor's movement in the system. Some support multi-user interactions, some cannot. As the screen-space becomes larger, we inevitably include multi-user interaction in the space and encourage a shared experience among users. As a boundary experience between the real and the virtual realms, the screen also becomes a shared display in the physical and virtual domains. Both shared display and shared experience expand the possibilities for social experiences.

Generally speaking, cinematic screens are typical shared displays. Large audiences experience the virtual and physical world through the screen in the theater. As an extension of this, the IMAX screen, using a dome-like concave screen, enhances the immersive experience of the virtual world for viewers who are sitting in the theater chairs. However, social interaction among the audience members is not encouraged in these kinds of spaces. The audience share simply shares the screen and the virtual experience, but not any physical interaction in this space.

The concept of multi-user interaction as a shared experience can be found in recent game design research such as networked mobile games and multiuser online games (Robinett 1994). Some research examines how playability and social interactivity are influenced by shared displays in networked space (Robinett 1994; Zagal 2000). According to Robinett and Zagal, the purpose of the shared display is not only to

explicitly show a holistic and rich-in-detail view, but also to provide a possible personalized point of view, such as location information where users can gather together and interact with each other. In this way, the social side of the game experience can be enhanced through this shared display (Ducheneaut 2004). However, the shared experience is not necessarily related with the shared display. In the case of mobile display, despite the fact that it encourages shared play and social interaction in a virtual space, the small screen size attached to a personal or private device isolates game players in the physical space no matter how many players are involved (Robinett 1994). Although a player shares the space and experience with others in the virtual and physical worlds, the screen does not support showing other players' viewpoints.

On the other hand, shared experiences through shared play are promoted by more recent multiuser games. Many of these emphasize virtual play with a group of people in physical space or with physical devices, so the integration of the physical and the virtual makes the game experience more interesting. Nintendo Wii and Microsoft Xbox provide good examples of this type of platform. In the Rock Band game by Xbox, each player becomes a drummer who plays with a drumstick, a guitar player who plays a guitar or a singer who sings with a microphone. To create a good performance, they must play together. Information needed for the performance, such as musical notes and rhythm indicators for each player are provided on a screen display. All the players must look at the same display while playing. In this case, the display is divided into small sections for each player. Players share the experience and the display, but each individual player still tends to look at his/her own part of the screen during the entire play. Due to the restless characteristic of this type of game (players lose points if they miss musical notes), players

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do not have enough time to look around, change their perspectives or talk with each other (Robinett 1994). Aside from games, shared display and shared play are often used as advertising applications in public place such as malls and theaters. To draw the attention of passersby, the advertising company Reactrix creates entertaining environments.[17] Reactrix's advertising display provides a screen display that interacts with the physical movements of the audience, typically children. In this work, the display and play are truly shared with audience members. In *Moons Over You,* I aim to create a shared screen-space across the virtual and the real, thereby providing a poetic, aesthetic, and social experience in the interactive installation space.

5.4.3. *Moons Over You*

Figure 5.4.3.1   Concept drawing of *Moons Over You*

A moon follows you as you walk around.
She has her own moon. He has his own moon.
And I have my moon following me...

This section describes how the physical installation space and screen are designed and configured and how the tracking system's hardware and software structure is implemented for the interactive installation, *Moons Over You*.

An interactive installation, *Moons Over You* extends the present and immersive experience that I began to explore in *the Willow tree* when audiences enter the gallery room (Refer to Section 4.4. and Figure 4.4.5). However in this case, the screen space is extended to a responsive space where the viewer's walk is embodied in the work. *"A moon follows you as you walk around. She has her own moon. He has his own moon. And I have my moon following me..."* We often feel like the moon is chasing us when we drive around, but we know that it is just our perceptual feeling since there is always only one moon in real space on earth. Seeing multiple moons overhead is not our usual experience in the real world. Even though we can picture this kind of experience in our imaginations, we cannot physically share it with others. It can visually exist only in an individual's mind. *Moons Over You* creates a poetic installation space where multiple moons can follow us across the virtual and the real worlds and the audience can share their own imaginative and individual experience with others.

In the first section of this chapter, I described how the concept of the screen as a boundary object has evolved into the screen as an embodied space as implemented in *Moons Over You*. I also discussed previous projects that incorporate shared displays and shared experiences, and looked at other artwork that have influenced or are related to *Moons Over You*. In the following section, I describe my conceptual focus toward constructing poetic experiences in this interactive media installation. The possibility of maintaining critical distance in interactive art experiences, particularly by using the

method of video capturing and visualizing the result on the screen was importantly and carefully considered in this process. Therefore, I have conceived and applied three conceptual schemes to our interactive system design that are explained here. Next, I address the setup of our physical installation, the video processing scheme, and the computer-vision based tracking technology developed for this work. Finally, I envision future direction for this work.

5.4.3.1. Conceptual Background

      This section introduces the three conceptual schemes for *Moons Over You*: 1) Space as Embodied Screen / Screen in Embodied Space; 2) Feedback Loops in Interactive Arts; and 3) Shared Experience and Shared Display.

Space as Embodied Screen / Screen in Embodied Space

      Conceptually, *Moons Over You* expands the idea of the "screen as a boundary object" by transforming the screen into an embodied space. This embodied space combines the spatiality of the screen, as explored in three-dimensional screens, with the interactivity of the screen, as explored in movable screen works. The viewer's interaction can be integrated in a responsive three-dimensional space. In *the Willow tree* installation, viewers wander the space, touching blowing ribbons that have willow-tree imagery projected on them. The viewers, thus, are enveloped in the space and actually stand in the physical and virtual space of the willow tree. *Moons Over You* continues this in a large-scale environmental screen-space exploration, where the viewer can enter and walk around "in" the screen-space in much the same way that visitors could experience "my" willow tree. *Moons Over You* also seeks to create a slow, calm experience with a natural object by using images of the moon as the subject matter.

Moons Over You has been conceived as an interactive installation using images of the phase changes of the moon, which are projected on/in a room space that responds to the movement of the audience members. In this interactive installation, the physical space that the audience walks around is lined to the virtual space where the video images are generated and presented. The movement and position of the viewer in the space is tracked and represented as visual images on the screen. To promote natural and immersive interaction, the sensing system needs to be embedded in the space as naturally as possible.

By combining the physical and the digital realms together in the same space, we try to enable people to get the feeling that they are in the boundary of the virtual and the real worlds. This kind of connection between physical and virtual worlds, particularly "through the screen," has been explored in diverse types of screen forms and experiences in my previous work. *Moons Over You* expands upon this kind of screen exploration.

Feedback Loops in Interactive Arts

Our second conceptual scheme considers that the poetic experience can be constructed by creating a space for self-reflection. Since *Moons Over You* is an interactive system that makes use of computer vision based tracking technology, the piece is programmed in a closed loop structure, and the closed system is intensified by its use of camera capture–display. As I discussed in the beginning of this thesis, most interactive systems use real-time, instant feedback between interactors and the system, and many of them are based on multiple levels of closed loops— the closed loop of computer code and electronic signals. In these situations, interactors tend to react to the system, which also reacts to them. If the results of their actions are immediately presented

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on the screen, another closed-loop, this time psychological, is created. The immediate

feedback creates a mirror effect (Rokeby, 1995). This kind of situation does not allow

time for reflection or provide the distance necessary for interactors to critically examine

their actions. In *Moons Over You,* we create a self-reflective space by avoiding one-to-

one mappings from real world actions to virtual world responses.

In *Moons Over You*, the space for self-reflection can be created by imaginative,

manifold spatial and temporal mappings between real world actions and the virtual world

responses. For instance, the viewers' interaction can be mapped in imaginative ways in

its video processing. In addition, a "seamful design," one that deliberately exposes limits

and variations in such technology, questions and challenges the relationship between the

viewer and the interactive system. Seamful interaction can help to elicit diverse and

flexible dialogue between the work and the viewers in order to expand the scope of their

experience and evoke a dialogue between the self and the world beyond. In this case, it is

important to create or maintain a critical distance for reflection and to provide the

interactors with a chance to ponder their actions and reactions within the interactive

system. In *Moons Over You*, our approach is to expand the scope of interactive feedback

and question the relationship between the viewer and the interactive system, particularly

in a screen-based interactive artwork experience. By aiming to leave room for the users to

communicate their experience in the interactive space with each other, this work

encourages viewers to achieve an imaginative space and time.

Shared Experience and Shared Display

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In our third conceptual scheme, I approach the poetic experience by creating a space for shared interaction and imagination. Since the screen is large enough to include the interactions of many users in a single physical place, the individual's relationship with the virtual world as well as the physical world is shared by other people in the space. This multiuser interaction may engage the interactors in an interpersonal relationship, and therefore, the art experience can be expanded to a social experience. As an interactive art installation, *Moons Over You* aims to make possible an aesthetic experience in an interactive system. We have designed and built our installation space and system to accomplish this. In the following section, I describe how the installation of *Moons Over You* was developed. This section also discusses the design of the physical installation setup for an immersive environment, the development of computer-vision based tracking technology for a responsive space, and image-processing methodologies. I also describe the constraints of the current system and the viewers' experiences in our constructed space. Finally, I envision future directions for this work.

5.4.3.2. Physical Installation Setup

This section introduces how the physical installation space of *Moons Over You* is configured based on the design of the screen as a display, and how the tracking system's hardware and software structure is implemented. The constraints of the current system are also examined.

Screen Design and Physical Space Layout

We considered many types of screens for *Moons Over You*. We focused on how to provide an immersive feeling for the viewers so that overall the experience would give a clear sense of having moons overhead. We also wanted to provide a large screen in

order to address the concept of shared display and shared experience. Since we are using a camera-based tracking technology for the responsive space screen, we are aware that in general, the higher the camera can go, the larger the space that can be covered. We use a fish eye lens in front of the camera to obtain a larger field of view. However, to capture the large area of the room, putting the camera under the ceiling has been a challenge for our current setup due to our room conditions. The ceiling is filled with crossing beams, racks and lights. We also have a limited number of projectors and computers (2 projectors, 2 computers) to setup our prototype installation. Due to these constrains, we would like to think about expanding to a larger screen-space for future development or for real setup in a gallery. This means that mobility, expandability, and ease of setup become central concerns in the design of the screen as well.
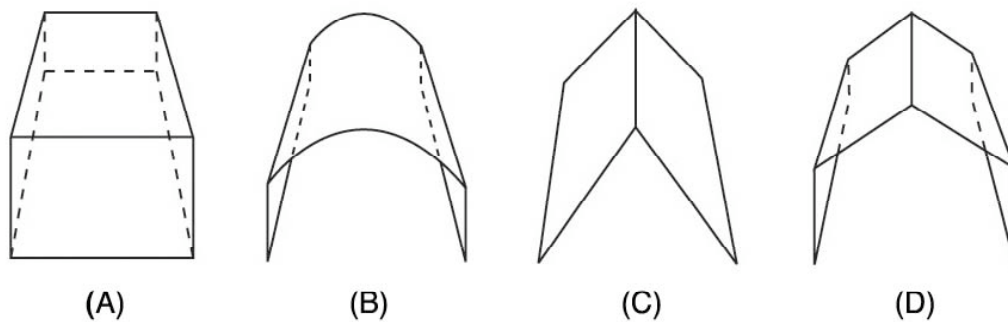
Figure 5.4.3.2.1 Discussion of Responsive Space Screen Design

At first, a dome screen with a half-dome mirror seemed best for our purpose, however we soon realized that our current physical space does not provide enough room for this kind of structure. Also, the dome structure does not provide mobility and flexibility for future expansion. A cubical screen ((A) in Figure 5.4.3.2.1) was discussed next because its generic shape could easily fit in many rooms and therefore provide flexibility. However, with two projectors, we realized that it would be hard to cover the

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entire room. Even though we could cover the entire space with projection methods using several mirrors, the algorithm to calculate the projection requires time and high-end computer processors. Also, in the current setup, the many ceiling beams and structures are another constraint. Next, we considered a half-cylinder screen ((B) in Figure 5.4.3.2.1). Compared with a cubic screen, the half cylinder ceiling screen would reduce the number of display projectors, since the two sidewalls and ceiling could be combined into a single plane. This configuration would be also good in that it would provide an immersive environment. The main disadvantage of this screen, however, is that projection display would need to be done from the ground, and the wider side of projection would be used to cover the wall-ceiling-wall part of the display. Since we could not make the screen wide enough or long enough with our limited number of projectors, this half-cylinder screen solution was also not suitable for our purposes.

With two projectors and room constraints, our prototype design of *Moons Over You* came down to using a slanted screen and a long corridor-like pathway (see (D) in Figure 5.4.3.2.1 and Figure 5.4.3.3.1). With two projectors, one long and wide sidewall can be covered. The idea of the slanted screen comes from a roof screen idea ((C) or (D) in Figure 5.4.3.2.1). The top part of the screen is attached to the ceiling, and the middle part of the screen is bent and attached to one side of the walls. Since the distance between the two projectors and the screen is also limited in our space, we thought that this solution would be best to maximize our usage of the space. In this design, the audience movement in the space can create the feeling of walking though a passageway. After testing several types of materials, we chose a dark blue fabric for our screen since it worked well with video that has fairly dark image overall. Projecting images on the

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screen created a natural dark environment, and as a result, the white moon images

displayed became more distinctive.

5.4.3.3. Technologies: Tracking System
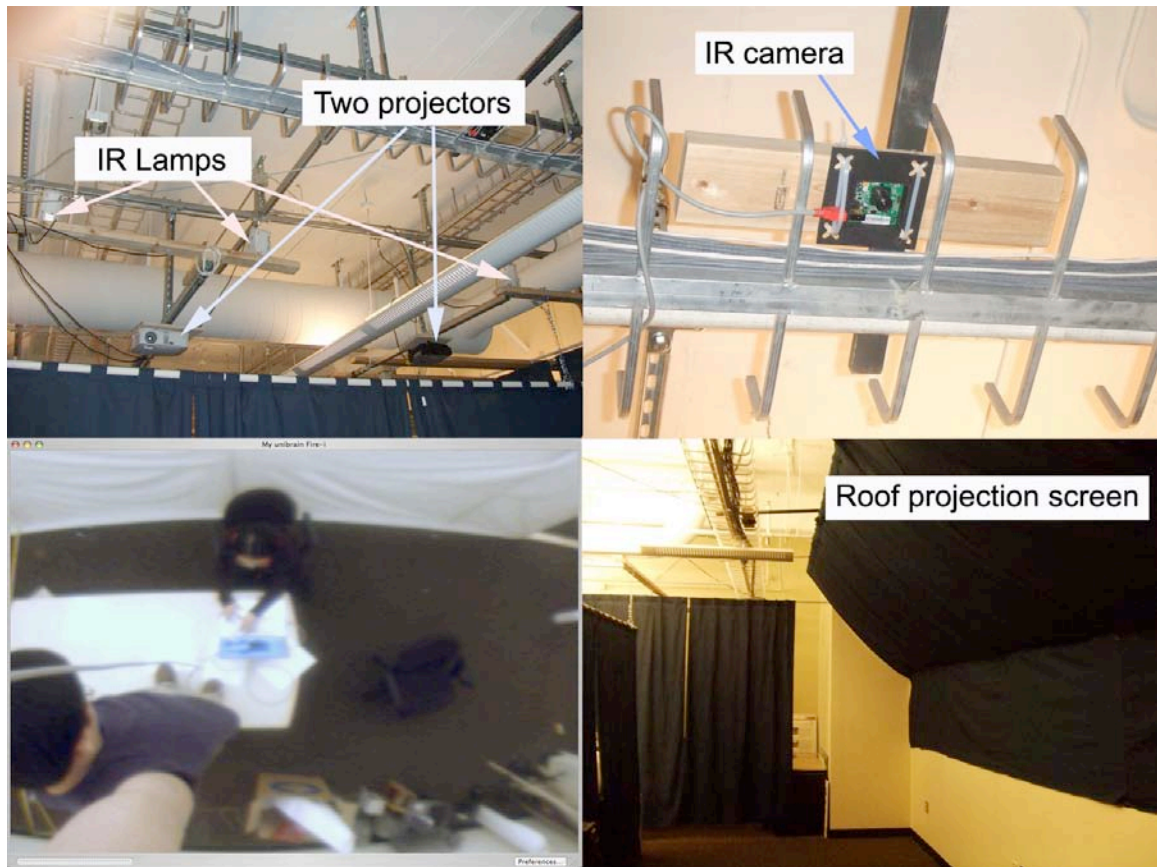
Figure 5.4.3.3.1 *Moons Over You* demo setup at the Synaesthetic Media Lab, GVU center, Georgia Tech. The upper left photo is the view from the projection screen. The upper right photo is a close shot of the camera on the ceiling. The lower left photo shows the view from the camera. The lower right photo shows what a user see when she enters the space.

Physical Space Layout

In order to implement *Moons Over You*, we needed to track the movements of

each individual interactor in the space. Tracking each individual's position and

movement is based on being able to follow each person's movement path and assigning

an individual ID to that path. To accomplish this tracking in the installation space without

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resorting wearable devices, we considered several alternatives such as pressure sensors on the floor or motion sensors on the wall. However, to design this installation to be easily moved and to fit into a variety of different settings, transporting and rearranging lots of sensors did not seem to be an ideal or elegant solution. As a result, we agreed that a camera-based computer vision tracking method would be an affordable and flexible solution to our problem. Thus, we developed our own system using an IR camera that responds to wavelengths from about 350nm to 950nm with five IR lamps spread over the room. Since our setup required tracking in a dark environment, more IR lights were provided as seen in Figure 5.4.3.3.1.

Figure 5.4.3.3.2   Background subtraction screen with help menu

Blob detection techniques are used to distinguish multiple interactors from nearly constant background images, and to assign them unique IDs. The system filters out brighter spots from dark backgrounds. The position of a user is decided by the geometric center of the corresponding blob. In our setup, the shape of a blob usually changes with ambient light. Therefore, it generates a jittering blob-center even if a user moves slowly. This undesired effect can be moderated by averaging two successive positions of a

specific blob. In the following we briefly illustrate our tracking system. During implementation, we encountered some unexpected technical constraints and limitations, such as ID swapping and losing track of IDs in the space. Figure 5.4.3.3.3 illustrates the procedures we implemented to track the movement of people.

1. *Background subtraction* – On the server side application, an operator subtracts the background image received from the camera (see Figure 5.4.3.3.2).

2. *Locating users* - The server application first applies a morphological opening operation to remove the noise. After that, it uses a blob detection algorithm to find blobs. It then returns basic information including the center location, the shape, and the size of the blob.

3. *Processing blobs* – Only blobs entering from the known entrances/exits to the space are considered valid. In our installation, this means that only blobs that enter from the two corridor ends are valid. Each valid blob that shows up in the space is then assigned an individual ID by the system. In addition to the basic information of a blob, such as location and shape, the speed of each blob is also calculated.

4. *Applying error correction* - Since blobs can sometimes disappear from view in the system, due to the effects of ambient light in the space, we designed a "lost in space" property for blobs. When a blob is marked "lost in space," it is not dropped immediately from the system. Instead, the system waits for a short period to see if it can pick that blob out again. We found this method usually works reliabling since the user sees only a twinkle of her moon on the projection screen. However,

if two users are standing very close to each other for an extended period of time and the "lost in space" event takes place, this can create unexpected and interesting effects. For example, the blobs may switch IDs, resulting in "moon switching" between users. Also, if a user who wears non-IR-reflective clothes enters the space, the system can sometimes lose track of the user. When this happens, this special blob is recorded and is assigned to a non-identified blob that suddenly appears without any previous information in that neighborhood.

5. *Encoding the information* - The server side application sends the information about all the blobs to a network port using the Open Sound Control (OSC) protocol (see Figure 5.4.3.3.3).[18]

6. *Decoding the information* - The client-side application receives the OSC messages from a specific network port and interprets them by using blob information. This part will be described in greater detail in the following section on video processing.

7. *Visualization* - The client side application visualizes the user data. In the case of *Moons Over You*, this is represented by the movement and phase changes of the moons projected overhead in the installation space. We will discuss this visualization in the following section in detail.
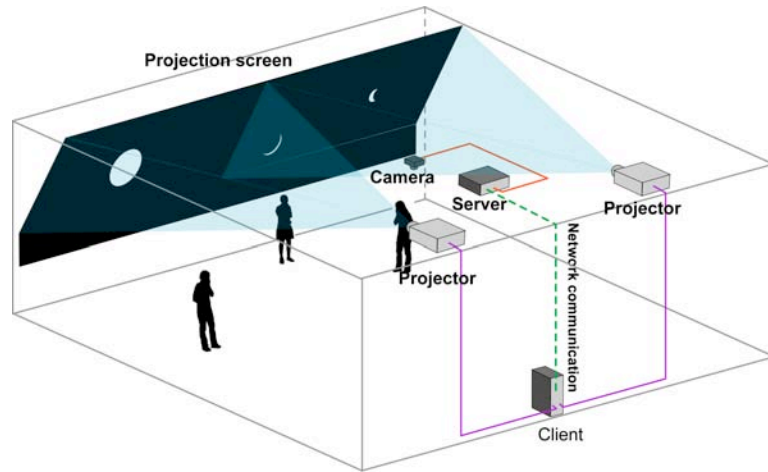
Figure 5.4.3.3.3   The Scheme of Overall Technical Setup

5.4.3.4. Video Manipulation and Mapping with the Space

This section describes how we create visual mapping between the viewers/interaction's position and ID with the images of the moon through a real-time video manipulation.

Video Manipulation and Mapping with the Viewer's Interaction in the Space

During the development process, we discussed how to map the video images of moons on the screen-space based on our tracking technology. The poetic feeling for an imaginative, aesthetic experience in *Moons Over You* can be elicited through careful and meaningful video manipulation. This mapping allows creative room for artistic imagination, and provides a means for us to create a reflective interaction for the participants. For this purpose, we thought of several ways to map the position and shape of each moon based on each person's position and movement in the space. Figure 5.4.3.4.1 shows the possible video manipulation schemes for a single moon movement in the screen-space. The shapes of each moon change from wane to wax according to the quantity of the time the individual spends in this physical/virtual space. The position of

the moon is also rendered according to the position and movement of the individuals. Therefore, depending on the viewer's position in the space, the moon in the sky can be moved or resized. In the current setting with the slanted roof screen, if the audience member steps far away from the screen, the moon rises up higher in the sky (the top of the screen under the ceiling overhead) and becomes smaller. If the audience approaches to the wall (the lowest side of the screen attached to the wall), the moon becomes bigger, showing a more detailed image of the moon. We hope that by looking at the images of the moon, the audience can get a natural and poetic feeling from the interaction. Although the display reflects the invisible tracking result of the interactors' movements in the space, when this result is mapped in more a creative way through spatial and temporal composition, it can create room for poetic interpretation. The video manipulation uses simple Quick Time video clips compressed as photo JPEGs, and the real-time manipulation is implemented in the Processing environment (http://www.processing.org).
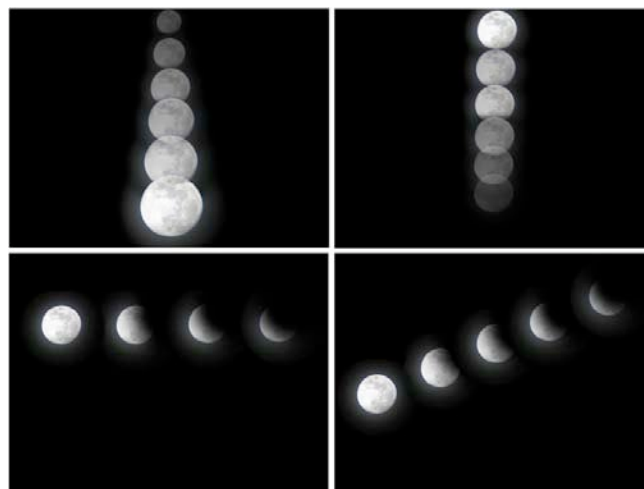
Figure 5.4.3.4.1   Video manipulation scheme based on the users
interaction

Setup Plan (A) - Side View

1 ft.   6 ft.   2 ft.   4 ft.

IR webcam

video projector

IR Lamp

IR Lamp

roof screen

3 ft.

3 ft.

3 ft.

computer running applications (Processing) (Max/Jitter)

Setup Plan (A) - Front View

3.5 ft.   3.5 ft.   3.5 ft.   3.5 ft.

video projector 1   IR webcam   video projector 2

roof screen

Setup Plan (B) - Side View

5 ft   mirror   mirror   5 ft

IR webcam

roof screen   6 ft

roof screen   6 ft

IR Lamp   IR Lamp

video projector 1   video projector 2
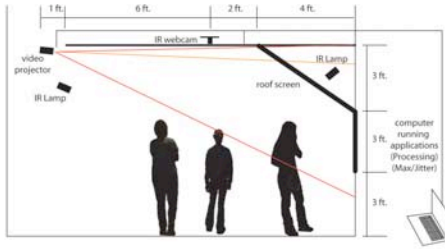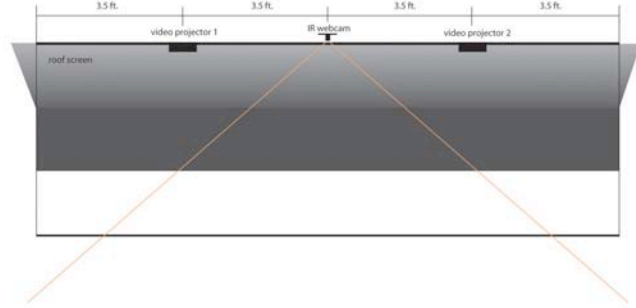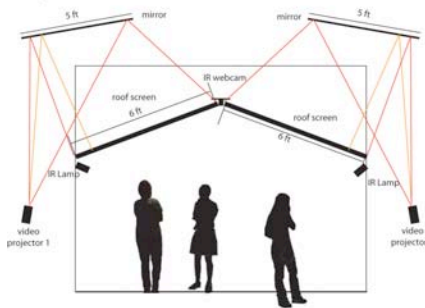
we will adjust the mirror and the angle of the roof and the heights of all surfaces according to the space.

Setup Plan (B) - Front View

mirror

4 ft.   4 ft.

IR webcam

roof screen

video projector s
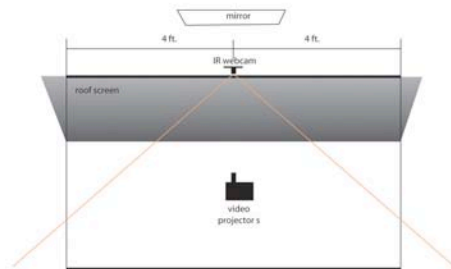
Figure 5.4.3.4.2   *Moons Over You* demo setup at the Synaesthetic Media Lab, GVU center, Georgia Tech.

Figure 5.4.3.4.3   *Moons Over You* demo setup at the Synaesthetic Media Lab, GVU center, Georgia Tech.

Figure 5.4.3.4.4   Three audience members in *Moons Over You*
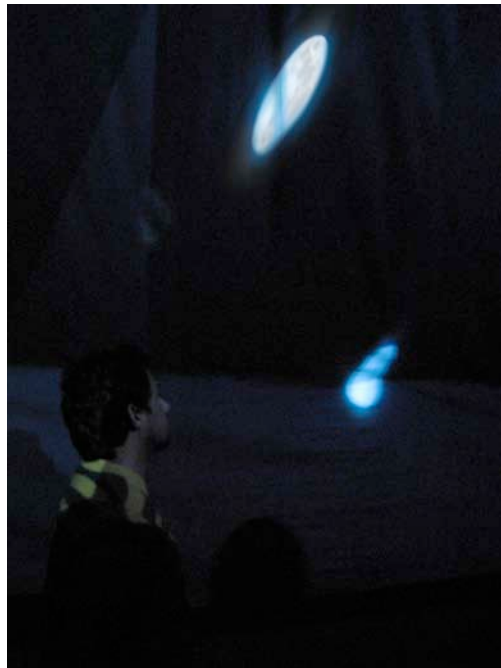
Figure 5.4.3.4.5   An audience member looking at his moon on the screen

5.4.4. Viewer Experience and Discussion
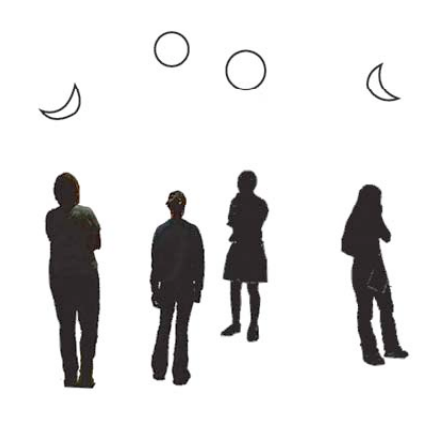
Figure 5.4.4.1   Multiple moons in the shared space

When an audience member enters the room space, she feels that the moon is following her as she walks around. If another person enters the room, another moon rises up above his head and starts to follow him as he walks around. Thus, each new audience member can create his own individual relationship with the moon. The moon following each new audience member creates a personal and individual relationship between the subject and the object. The physically impossible experience of possessing your own moon becomes possible in this virtual space. As more visitors enter the room, new moons keep rising and creating an individual relationship for each audience member. When one audience member pays attention to people around her, her perspective is extended beyond her own to include other people's interactions. In this way, *Moons Over You* becomes a shared memory, not merely an individual memory. It becomes a shared social space.

As I discussed previously, we found that the material of a participant's clothing influences the reflection of infrared light, e.g. while black cotton reflects infrared light well, black wool and black hair do not. As a result, sometimes some audience members lose their moon, or have their moons swapped. This kind of situation happens when two

people are too close to each other, resulting in their blobs merging; the system loses track of their IDs and sometimes switches them when the blobs separate. In this case, a visitor's waning moon may unexpectedly transform into a full moon, while another visitor's full moon may suddenly become a crescent moon. This tracking bug actually has a playful effect. We found that participants are first surprised by the sudden change in their moon, and then become amused when they notice that it has been "stolen" by another participant.

The Subject/Object Relationship
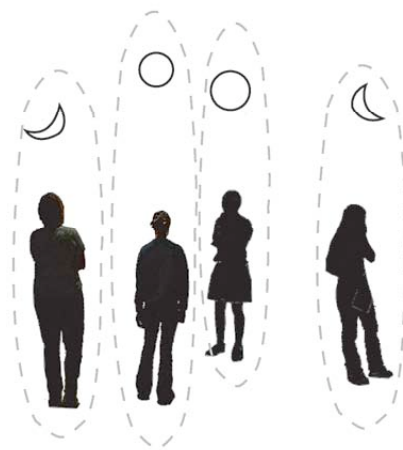
Figure 5.4.4.2   Each audience member has her own relationship with her moon.

Debates in astronomy between the heliocentric system (claiming that the sun is the center of the universe. Also called the Copernican system) and the geocentric model (claiming that the Earth is the center of the universe and other objects go around it) once suggested a philosophical question regarding who is leading and who is following. In *Moons Over You,* participants can direct and guide their moons while interacting with other participants. Multiuser interaction expands an individual experience into a shared

experience. The shared display integrates and enhances the aesthetic experience, making it a social event. Thus this system opens up individual perception to social interaction.

Manifold Mappings

The calm and slow feeling, and the required distance to reflect on this, can be evoked by the manifold spatial and temporal mappings between the movements of the audience members and the screen reflection/presentation. When the image-object on the screen responds to every visitor's movement directly, it can easily create a narcissistic type of interaction. Quoting Manovich's example of video game as media space Taylor says "As Manovich noted with the image object, the player is taught to expect certain objects to operate in a certain manner and when the image object do not, the artifice of the video game world (the media space) becomes glaringly apparent" (Taylor 2003). Through manifold spatial and temporal mappings of the relationship between the physical and the virtual space, *Moons Over You* creates an unusual corresponding experience. In our setting, the position and movement of the interactors results in the video image of each moon becoming "attached" to one interactor. If you walk toward the screen wall, the moon travels down the screen and gets bigger. If the visitor walks back from the screen, the moon rises up the screen and gets smaller. However, the mapping for this installation could be correlated in other very different ways. For example, the visitor could walk toward the screen, and the moon could travel up the screen and get bigger. Or, if the visitor walks back from the screen wall, the moon could go down to the lower part of the screen and get smaller. Or several different mappings could be applied together in a single space: Forward/backward, up/down, and left/right mappings could be combined arbitrarily to create completely unpredictable relationships between the viewer and the

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object. This methodology is similar to the notion of time collage in video and film editing. Filmmakers and video artists often try to reprocess and edit the videotape, expanding, condensing, or interrupting the video or film sequence in a seemingly arbitrary way. Such a time collage loses the real-world timing of the original recording. It also rejects any illusion of narrated time, as film or TV tends to bring a story to an end. In "The Temporality of Video Art" (2003), Hans Belting mentions that through editing, video artists retain control over their material and initiate a dialogue with the viewer with their personal "language." Belting also says that in this process, the time collage is intended to represent "internal time" and the viewer's reading of the video grants him/her access to the experience of the "self" (Belting 2003). In *Moons Over You* a real-time interactive media space, manifold mappings create a collage of both time and space. As such, the installation provides an experience of subjective time and critical distance in a mediated space.
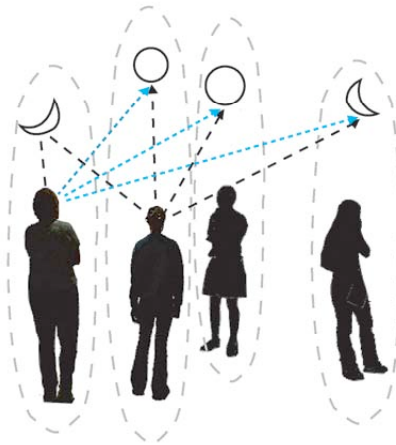
Figure 5.4.4.3   When audience members pay attention to other people around her, her perspective is extended beyond her own.

In addition, as the screen space becomes to include multiuser interaction and extend it to the social realm, manifold spatial and temporal mappings can be extended from the physical and the virtual to the social level. For example, the representation of the individual movement or interaction is affected by other interactors in the virtual and physical realm, the moment and space can be memorized and mapped to particular moments and places in the social world.

ID swapping and Lost in Space

When the interactors encounter the moments in which their moon is lost or two moons are swapping, this is a moment when they perceive the seam of a technical limitation. At this moment, the viewer's perception of space becomes apparent, and his/her level of perception moves from invisible and immaterial to its material level. In "When Seams Fall Apart - Video Game Space and the Player," Laurie Taylor describes a similar situation that happens in video game spaces, for example, between the different cut scenes and when the protagonist's gaze meet the interactor's gaze. Taylor says, "When the narcissistic mirror rips up its seam, it is the moment to disrupt its the spatial construction of interactive and responsive space as a medium" (2003). When seams come apart, the viewer's perception of space becomes apparent, and his/her level of perception moves from invisible and immaterial to a material level. Interface begins to shift from the *ready-to-hand, seamless experience* to the *present-at-hand, seamful experience* of reality. As a poetic experience that aims for critical self-reflection, we thought that this awareness of the seams could be meaningful. This seamful intention has also been explored in *Seamful Games* by the Equator project. According to Tom Rodden who a director of the Equator project, *Seamful Games* were designed as mobile multiplayer

games to let people use–or even take advantage of—the limits and gaps of a ubiquitous computing infrastructure, such as wireless networks and positioning systems.[19] This game deliberately exposes the limits and variations in such technologies. The creators of the game wanted the players to think about the seams in ubiquitous computing infrastructures. We also think that ID swapping or being "lost in a space" can give viewers a chance to engage in diverse and philosophical contexts in the interaction. We found that this actually encourages interpersonal relationships between interactors and expands the scope of the individual level of experience to the social level. When this kind of seam is revealed in the system, and interactors engage in social behavior, the chance to have a critical stance in the interactive experience is also increased.

A Poetic Experience

Although the sensing, tracking, and video processing use a real-time system, *Moons Over You* attempts to provide a slow, calm, and contemplative environment for its audiences. When visitors first enter the gallery space, they can step out of their fast-paced everyday life and have a chance to reconnect with nature. With sufficient time to look at nature and find a relationship between oneself and the moon, the interactors become immersed into their own "inner time." Full bodily movement in an open space will enhance this natural interaction. *Moons Over You* is also a conceptual experiment in creating a poetic screen-space that bridges the virtual and the real worlds. The audience can physically walk "into" the virtual space and interact with the moons overhead. Therefore interactors can feel as if they exist in the virtual and the physical space simultaneously.

5.4.5. Summary and Future Directions

I have discussed the conceptual intentions, the physical and technological design, and the video processing implemented for *Moons Over You.* Together with my collaborators, I look forward to expanding this installation in a larger space, hoping to increase the intensity of the immersive experience. For this, we are preparing to add one more camera to the current setup to cover a bigger space. In this case, the sensing and video manipulation will need to happen on separate machines in order to allow us to reliably process the video in real time. In terms of screen design, we can experiment with other options described above based on the new configuration of the space. The current version of the screen was chosen because of the limitation of the space. If we continue using a slanted screen, the slight distortion problem needs to be fixed.

With regard to technology, a more solid computer vision system can be further developed. In our current system, the audience shadows on the wall can affect blob detection, as can other ambient lighting conditions around the room. In *Moons Over You,* we have constructed a very dark environment to promote an aesthetic experience, however, in researching related works, we realized that there are relatively few tracking technologies developed for dark environments. There are some examples, but they use the projection screen light itself to light up the space. Therefore, a more solid IR tracking system for dark environments, one adjusted for black hair and a range of clothing materials, can be explored for future research. Also, although ID swapping and losing track of IDs create poetically interesting effects, if we create better control, the installation will be able to intentionally provide a seamful interactive experience.

Conceptually, as an artistic approach, I will continue to explore poetic and reflective interactive projects. Therefore, I will continue to examine the question about critical distance in interactive systems with closed feedback loops in future work. Opening the closed loops in the interactive system for imaginative approaches has been experimented with by a number of artists, and I hope *Moons Over You* can also contribute to this body of work.

CHAPTER 6

REFLECTION AND DISCUSSION

> "The relative calm provides us time for reflection:
> a propitious moment for artists and other culture workers
> to interpret, think and reckon with the sense of our meditated sensorium."
>
> – Caroline A. Jones, "The Mediated Sensorium" (2006)

> "Indeed, for some it is the very essence of art: intuition, the specific way of looking.
> It is inextricably linked with the most important source of energy for artistic praxis, namely, imagination."[1]
>
> - Siegfried Zielinski, *Deep Time of the Media* (2006)

Conclusion

In this thesis, I have argued that, as an object at the boundary between virtual and physical reality, the screen exists both as a displayer and a thing displayed, simultaneously functioning as a mediator. The screen's virtual imagery produces a sense of immersion for the viewer, yet at the same time the materiality of the screen produces a sense of rejection from the viewer's complete involvement in the virtual world. Also, as window to look through and into the world and as mirror to look back on ourselves, the screen can provide both a mediated experience and an immediate experience simultaneously. Thus, the experience of the screen is an oscillating experience between these two states of attraction and repulsion.

Building on the idea of the screen as a boundary object, I have examined the screen in the interactive art experience and the heterogeneous feeling generated from such an experience, which is, I feel, different from traditional screen based experiences. First of all, I described how the screen is involved in multiple levels of closed feedback

loops. In particular, in many digital interactive media art pieces that use real-time images of the viewer/interactor captured from the camera for their interaction, I have argued that the spectator/interactor's body is encapsulated with the camera and monitor-screen, and that the face and body of the viewer is in the interface mechanism. In this interface, the interactor's body begins to respond to the system, the system responds to the interactor, and the psychological feedback loop in the encapsulation becomes even more complicated and intensified by immediate and immersive interaction as in direct mirroring in between two facing mirrors. I have claimed that the current interactive screen-based media work does not support the desired model. Since situations like this are under real-time instant feedback between two active ends, the closed loop allows only a short range of critical distance or time for contemplation of the artwork. Therefore, I have explored screen experiences that can reflect the viewers and provide an oscillating experience so that the viewers can discover new modes of perception produced by screen-based media. I have proposed interactive screens as boundary objects in the realm of imagination. For this purpose, I have examined the previous aesthetics of temporal perception such as presentness, instantaneousness, and the notions of passage and of psychological perception, which include reflection, reflexiveness, and auratic experience. I have tried to find how these aesthetics could be integrated into new media screen experiences and the thesis has proposed to create interactive screen spaces that can open the feedback loops in order to provide the means by which viewers can reflect on themselves and gain subjective time in their interaction. More in detail, I suggest that the screen is a space that artists can infinitely explore and experiment with as another realm for imagination.

Based on the basic model of the feedback loop through camera-screen based installations which often create direct mirroring, I have looked at how to expand and open this loop in order to find opportunities for subjectivity by presenting a series of interactive artwork installations. Roughly these works have been described through interactive movable screens that generate a doubling effect between physical/virtual worlds, and through responsive space-screens that use manifold spatial and temporal mappings, the feedback loops can be open or expanded in order to elicit the viewer's reflective screen experience. However, in detail, these presented works have been developed by examining and adding the following criteria to the basic model of camera-screen feedback loop.

I have examined the way to open or expand the closed feedback loop or simple mirroring condition by: 1) exploring and adding an artificial intelligence (AI) feature in the closed system, for example, in *Cross-Being: Dancer* or *Cross-Being: Todd*; 2) facing the camera not toward the audience but toward the other objects to include abstraction in *Illumination* and *Time Ripples*; or 3) using multiple cameras in the basic model like in *Time Ripples* and *Moons Over You*; 4) expanding the screen from an object to an open space as a responsive screen - or screen as space in WiiArts project using large screen and open space or *Moons Over You*; 5) mapping the spatial and temporal elements in new ways, such as multiple time and space collages or thinking of or leaving a somewhat arbitrary relationship between action and reaction in *Ripplecast, Chromaflow, Illumination* and *Moons Over You*; 6) expanding this basic model to the social realm of meeting with others in *Moons Over You.* Through the continuous mapping between the visible and the invisible, and playing the perceptual synchronization and perceptual gap

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revealing from this tight synchronization, I have added and examined perceptual involvement in the experience with the interactive closed system. Although I have explored several methodologies in this thesis, these screen ideas can be extended more with other imaginative approaches. For example, we may try a networked camera-screen setting or tele-presence to expand the simple and basic model of camera-screen interface.[2]

In this thesis, the closed feedback loop is the perspective that I have used to describe and explore the instant (real-time) and direct relationship between the viewer/interactor and interactive artwork as actions and reactions. Mirrors and windows are also metaphorically used as perception and experience of the screen as mediated experience. At the beginning of this thesis, I said that as technologies have developed, new ways of interactive screen design would be developed. Through this thesis I have tried to propose richer and more humanized ways of creating the interactive art experience, particularly the interactive screen experience. I hope these approaches can provide diverse perspectives and open a realm for discussion for new media artists and designers, and technologies. Perhaps, by exploring and discussing this, we may also get a better view or broader sense of what we can create and expect from the interactive media experience.

Art and Technology

Art has always been created with media; therefore, media becomes the materials and techniques of art. With colored pigment, marble, clay, or a violin or piano, or even the human voice, every piece of art is created through a certain medium or media. In traditional visual art, it used to be the case that the material or medium defined the genre

of art. For example, oil paintings use colored oil-based paint, and sculpture typically uses clay, metal, or stone as its medium. It is always (and only) through the medium that the viewers experience the artwork. Although the traditional meaning of medium includes only the original medium that the artists used for their creation or production (again the pigment, marble or clay, violin or piano,..), today, "medium" can also include the means of presentation, reproduction, or delivery such as MP3, DVD players or HDTV or LCD screens. Through these means, the meaning (message) or the body of artwork is delivered (communicated) and consumed as a mediated experience, and in this sense, sometimes the quality of work is affected by the quality of medium itself, although the quality of the work is not always measured exclusively by the medium itself.[3]

New media art is an art genre that encompasses artwork created with technological media or new media technologies. As technology develops and better media become available, sometimes, it may become true that the most up-to-date technology can actually create more immersive, sophisticated, and multilayered media experiences. Faster machines, or better real-time graphic cards, and sound cards can provide viewers or listeners with newer and better experiences. Compared to other genres of art, media art may be the one that is most affected by the quality of the medium. As a result, many media art pieces often focus on how to incorporate and even take advantage of the most-up-to-date technologies and research trends. Also many computer media related science and technological research communities try to be aware of the most provocative art and design research and applications. Indeed, in new media art, art and technology, and art and science become blurred and intermingled, affecting each other. This kind of fusion (or confusion) between the art and technology as well as between the

medium and its content provides freedom for exploration and experimentation for artists who wish to escape from traditional or conventional constraints. British artist and theorist, Roy Ascott claims, "Many artists escape the constraints of artistic identity by straying freely in the speculative zones of science and technology, mysticism and philosophy. Breaking free of categories, intellectually and emotionally, and creating new realities, new language, new practices is what art is about" (Ascott 2000, 4).

It should be emphasized, however, that without a solid ethical or aesthetical foundation, the power of technology can be used to provide some dangerous or superficial results. Interactive media artist, David Rokeby says in "Transforming Mirrors" (1995), "The expressive power of the interface, in conjunction with the increasing 'apparent' transparency of interface technologies, raises complicated ethical issues regarding subjectivity and control. Interactive artists are in a position to take the lead in generating a discussion of these concerns, but, on the other hand, are also in danger of becoming apologists for industrial, corporate, and institutional uses of these technologies. An awareness of the contradictions inherent in mediated interactivity is essential if we, as a society, are to move into the future with our eyes open" (134). According to Rokeby, interactive artists are "at a privileged position at the junction of culture and technology," and the "artists' role is to explore, but at the same time, question, challenge and transform the technologies that they utilize" (156). He says, "We're always looking for better input devices and better sensors to improve the interactive experience. But we also need to improve our own sensors, perceptions and conceptual models so we can be responsive to the broader implications of our work" (Rokeby 1998, 47-48).

Imagination

Nowadays, media art combines art and technology more than ever. The current state of media art is really dealing with the multi-disciplinary topics simultaneously. For the last four years, I have worked collaboratively with computer scientists and engineers at the Synaesthetic Media Lab, in the Graphic, Visualization, and Usability center at the Georgia Institute of Technology, as well as in the Digital Media program which approaches the use of digital media from a Humanities perspective. These years have provided me with invaluable opportunities to be exposed to and experience truly cross-disciplinary research. I have learned how to communicate with people who have diverse backgrounds and knowledge and those who share common interests. Such experiences have made me think of the unique function of art and technology, as well as my own identity as a media artist. If technology and science expand human beings' new scientific frontiers, art is the medium through which we can explore the human spirit.. If media art is the combination of art and technology, it should touch human beings' minds and hearts to create new possibilities and experiences.

In this sense, Alan Lightman's lecture, "The Crossroads of Science & the Arts,"[4] was very interesting for me to think of the relationship between art and technology and their marriage in the media art. Lightman, the author of *Einstein's Dreams*, said that our relationship with the world keeps changing through each moment of experience. Everyone perceives and travels the world differently depending on their previous experience. Comparing scientists and artists, Lightman said that scientists tend to find a problem and break the problem into its smallest component. They ask questions to find answers and clarity. In contrast, but artists tend to ask questions without answers, or ones without definite answers. Artists tend to seek intrinsic ambiguity and contradiction. On

the other hand, both scientists and artists share a common tendency, which is to seek creativity and imagination. Lightman said that both processes involve the creative moment and seek a "sense of rightness," the thrilling and exciting moment of experience.

Indeed this view of art and science and art and technology seems to make perfect sense. Instead of clarity, sometimes the process of making meaning in arts is looked at as if it seeks ambiguity in its encoding and decoding. Particularly when subjective meaning is involved in art, the ambiguity increases. However, I think that through ambiguity, the process of art reveals its own meaning and functions. For example, a renowned kinetic sculptor, Arthur Ganson, once said that his "ambiguous" machines use "artful" and "thoughtful" methods in order to reveal the ambiguous aspect of life. His machines are not functional, but meaningful and beautiful. I also think that through ambiguity, what artists try to invoke is imagination and a new perspective from which to look at life.

This kind of self-critical question, which asks about the identity of interdisciplinary research can also be found in humanities research. In the GVU brownbag talk, "The Value of Theory in Digital Media Studies: A Discussion and Debate," in the Technology Square Research Building, at the Georgia Institute of Technology on October 2, 2008, two faculty members of the Digital Media Program in the school of Literature, Communication, and Culture, Jay Bolter and Ian Bogost, gave a talk discussing the relationship between theory and practice in digital media, and the role, purpose, and value of theoretical studies in humanities-based research. Suggesting the idea of digital humanities,[5] Jay Bolter and Ian Bogost said, "Theory's purpose is to change perspective, not to create output." They also said, "Theory involves speculation and disputes common sense." They said that as a cultural practice, the objective of the

study of digital humanities should be the human condition. This is, essentially, my stance on media art. I think that media art or interactive media art, as a cultural practice of human experience, should be a critical, technical approach for the practice of humanities. I believe that this kind of self-critical question also contributes a great deal to multi-disciplinary research.

Corresponding

I had a solo exhibition from July 28 – August 13, 2008 at Songeun Gallery in Seoul, Korea. I entitled this show *Corresponding*, and showed my artwork that I had created since 2003, including movable screens and *Corresponding III*, and *Ripplecast* as WiiArts project. As described in the previous sections, the name of "corresponding" was used as a title of the single-channel video work created in 2003-2005, and the concept that I had for this video influenced the later development of movable screens for interactive works. However, as the idea of "corresponding" includes the meaning of the interrelationship with others and the response to others in a broader sense, it also implicitly includes the meaning of interactivity resulting in a cause and effect relationship, since the interactivity itself is none other than the corresponding experience between the work as an artifact and the viewer of the work. Therefore, the idea of "corresponding" has stayed with me, resonating, and extended to my other interactive works. Works such as the WiiArts project conceptually reveal the idea of corresponding between the interactors and their actions, and the results of their interaction. If a stone is cast on the still surface of the water, the stone either directly sinks or skips on the surface depending on how it is thrown. Each time, the thrown stone brings different surface tensions and again different results. Although it is interaction with the water and stone,

we can never anticipate the precise way in which each interaction might bring a different result. In this exhibition, I tried to show my ongoing exploration of how to create an endlessly new, imaginative, and reflective experience in interactive artwork, and this thesis is a continuation of that exploration.

Dialogues

I often think of interactive artwork compared with real dialogue, and I hope my interactive artwork can create this kind of real dialogue-like interaction for the participants. In a dialogue, in addition to auditory information, the facial expressions of the other person reveal diverse and rich information in and about the communication. Through the delicate change of an eyebrow or the slight movement of the lips of the other person, we can read his/her ideas and thoughts. From the look in their eye, sometimes we can guess or absolutely tell how the dialogue is going and how much the other person is (or is not) truly involved in and enjoying this communication.

As I said above, people who are engaging in real conversation with others can experience reflective (never repetitive or expected) situations. Interactive artwork can be not so different from this. Remembering John Dewey's account of art as experience, where "the meanings that are imaginatively evoked, summoned, assembled, and integrated are embodied in material existence that here and now interacts with the self," I hope that the interactive art experience can be an individualized experience of participation. In this way, the interactive experience with the work of art is recreated every time that it is esthetically experienced by the viewer. The viewer creates an imaginative relationship with the self through their experience with an artwork, and this kind of process can be called interactive engagement. Indeed, when we think of the most

fundamental experience and relationship between art and audience, nobody will argue that the reflective and meditative effect is still important, even in the interactive artwork experience.

In "Video Black," one of the most influential video artists, Bill Viola, says that the ideal mirror, around since the beginning of humankind, is the black background of the pupil of the eye: "There is a natural human propensity to want to stare into the eye of another or, by extension of oneself, a desire to see seeing itself, as if the straining to see inside the little black center of the eye will reveal not only the secrets of the other, but of the totality of human vision. After all, the pupil is the boundary, and veil, to both internal and external vision" (1996, 449). From this black background of the pupil, what he tries to find is self-reflection as philosophical investigation of the self and as the ontological condition of human vision.

Viola finds the infinite feedback loop in this pupil gazing. But this infinite feedback loop is not caught in the simplistic mirror reflection.

Looking closely into the eye, the first thing to be seen, indeed the only thing to be seen, is one's own self-image. This leads to the awareness of two curious properties of pupil gazing. The first is the condition of infinite reflection, the first visual feedback. The tiny person I see on the black field of the pupil also has an eye within which is reflected the tiny image of a person… and so on. The second is the physical fact that the closer I get to have a better view into the eye, the larger my own image becomes thus blocking my view within. These two phenomena have each inspired ancient avenues of philosophical investigation and, in addition to the palpable ontological power of looking directly into the organs of sight, were considered proof of the uniqueness and special power of the eyes and the sense of sight (Viola 1996, 449-450).

In his observation, the image of the self, revealed through the most basic screen experience, which is embedded in our body, actually reveals the self-reflective feature as the most fundamental function of visual art. If the feedback loop is the inevitable condition of interactive media art, then it can hold the viewer's gaze long enough for the viewer to look back at him/herself. If successful, this interactive experience will provide the viewer with self-reflection, of gazing into the pupil of a human eye.

Note

< Chapter 1 >

[1] Octavio Paz quotes Duchamp's sentence, "The spectator makes the picture," which was originally stated in *Art News*, vol. 56, no. 4 (New York, 1957). Paz writes that here Duchamp explains that:

> (t)he artist is never fully aware of his work. Between his intention and the realization, between what he *wants* to say and what the work actually *says*, there is a difference. This "difference" is, in fact, the work. Now, the spectator doesn't judge the picture by the intentions of its originator but by what he actually sees. This vision is never objective; the spectator interprets and "distills" what he sees. The "difference" is transformed into another difference, the work into another work. In my opinion Duchamp's explanation does no account for the creative act or process in its entirety. It is true that the spectator creates a work that is different form the one imagined by the artist, but between the two works, between what the artist *wanted* to do and what the spectator *thinks* he sees, there is a *reality*: the work. Without it, the re-creation of the spectator is impossible. The work makes the eye that sees it—or, at least it is a point of departure; out of it and by means of it the spectator invents another work. The value of a picture, a poem, or any other artistic creation is in proportion to the number of signs or meanings that we can see in it and the possibilities that it contains for combining them. A work is a machine for *producing meanings*. In this sense Duchamp's idea is not entirely false: the picture depends on the spectator because only he can set in motion the apparatus of signs that comprises the whole work. This is the secret of the fascination of the *Large Glass* and the Readymades. Both of them demand an active contemplation, a creative participation. They make us and we make them. (Paz 1978, 85-86)

[2] Microsoft's Surface for tabletop is a good example of these interactive surfaces, http://www.microsoft.com/surface/index.html, http://news.cnet.com/8301-13860_3-9943986-56.html. http://news.cnet.com/8301-13860_3-9943920-56.html?tag=mncol;txt. (Accessed October 13, 2008).

[3] Microsoft's Surface, http://www.microsoft.com/surface/index.html. (Accessed October 13, 2008).

[4] Requoted from (Senger and Gaver, 2006). Also refer to Rogers, Y., Rutherford, A., and Bibby, P.A. (Eds.) *Models in the Mind: Theory, Perspective and Application*. London: Academic Press.

[5] Also refer to other Sengers papers about reflective design and reflective HCI. Claiming the ongoing need for critical reflection in HCI design and research, Sengers and Gaver say that reflective HCI can be a new style of approach to HCI research that integrates technical practice with ongoing critical reflection.

Sengers, Phoebe., McCarthy, J., Dourish, Paul. "Reflective HCI: Articulating an Agenda for Critical Practice" (workshop paper in *Proceeding of CHI 2006*, 1683-1686 Montréal, Québec, Canada, April 2006. New York, NY: ACM Press. Also in Sengers, Phoebe., Kirsten Boehner, Shay David, and Joseph 'Jofish' Kaye. 2005. "Reflective Design". In *Proc. Critical Computing: between sense and sensibility,* 2005. 49 – 58.

[6] Itsuo Sakane, the Japanese journalist and curator, suggests that interactive art is simply art that involves the participation of the viewer. But he goes on to remark, "All arts can be called interactive in a deep sense if we consider viewing and interpreting a work of art as a kind of participation" (1989, 3).

[7] THE ANTENNAE OF THE RACE by Nina Colosi, Producer/Curator, evo1 http://www.evo1.org/essays.html. (Accessed November 3, 2007).

"Audience: The networked, digital environment is by nature polyvocal and favors a plurality of discourses. Interactive art involves reciprocity and collaboration between the creator or creators, the audience and a project. Audiences collaborate in the process of remapping textual, visual, kinetic and aural components of the artwork—the public and audience becomes a participant.
Artist: Rather than being the creator of a work of art, the artist often becomes a mediatory agent and facilitator for audiences interaction with and contribution to the artwork."

[8] This is requoted from Rokeby's "Transforming Mirrors" (1995, 136).

[9] Espen J. Aarseth in his book *Cybertext--Perspectives on Ergodic Literature* (1997)*, introduces the term "ergodic literature." According to him, "In ergodic literature, nontrivial effort is required to allow the reader to traverse the text." Therefore, the focus of this new concept is on the consumer, or user of the text. In other words, reader response, in cybertext which is based on interactive digital machines ask the audience to change the text, not just read it, thus the reader-response becomes an important concept and perspective.

Interestingly at the beginning of this book, while introducing the concept of ergodic literature or cybertext and how it is different form the other literary texts; Aarseth mentions the difficulty comparing the differences between traditional narratives and interactive narratives. I think it seems similar to my question here regarding interactivity in the interactive media arts comparing to traditional arts.

> Whenever I have had the opportunity to present the perspective of ergodic literature and cybertext to a fresh audience of literary critic and theorists, I have almost invariably been challenged on the same issues: that these texts (hypertexts, adventure games, etc.) aren't essentially different from other literary texts, because (1) all literature is to some extent indeterminate, nonlinear, and different for every reading, (2) the reader has to make choices in order to make sense of the text, and finally (3) a text cannot really be non-linear because the reader can read it only one sequence at a time anyway (1997, 2).

[10] "A work of art no matter how old and classic is actually, not just potentially, a work of art only when it lives in some individualized experience. As a piece of parchment, of marble, of canvas, it remains (subject to the ravages of time) self-identical throughout the ages. But as a work of art, it is recreated every time it is esthetically experienced. … he himself would find different meanings in it at different days and hours and in different stages of his own development. (215) … The formed matter of esthetic experience directly expresses, in other words, the meanings that are imaginatively evoked; it does not, like the material brought into new relations in a machine, merely provide means by which purposes over and beyond the existence of the object may be executed. And yet the meanings imaginatively summoned, assembled, and integrated are embodied in material existence that here and now interacts with the self (Dewey 1984, 222 (or 2005, 113)). (Also quoted from "Art as Experience" by John Dewey in *Art and Its Significance: An Anthology of Aesthetic Theory*, by Stephen David Ross, 1984)

[11] I will discuss more about this in Chapter 3.

< Chapter 3 >

[1] Manovich (2002, 97) says, "(W)ith VR, the screen disappears altogether. VR typically uses a head-mounted display whose images completely fill the viewer's visual field. No longer is the viewer looking at a rectangular, flat surface from a certain distance, a window into another space. Now she is fully situated within this other space."

[2] http://humanities.uchicago.edu/faculty/mitchell/glossary2004/screen.htm. (Accessed October 10, 2005).

3 According to Paul Levenson, the word "remediation" is defined as the "anthropotropic" process by which new media technologies improve upon or remedy prior technologies. Bolter and Grusin (1999) define and use this term differently to mean the formal logic by which new media refashion prior media forms.

4 In 1425, Filipo Brunelleschi discovered the laws of linear perspective with a small hole in a wooden box containing a mirror. Twelve years later, his friend, Leon Alberti, formalized and published this new system. (This sentence was revised by me.) …. (i)rrevocably, this altered the history of painting and accelerated the development of techniques of artificial image making. What Brunelleschi achieved was the personification of the image, the creation of a "point of view" and its identification with a place in real space. In doing so, he elevated the position of the individual viewer to an integral part of the picture by encoding this presence as the inverse, in *absentia*, source of the converging perspectival lines. The picture became an opaque mirror for the viewer, and the viewer, in turn, became the embodiment of the painter, "completing the picture" as art historians like to say, with the two points of view merging in a single physical spot.

5 Merleau-Ponty (1993, 142) wrote, "When through the water's thickness I see the tiled bottom of the pool, I do not see it *despite* the water and the reflection; I see it through them and because of them. If there were no distortions, no ripples of sunlight, if it were without that flesh that I saw the geometry of the tiles, then I would cease to see it *as* it is and where it is– which is to say, beyond any identical specific place. I cannot say that the water itself–the aqueous power, the syrupy and shimmering element–is *in* space; all this is not somewhere else either, but it is not in the pool. It inhabits it, is materialized there, yet it is not contained there; and if I lift my eyes toward the screen of cypresses where the web of reflections plays, I must recognize that the water visits it as well, or at least sends out to it its active, living essence."

6 *Samguksagi* is a history of the Three Kingdoms written during the Goryeo Dynasty by Kim, Busik. It is composed of 50 volumes - 12 on Silla (Sillabongi), 10 containing Goguryeo (Goguryeobongi), 6 on Baekje (Baekjebongi), 3 of chronological tables (Yeonpyo), 9 on rituals, music, government structure, clothes, architecture and other records (Ji), and 10 on biographies of major historical figures (Yeoljeon). *Samguksagi* is a pivotal reference material for the study of Silla, Baekje and Goguryeo.

7 This specific story about Solkuh can be found in the URL (Accessed July 24, 2007) http://www.koreandb.net/Sam/samtext.asp?ID=72&Class=Y. The text in this URL is written in Korean.

8 Kathy O'Dell (1998: 37-8) maintains that Vito Acconci's video works and installation works simultaneously invite and prohibit the audience in diverse ways and that it is a kind of process of identification and separation. With the word "outside" in Vito Acconci's video artwork, *Trademarks* (1972), O'Dell argues that "[Acconci] evokes an *environmental* connotation, thereby producing a crucial link between *the spatial aspects of psychic separation and the material space or environment in which that separation takes place* - what psychoanalyst Didier Anzieu calls the 'mothering environment." (…) Anaclisis is the psychoanalytic term which refers to the propping of the child on the skin of the mothering figure during the oral phase. Contact with skin during anaclisis instills qualities in the developing child related to the skin's three primary functions. As stated by Anzieu, these functions are first to [contain and retain], second to mark [a protective boundary] against penetration by the outside, and third to afford [a means for communication] by providing an "inscribing surface."

9 Murray also mentions the liminal object as a digital equivalent of the theater's fourth wall. "We need to define the boundary conventions that will allow us to surrender to the enticement of the virtual environment." (1998, 103) "When we enter the enchanted world as our actual selves, we risk draining it of its delicious otherness." (101)

10 The boldface of "breathe" and the addition "(*experiences*)" are mine. I added the word "breathe" along with the "experience,"' which was originally in the English-translated version of "The Work of Art in the Age of Mechanical Reproduction" The original paper written in German, a direct translation of the word, "atmen" is 'breathe.' For reference, here is the original German version of this text;

Diese letztere definieren wir als einmalige Erscheinung einer Ferne, so nah sie sein mag. An einem Sommernachmittag ruhend einem Gebirgszug am Horizont oder einem Zweig folgen, der seinen Schatten auf den Ruhenden wirft—das heißt die Aura dieser Berge, dieses Zweiges atmen.

I think, the word "experience" seems too general and does not include the nuance of resting or appreciation. Benjamin, in another article, "A Short History of Photography"(1981, 209) also mentions the aura by using the analogy from nature very similar to that in "The Work of Art." The English translation of this version uses the word "breathe" here. (Again, the boldface of the word "breathe" is my addition.)

> What is aura? A strange web of time and space: the unique appearance of a distance, however close at hand. On a summer afternoon, resting, to follow the line of a mountain range on the horizon or a twig which throws its shadow on the observer, until the moment or hour begins to be a part of its appearance–that is to **breathe** the aura of those mountains.

[11] Lacan states that the mirror stage is the stage in the development of the child. It is a phase in which the subject is permanently caught and captivated by his own image, and therefore the representation of a permanent structure of subjectivity is created in the paradigm of the Imaginary order.
The mirror stage illustrates the conflicting nature of the dual relationship which refers not only to the relation between the Ego and the body, which is always characterized by illusions of similarity and reciprocity, but also to the relation between the Imaginary and the Real. The visual identity given from the mirror supplies imaginary "wholeness" to the experience of a fragmentary real.

[12] Here is more explanation by Hal Foster about Lacan's subject (1996, 139-140); "But Lacan adds immediately 'I am not simply that punctiform being located at the geometral point from which the perspective is grasped. No doubt, in the depths of my eye, the picture is painted. The picture, certainly, is in my eye. But I, I am in the picture.'(Lacan 1978, 96) That is, the subject is also under the regard of the object, photographed by its light, pictured by gaze: thus superimposition of the two cones, with the object also at the point of the light (gaze), the subject also at the point of the picture, and the image also in line with the screen. (…) (t)his screen *mediates* the object-gaze *for* the subject, but it also *protect* the subject *from* the object-gaze (…) Lacan states, "The screen is here the locus of mediation" (Lacan 1978, 107)."

[13] While describing the psychic complexity of the telepresent relationship (multipresence) of the video game experience by means of the screen, Taylor's article (2003) also uses Lacan's uncanny effect of gaze.

[14] In the "The Work of Art in the Age of Mechanical Reproduction," Benjamin differentiates Daguerre type photography from the photography in the mechanical reproduction. In of his perception, the category of earlier photography is usually a person's portrait. Since daguerreotype photography has to have a long exposure, the person needs to sit in front of the camera, keeping his/her posture without any movement as much as possible for a long while. Thus, the result may come out looking like a painting and it reveals lot of emotional aspects of the person. Benjamin says, "It is no accident that the portrait was the focal point of early photography. The cult of remembrance of loved ones, absent or dead, offers a last refuge for the cult value of the picture. For the last time, the aura emanates from the early photographs in the fleeting expression of a human face. **This is what constitutes their melancholy, incomparable beauty**."(1968b, 226) But Benjamin began to have a different mode of perception from Atget's photographs, which became standard evidence for historical occurrences, and which acquired a hidden political significance. He continues, "as man withdraws from the photographic image, the exhibition value for the first time shows its superiority to the ritual value. ... **They demand a specific kind of approach; free-floating contemplation is not appropriate to them**. They stir the viewer; he feels challenged by them in a new way." (1968b, 225-6)

On the other hand, in "The Return of the Real," Hal Foster (1999) points out that Benjamin's notion of gaze is analogous to Roland Barthes' idea of *punctum*. In *Camera Lucida: Reflections on Photography*, Barthes says that *punctum* is the "element which rises form the scene, shoots out of it like an arrow, and pierces

me."(1981, 26-7) "It is what I add to the photograph and *what is nonetheless already there*"(1981, 55) "It is acute yet muffled, it cries out in silence." (1981, 53) Barthes stipulates that is a personal effect. *Punctum* is denotating personally touching detail which establishes a direct relationship with the object or person within it.

[15] In "Some Motifs in Baudelaire," Benjamin cites Paul Valéry to mention fulfillment in painting (1968a, 187).

> Valéry has set forth the conditions for this fulfillment: "We recognize a work of art by the fact that no idea it inspires in us, no mode of behavior that it suggests we adopt could exhaust it or dispose of it. We may inhale the smell of a flower whose fragrance is agreeable to us for as long as we like; it is possible for us to rid ourselves of the fragrance by which our senses have been aroused, and no recollection, no thought, no mode of behavior can obliterate its effect or release us from the hold it has on us. He who has set himself the task of creating a work of art aims at the same effect." According to this view, the painting we look at reflects back at us that of which our eyes will never have their fill. What it contains that fulfills the original desire would be the very sane stuff on which the desire continuously feeds. What distinguishes photography form painting is therefore clear, and why there can be no encompassing principle of "creation" applicable to both: to the eyes that will never have their fill of a painting, photography is rather like food for the hungry or drink for the thirsty.

[16] In *The Return of The Real*, Hal Foster (1999, 266-7) compares the gaze of Benjamin's aura and the gaze of Lacan: Benjamin's gaze is the beneficent gaze, and Lacan's gaze is more like the maleficent gaze.

> Lacan relates this maleficent gaze to the evil eye, which he sees as an agent of disease and death, with the power to blind and to castrate: "it is a question of dispossessing the evil eye of the gaze, in order to ward it off. The evil eye is the *fascinum* [spell], it is that which has the effect of arresting movement and, literally, of killing life. … It is precisely one of the dimensions in which the power of the gaze is exercised directly" (Lacan 1978, 118). Lacan asserts that the evil eye is universal, with no equivalent beneficent eye, not even in the Bible. Yet in biblical representation there is the gaze of the Madonna upon the Child and of the Child upon us. However, Lacan opts for the exemplum of envy in Saint Augustine, who tells of his murderous feelings of exclusion at the sight of his little brother at the maternal breast: "Such is true envy – the envy that make the subject pale before the image of a completeness closed upon itself, before the idea that the petit a, the separate a from which he is hanging, may be for another the possession that gives satisfaction" (Lacan 1978, 116).
>
> Here Lacan can be contrasted with Walter Benjamin, who imagines the gaze as auratic and replete, from within the dyad of mother and child, rather than as anxious and invidious, form the position of the excluded third. Indeed, Benjamin imagines the beneficent eye that Lacan refuses to see, a magical gaze that reverses fetishism and undoes castration, a redemptive aura based on the memory of the maternal gaze and body: "Experience of the aura thus rests on the transposition of a response common in human relationships to the relationship between the inanimate or natural object and man, The person we look at, or who feels he is being looked at, looks at us in turn, To perceive the aura of an object we look at, means to invest it with the ability to look at us in return. This experience corresponds to the data of the mémoire involontaire" ("On Some Motifs in Baudelaire, " in *Illuminations*, Hannah Arendt. Harry Zohn (ed.) [New York: Schocken Books, 1977], 188).

[17] In Semiotics, "floating signifiers" denote signifiers without referents.

[18] Refer to Friedrich A. Kittler's book, *Gramophone, Film, Typewriter* (1999).

[19] Nam June Paik, *TV-Buddha*, http://www.medienkunstnetz.de/works/tv-buddha/images/2/. (Accessed October 13, 2008).

[20] I took the "video art" class in Summer 2003 at the Interactive Telecommunications Program at New York University. Even introduced a perspective to look at several early video artworks with psychological and perceptual distance as a sense of engagement and a sense of separation. The psychological interpretation is also addressed in her article "Video Art, Evolving Perspectives on Point of View" (1997).

[21] The Video Data Bank, http://www.vdb.org/. (Accessed October 13, 2008).

[22] Hal Foster again attacked this methodology. Foster argues that Krauss discusses minimalism as an apogee of modernism, rather than as a break with modernist practice. He says that Krauss projects the recognition of minimalism back onto modernism so that she can then read minimalism as a modernist practice (Foster 1996, 42).

[23] Again, "what sculpture uniquely was" is the highly modernistic approach that depends on self-referentiality.

[24] Krauss claims that Fried's account is ideological, too. Fried's account of "what sculpture was" is insufficient because it is founded on an idealists' myth.

[25] Foster quotes the text from Govan's interview "Interview with Richard Serra" (1997, 16).

[26] Baroque in the arts was referred to as a style which became popular at the beginning of the 17th century in Rome, Italy. Originating from the French word "baroque" meaning "a rough or imperfect pearl," Baroque was generally exemplified by drama and grandeur in its expressive style. Baroque artists used repeated and varied patterns or metaphor and allegory in their expression. Typically, Baroque architecture explored a dynamic movement and energy of human forms through a spiral around an empty central vortex, or inside reaching outwards into the surrounding space. From these kinds of surface and structural characteristics of Baroque, Gilles Deleuze, in his book *The Fold,* defines the Baroque as a disconnection between the inside and outside. For him, there is no one substance, only an always-differentiating process, such as an origami cosmos that is always folding, unfolding, refolding.
In the essay, "Richard Serra: torqued spirals, toruses and spheres," Hal Foster connects Serra's torqued spiral work with Deleuze's notion of Baroque and neo-Baroque, as well as with the "transcendence" of digital virtuality. Foster states that neo-Baroque has the tendency to indulge in arbitrary forms, and to efface the subjectivity of the experience.

[27] In the Korean-translated version of the *Passages in Modern Sculpture*, the translator Nan-Ji Yoon added her notes. In this note, she mentions the notion of the "hyper-time"

[28] Star, Susan Leigh & Griesemer, James R. (1989). "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39" in *Social Studies of Science* 19 (4): 387–420. Also refer to Bowker, Geoffrey. C. and Star, Susan Leigh (1999). *Sorting things out: classification and its consequences*. Cambridge, MA: MIT Press.

[29] Depending on the reliability and accuracy of information, the second and third hand experiences can be more reliable or less reliable.

[30] Refer to the site: http://www.absoluteastronomy.com/topics/Mind/. (Accessed May 2, 2008).

[31] Again, refer to the site: http://www.absoluteastronomy.com/topics/Mind/. (Accessed May 2, 2008).

[32] Screens can open diverse ways for gazes to meet.

[33] The new media screens of VR, AR, and various forms of interactive design will be the examples of these.

[34] *Pro domo et mundo* [For Home and for the World] (1912) Chapter 7.
Also in Kraus, Karl. (1874–1936), Trans. Harry Zohn, originally published in *Beim Wort genommen* (1955). *Half-Truths and One-and-a-Half Truths*, University of Chicago Press (1990).

[35] "*Kairos* is an ancient Greek word meaning the "right or opportune moment." The ancient Greeks had two words for time, chronos and kairos. While the former refers to chronological or sequential time, the latter signifies "a time in between," a moment of undetermined period of time in which "something" special happens. What the special something is depends on who is using the word. While chronos is quantitative, **kairos** has a qualitative nature.", referred from Mark Freier (2006) "Time Measured by Kairos and Kronos"

[36] When Barthes explains *punctum,* he states, "I animate the photograph, it animates me (1981, 59)."

< Chapter 4 >

[1] I examined this work in Chapter 3.4 in this thesis.

[2] Gorbet respond to the Utterback's article "Usual Positions – Embodied Interaction with Symbolic Spaces" in *First Person: New Media a Story, Performance, and Game*, (eds) Noah Wardrip-Fruin, Pat Harrigan, Cambridge, Mass: The MIT Press. 2004. pp. 218-226.

[3] Hansen discussed Deleuze's close-up aims toward a certain transcendence: a cinematic detachment of affect from the body. "While mental reflection is 'undoubtedly the process by which one thinks of something,' *cinematographically* it is 'accompanied by a more radical reflection expressing a pure quality.' Likewise, althrunge the intensive micromovements of the face undoubtedly express states of the body, *cinematographically* they 'begin to work on their own account, ' passing from 'one quality to another, to emerge on to a new quality, or rather a 'pure Power'" (Hansen, 136) (also refer to Deleuze's *A Thousand Plateaus*, and *Cinema 1: The Movement-Image*.)

[4] "Appropriating Deleuze's distiction between receptivity and intensity, we can distinguish two tendencies in experimentations with the DFI: a tendency to confront the participant-viewer with single, relatively static digital affection-images; and a tendency to engage the participant-viewer in a protracted interaction with a moving close-up of what can only be called a "virtual creature." In both cases, however, the emphasis is transferred from the image to the embodied response it catalyzes" (Hansen, 137).

[5] Refer to the video at http://www.youtube.com/watch?v=sDxXJhOOXHc. (Accessed September 2, 2008)

[6] http://www.artcom.de/index.php?lang=en&option=com_acprojects&id=24&page=6/. (Accessed August 27, 2007).

[7] Rokeby says, "By relinquishing a relatively small amount of control, an interactive artist can give interactors the impression that they have much more freedom than they actually do (1995: 141)."

[8] I will discuss this in the next section 4.2.

[9] http://www.shiffman.net/projects/swarm/. (Accessed September 23, 2008).

[10] http://www.camilleutterback.com/. (Accessed September 23, 2008).

[11] Also see Section 3.3 mentioning cybernetic identity in this thesis.

[12] Echo was a nymph who used to tell stories to Juno in order to distract her while Jupiter consorted with the other nymphs. When Juno discovered Echo's deceptions, she punished Echo by removing her ability to source words. She retained only the ability to repeat back the last words said to her. And so when she saw Narcissus in the forest, and fell in love with him, she had only his words of rejection to transform into an expression of her love.

[13] "I apprehend the world in a perception that seems to concern the immanence of the I see myself seeing myself. The privilege of the subject seems to be established here from the bipolar reflexive relation by which, as soon as I perceive, my representations belong to me. (Lacan, in *The Four Fundamental Concepts*, 81)"

[14] For discussion of this, see Gasché, Rodolphe, *The Taint of The Mirror: Derrida and the Philosophy of Reflection* (Cambridge: Harvard University Press, 1986), 317. and Bennington, Geoffrey, *Jacques Derrida* (Chicago: University of Chicago Press, 1993), 267-283.

[15] http://en.wikipedia.org/wiki/Diff%C3%A9rance#cite_ref-3/. (Accessed September 20, 2008).

[16] "What differs? Who differs? What is *différance*? .... we would gave to conclude that *différance* has been derived, has happened, is to be mastered and governed on the basis of the point of a present being, which itself could be some thing, a form, a state, a power in the world to which all kinds of names might be given, a *what*, or a present being as a *subject*, a *who*."(14-15).

[17] "No doubt life protects itself by repetition, trace, différance (deferral). But we must be wary of this formulation: there is no life present at first which would then come to protect, postpone, or reserve itself in différance. The latter constitutes the essence of life. . . . It is thus the delay which is in the beginning. Without which, différance would be the lapse which a consciousness, a self-presence of the present, accords itself. To defer (différer) thus cannot mean to retard a present possibility, to postpone an act, to put off a perception already now possible. That possibility is possible only through a différance which must be conceived of in other terms than those of a calculus or mechanics of decision. To say that différance is originary is simultaneously to erase the myth of present origin. Which is why "originary" must be understood as having been crossed out, without which différance would be derived from an original plenitude. It is a non-origin which is originary" (Derrida, 1978. "Freud and the Scene of Writing" In *Writing and Difference*, trans Alan Bass. 203).

[18] From exhibition introduction and review "Take your time: Olafur Eliasson" on website of PS 1. Contemporary Art Center, New York, http://ps1.org/exhibitions/view/163. (Accessed September 21, 2008).

[19] See same review as above.

[20] Take your time (2008) by Olafur Elliason, http://www.olafureliasson.net/selected_works/sw_30.html. (Accessed September 21, 2008).

[21] http://www.jimcampbell.tv/LE/LEMotion/text/index.html. (Accessed April 21, 2007).

[22] http://www.earstudio.com/projects/listeningpost.html. (Accessed Feb 7, 2006).

[23] Jean Baudrillard mentions simulacrum in *Simulacra and Simulations*. It is used to describe a representation of another thing, but by the late 19th century, it had gathered a secondary association of inferiority: an image without the substance or qualities of the original. Philosopher Frederic Jameson also describes a phenomenon of simulacrum is another characteristic of Postmodernism in *Postmodernism, or, the Cultural Logic of Late Capitalism* (1992). Similar to Guy Debord's notion of "The Society of the Spectacle (Debord 1995)," simulacrum is a phenomenon of 'new depthlessness' and superficiality that consequently weaken or negate historicity of the past and its originality. Borrowing Lacan's term of 'schizophrenic,' Jameson says that post structuralism seeks to abandon the signifying chain that Modernist structuralism established, because it has been a metaphysical baggage for them. Postmodernists also

question and tend to break down the modernist's myth about the truth. In this reproduction of simulacrum, the depth model is replaced by multiple surfaces and intertextuality that are no longer matters of depth. The distinctive trend is thematic representation of content and its potentiality that can be changed into narratives. But the narrative itself often has some degraded collective objective spirit, multiple centers, de-centered narrative or heap of fragment. These collective and multiple spirits are replaced to positive term of euphoria. In this situation, discontinuity is a new mode of thinking relationship and a notion of difference itself. If Modernist's "sublime" has questioned the representation itself and the incapacity of the human mind to give representation to such enormous forces, new sublime of this era is sublime to technology, new economic world system. Overall, Jameson says that the postmodernist society we inhabit now is more synchronic than diachronic: we are now more dominated by space than time.

< Chapter 5 >

[1] Minimalism was the result, even though the artists associated with it did not generally embrace the term "minimalism," and many practitioners of art designated minimalist by critics did not identify it as a movement as such.

[2] *66movingimages,* http://www.movingimages.de/index.php?type=arts&txt_id=13&lng=eng/. (Accessed March 13, 2007). I changed the quote the words in the square brackets according to my sentence.

[3] http://www.onomy.com/redweb/tilty_tables.html. (Accessed November 1, 2008), In Matt Gorbet's response to the Camille Utterback's article. "Usual Positions – Embodied Interaction with Symbolic Spaces" in *First Person: New Media a Story, Performance, and Game*, (eds) Noah Wardrip-Fruin, Pat Harrigan, there is information of the *Tilty Tables*.
Also refer to http://www.theredshift-xfr.com/tilty_tables.html and http://www.onomy.com/blue/tilty.html. (Accessed November 1, 2008)

[4] *Morphovision*, http://www.nhk.or.jp/strl/morphovision/index_e.html/. (Accessed April 12, 2008).

[5] Scott McCloud in *Understanding Comics: The Invisible Art* Chapter 3. "Blood in the Gutter"

[6] The problem of limited numbers of conductors was solved with two different methods. The first one used wireless VGA to transmit the video signal to up-part monitors in Steelcase spinning screen design. The second used multi-tap at the top-head monitors. Refer to Appendix E.

[7] Therefore, I renamed it *Cross-being: Dancers* (2004) to *Cross-being: Dancer* (2008).

[8] http://www.siggraph.org/s2008/submissions/juried/slowart/. (Accessed November 1, 2008).

[9] This can be seen as more evidence of many interactive artworks that use camera–screen interface.

[10] This can be seen in *the Matrix*, when Neo was escaping the bullets from the agents.

[11] http://www.lgphilips-
lcd.com/homeContain/jsp/eng/inv/inv101_j_e.jsp?BOARD_IDX=1280&languageSec= E/. (Accessed October 23, 2008).

[12] The CEO of E-Ink, Russ Wilcox, says "We all need flexible displays," since "they are 80% thinner and lighter than glass displays, and they do not break like glass displays. You can roll them up and put them in your pocket. You can curve them around the outside of a cellphone. Or you can throw them in your briefcase like a newspaper. As Galileo famously told us, the world is not flat." (http://support.eink.com/community/showthread.php?t=5/. (Accessed April 12, 2008).)

[13] How the Wii Works, http://electronics.howstuffworks.com/wii.htm. (Accessed October 12, 2007).

[14] The 'Nam June Paik and Media Art" International Symposium was held at 100 Years Hall, Yonsei University in Seoul. March 25- 27, 2002.
http://ima4225001.pooding.com/engsite/bbs/view.php?id=01_public&page=1&sn1=&divpage=1&sn=off&ss=on&sc=on&select_arrange=headnum&desc=asc&no=7.

[15] Frank, A. and Simpson, Z. *Shadow*, http://www.adamfrank.com/shadow/shadow.htm. (Accessed November 22, 2008).

[16] *ACCESS* (2003), Ars Electronica, September 2003

[17] Reactix. http://www.reactrix.com/. (Accessed November 22, 2008).

[18] The self-defined OSC packets are in three formats:
```
add id
set id x y sx sy
del id
```

id : the id assigned by the server
x : the normalized x position of the user
y : the normalized y position of the user
sx : the user's normalized speed in x-axis
sy : the user's normalized speed in y-axis

The `Add/Del` commands add and delete a new user with a unique ID. The set command sets the properties of a specific user.

[19] Tom Rodden was the keynote speaker of the First International Conference on Tangible and Embedded Interaction 2007 conference, (February 15, 2007 at Baton Rouge, Louisiana). "He questioned if the notion of seamless integration of technology based on several examples from the Equator Project. A central lesson from his talk for me is to look more closely how to design interactive systems so that people can exploit the technical weakness of system creatively. We will always have to deal with sensors systems, context-recognition, and learning algorithms that are not 100% perfect. I find it interesting to see this rather as a resource for design than a problem. The experience Tom reported from CYSMN (http://www.equator.ac.uk/index.php/articles/618.) show nicely how people make use of GPS inaccuracies

in a game" (Albrecht Schmidt 2007, the TEI'07 Conference Chairs, Available at http://albrecht-schmidt.blogspot.com/2007/02/keynote-at-tei07-by-tom-rodden.html. (Accessed October 15, 2008))

< Chapter 6 >

[1] "Indeed, for some it is the very essence of art: intuition, the specific way of looking. It is inextricably linked with the most important source of energy for artistic praxis, namely, imagination. Formalizability and computation on the one side, and intuition and imagination on the other, are the two poles of the mixtum compositum media art with regard to the actions of the subject. To understand these poles as two ends of a scale that can be played in both directions is an alternative to a dualistic view, which is an easy option but also fatal, if one remains trapped within this kind of thinking. The spectrum of what is currently still referred to as media art is training ground for mixtures of the heterogeneous. It is, therefore, a chaotic space, if one understands chaos to mean that dynamic linkage of multifarious elements" (Zielinski 2006, 276-277).

[2] Although Virilio mentions that tele-communication may lose its distance, the next approaches may be able to overcome real-time issues.

[3] For example, the world-class violinist Sarah Chang uses a Guarneri Del Gesu, which was made in the 19th century, and only one hundred such instruments exist.

[4] Karlovitz Lecture Series Event, on Wednesday, March 5, 2008 at 7:00pm LeCraw Auditorium, College of Management, Georgia Institute of Technology.

[5] Beside Digital Humanities, Bolter and Bogost also said that the name for this kind of practice could be: Humanistic Informatics, Humanities Computing, Computational Media, or Computational Humanism.

APPENDIX A

A. ANALYSIS OF SCREEN EXPERIENCE

Screen experiences can be analyzed in diverse perspectives. The viewer's experience with the screen includes the relationship with the physical and the virtual worlds. If the viewer's experience is shared with other viewers, it includes the social relationship. This following diagram describes the screen experience in multiple levels.
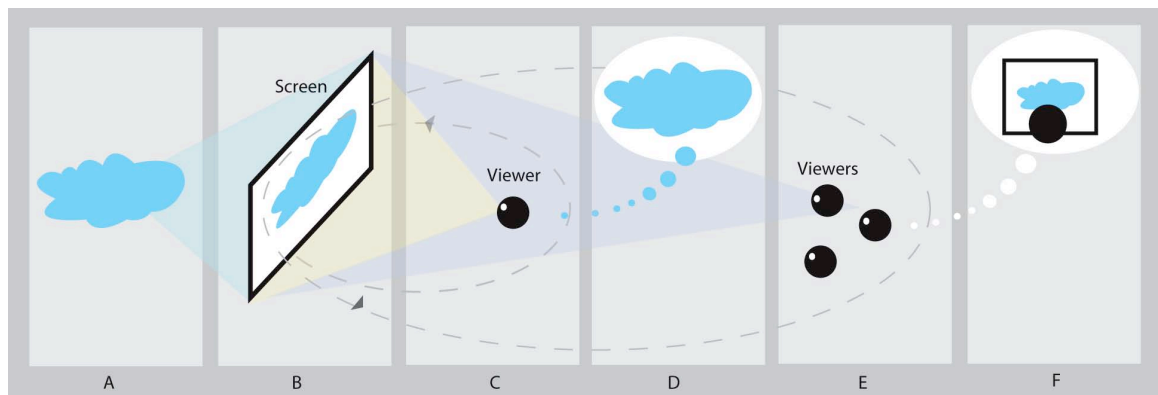

Figure A.1 A diagram of screen experience

< Description 1>

A: The virtual world appeared "on/in" the screen (the world "inside" the screen)

B: A Screen with images

C: A viewer looking at the screen standing "in front of" the screen

D: The virtual world in the viewer's mind

E: Viewers/watchers looking at the scene of the viewer and the screen and the interaction between them.

F: The images/scenery drawn in (E) viewers' minds

< Description 2>

A: The virtual world

B: The screen in the physical world, but the screen contains the virtual world in it

   -> the boundary of the virtual/physical world (the boundary of A and C)

C: the viewer looking at the screen, standing in the physical world

D: the virtual world that the viewer (viewer in the C) is engaged with or drawn in the viewer's mind
E: the physical world that the other viewers stand looking at the scenery of the B and C
F: the virtual world that the viewers (viewers in the E) are engaged with or drawn in the viewers' mind

A screen with images is in the physical world (B) and the viewer is looking at the screen standing on the physical world (C). The images on the screen create the virtual world (A) and the viewer can be engaged in/with it virtually and psychologically (D). Other viewers (F) can share the experience while observing the screen and interaction of the viewer (C). The virtual experience in their mind or in their imagery can be same or different with the one that viewer (C) has.

If I reexamine this scene in the space perspective, the viewer (C) is standing in the physical space, and the world (A) is in the virtual realm. Since the screen is standing on the physical ground representing the virtual world, the screen stands on the boundary of the virtual and the physical in (B). The viewer (C) may be frequently in/out of the virtual world of (A). If the viewer (C) is fully engaged in the virtual world that screen provides, then the viewer's mind is in the virtual world, although his body remains in the physical world. If the viewer feels some sense of alienation or rejection from his/her full engagement in the virtual experience, the viewer will return to the physical world. This whole situation can be shared with other viewers (E). They can look at the scene of the screen (B), the viewer (C) and interaction between (B) and (C) in the physical world. Like the viewer (C), they can also engage with the virtual world that is provided by the screen and may be in and out from their virtual/physical experiences (F).
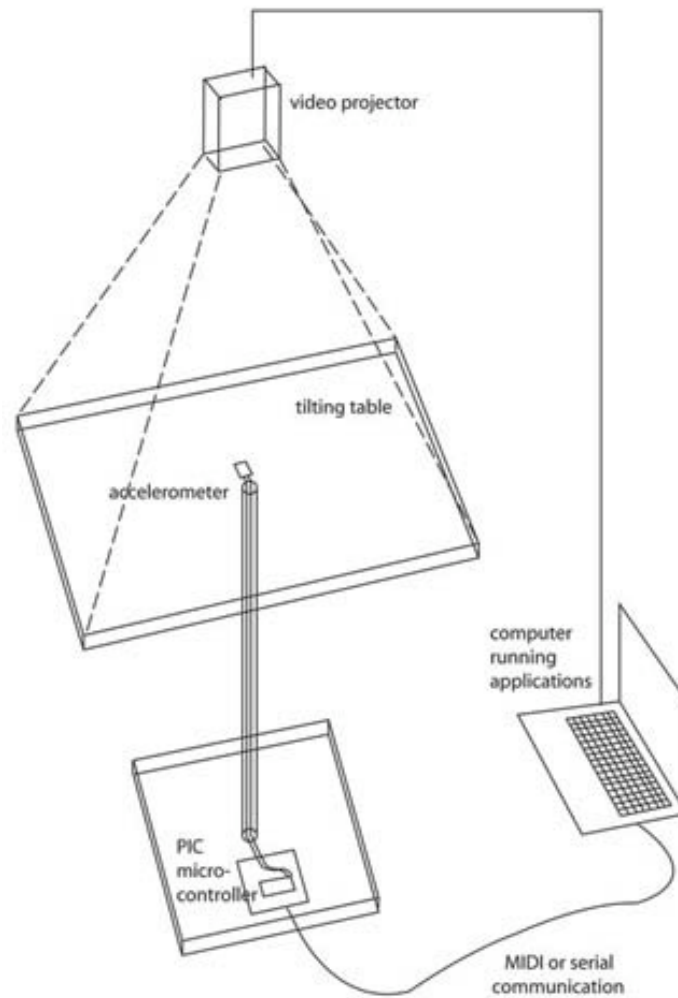
255

APPENDIX B

B. TILING TABLE DESIGN

Figure B.1 Tilting Table Setup

The tilting table uses an accelerometer (a sensor for measuring gravity) for detecting the movement of the tabletop in response to user actions. The accelerometer communicates the tilt-angle values to a PIC microcontroller, which then delivers those values to a computer via either MIDI or serial communication. Computer-driven real-

time images are transformed by the input and displayed on the tilting table surface by a ceiling-mounted projector (Figure B.1).

Mechanically, the joint for the tabletop has been implemented in two ways. Our first version uses a balljoint, while the second uses a spring. These two joints have different traits: with the ball-joint, the tabletop remains in the last position in which the user left it; the spring, because of its resiliency, returns the tabletop screen to its original position after the user's interaction.

Figure B.2 A tabletop with a spring joint and an accelerometer

APPENDIX C

C. *CROSS-BEING: TODD (A TILTING TABLE)*:

TODD'S INTERACTION

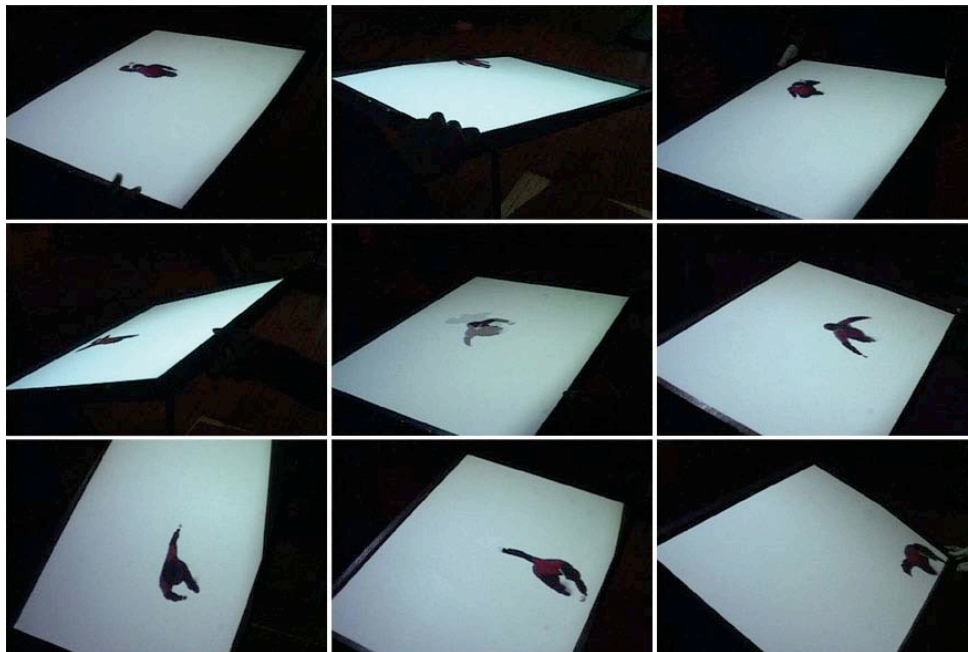Figure C.1 Todd's Interaction in *Cross-Being: Todd*

Figure C.2 Interaction with *Cross-Being: Todd*

APPENDIX D

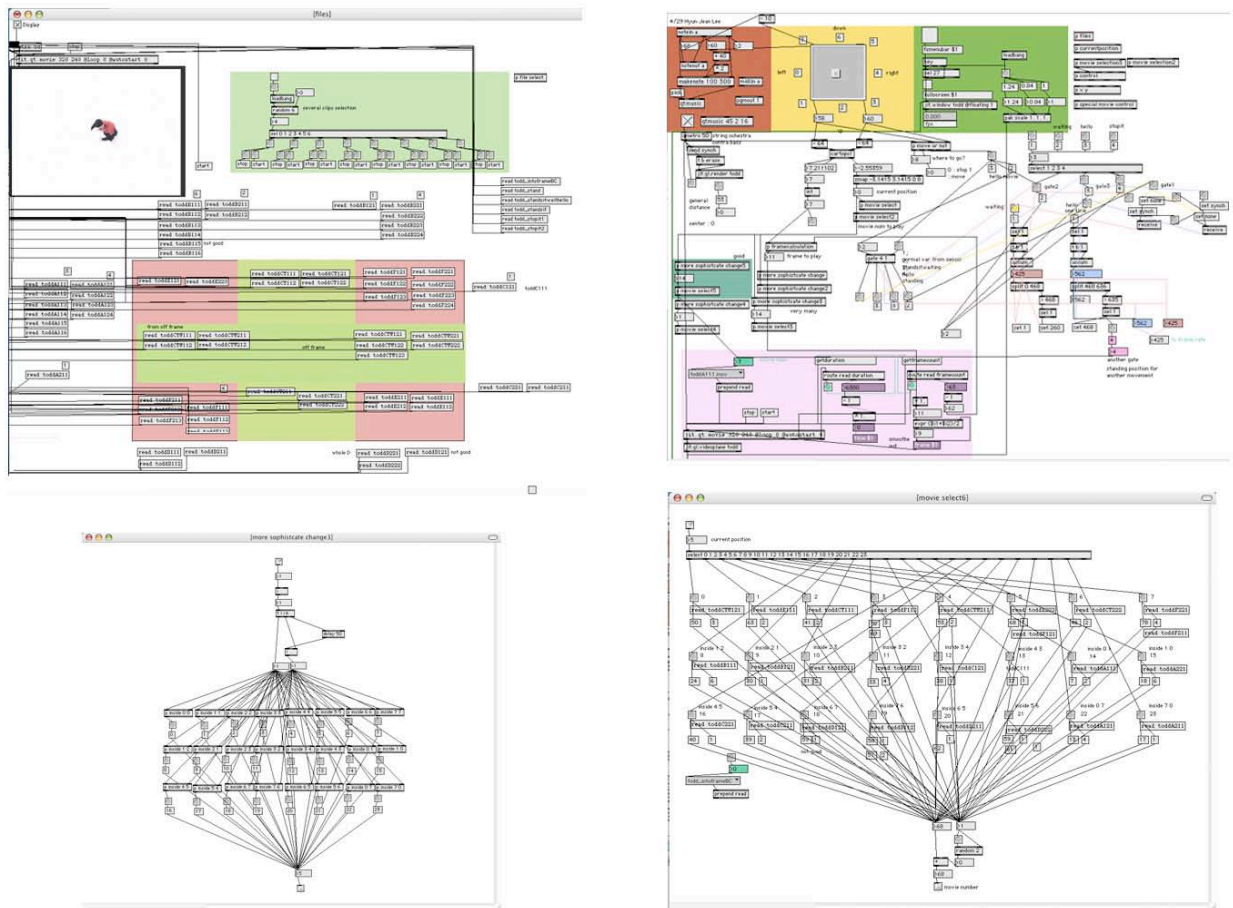## D. *CROSS-BEING: TODD (A TILTING TABLE)*: JITTER PATCHES

Figure D.1 Jitter Patches for *Cross-Being: Todd*

APPENDIX E

E. DESIGN OF THE SPINNING SCREEN

Figure E.1   A sketch of the spinning screen measuring the spinning radius

slotted disc coupler 1040
adjusting two piece
6208K14, $27.58 each
black aluminum
OD 1.5 , O'all length 2-3/8
screw size :10-24
A bore :5/8   B bore : 1/4

light duty two piece clamp-on coupling
mcmaster-carr
Part number: 6115K1, $18.34
OD 1-7/8
O'all length 2-1/2
screw size 12-32
A bore: 5/8   B bore: 9/8

gear 14 1/2 pressure angle spur gear

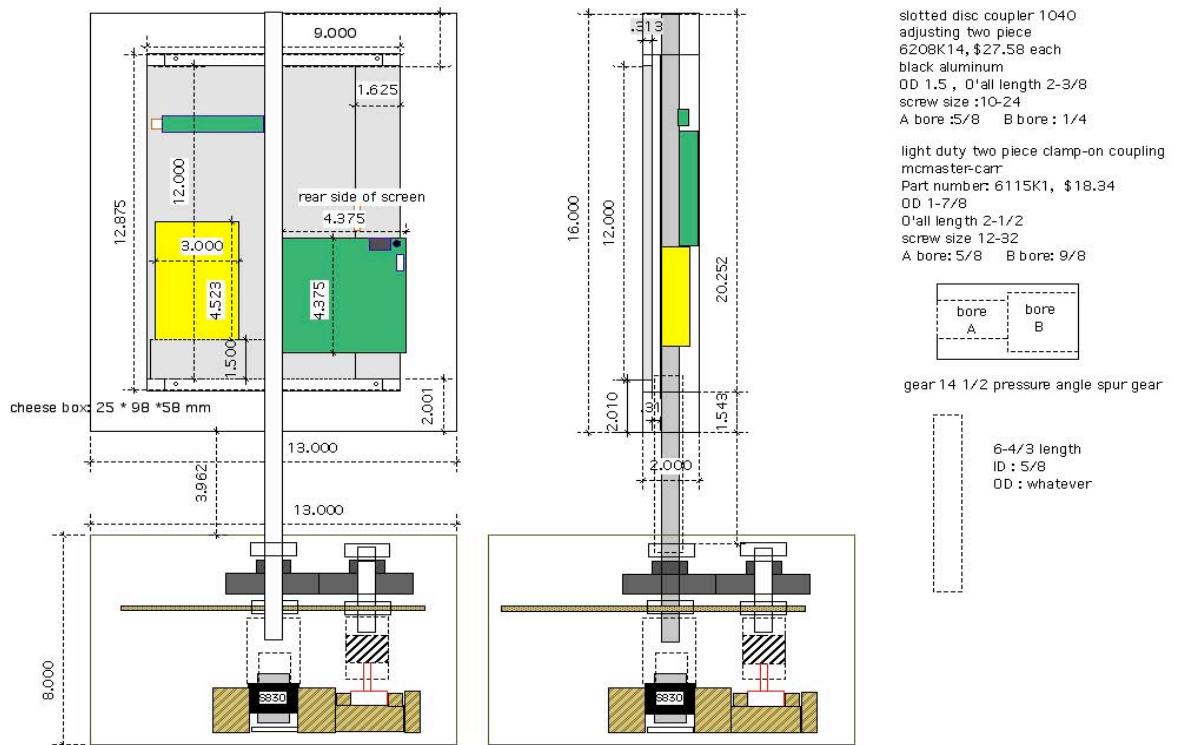6-4/3 length
ID : 5/8
OD : whatever

Figure E.2   The original spinning screen design to support one video displays on the side-by-side LCD monitors.
The right side layout shows the interior of the back-to-back screen and layers of acrylic sheets
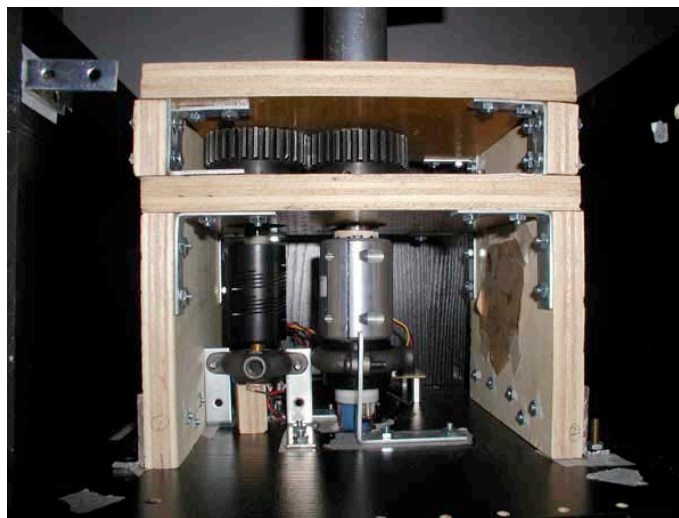

Figure E.3 A base structure of the spinning screen with two gears, a potentiometer, rotary connectors, and so on.

261
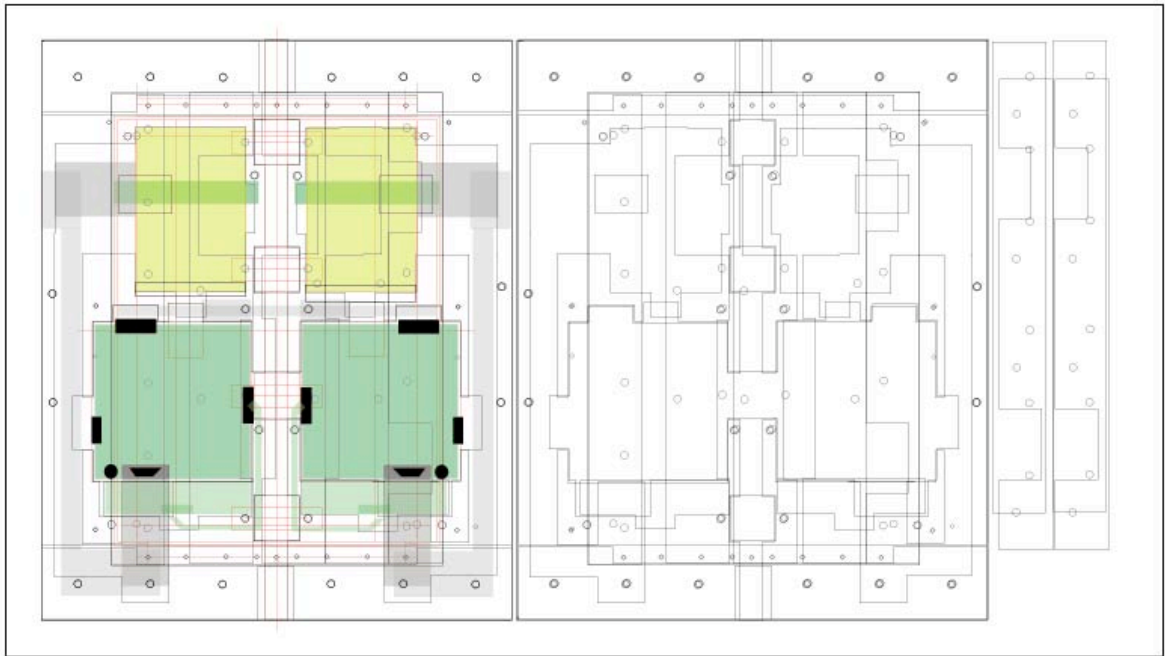
Figure E.4 This layout shows the layers of acrylic sheets for the interior of the back-to-back screen

Figure E.5 and FigureE.6.   The spinning screen construction testing LCD display output on one side of the screen

New Design of the Spinning Screen in 2008
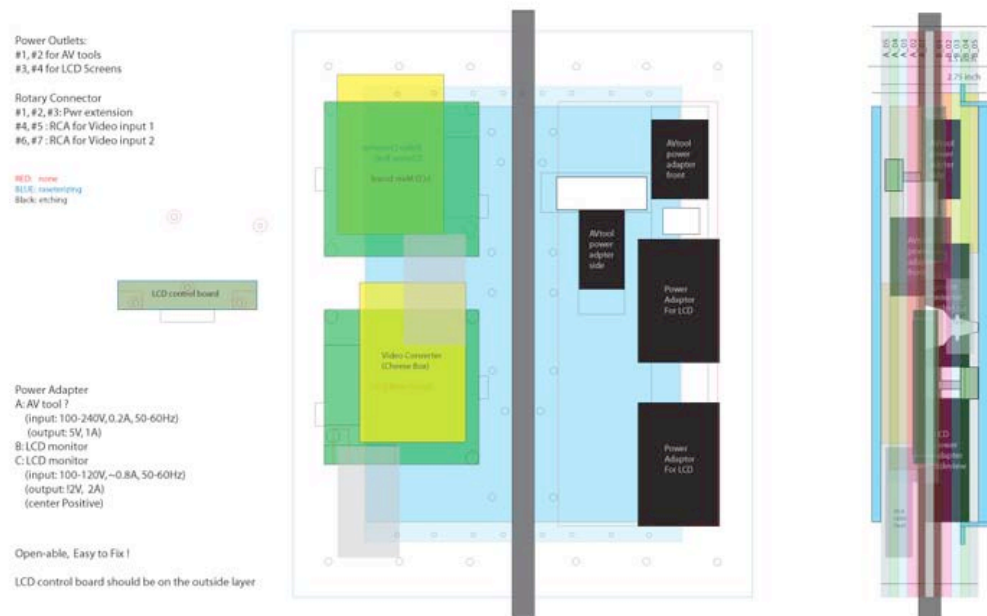
Figure E.7   New spinning screen design to support two separate video displays on the side-by-side LCD monitors. This layout shows the interior of the back-to-back screen and layers of acrylic sheets

Figure E.8   New construction of the spinning screen in 2008

Figure E.9   This shows the construction of the spinning screen with a wireless VGA kit.
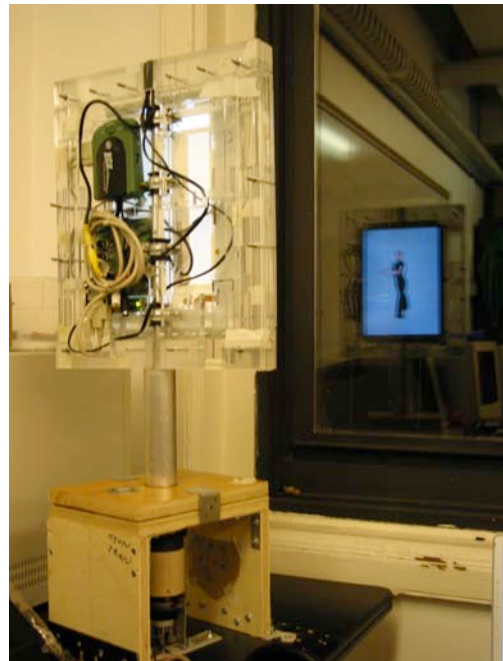The wireless VGA enables to transmit the video signal to two monitors in the upper part.
This spinning screen is designed for the Steelcase spinning screen design in In-Space project at Synlab

Figure E.10 Steelcase spinning screen design in In-Space project, *SpinSpace* (collaborated with Kirti Goel)

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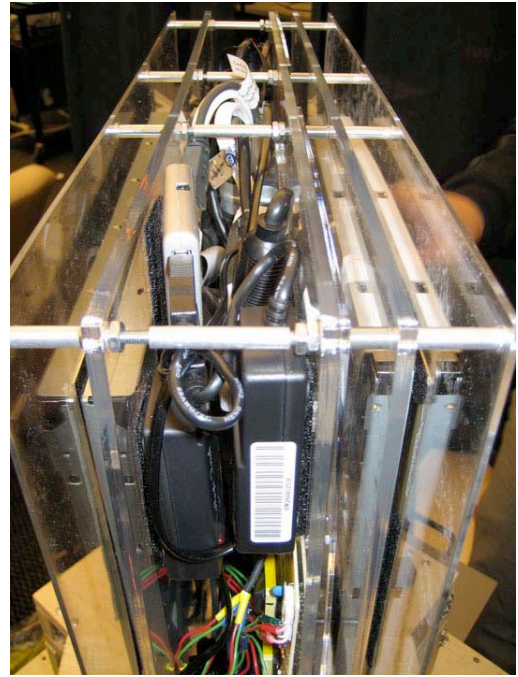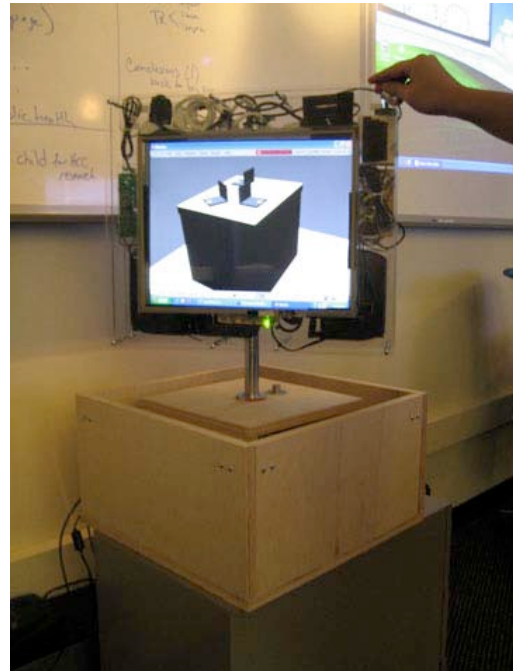Agre, Philip E. 1997. "Toward a Critical Technical Practice: Lessons Learned in Trying to Reform AI," In *Social Science, Technical Systems, and Cooperative Work: Beyond the Great Divide,* eds. Geoffrey Bowker, Les Gasser, Leigh Star, and Bill Turner, 131- 157. Philadelphia, PA: Erlbaum.

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