Experiencing by Interacting:

A Study on Mediated Experience in Digital Interactive Arts

by

Yifan Wang
B.A., Xi'an Academy of Fine Arts, 1997
M.F.A, University of Victoria, 2005

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Supervisory Committee

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Dr. Andrea Walsh (Department of Anthropology)
Departmental Member

Dr. Lianne McLarty (Department of History in Art)
Departmental Member

Abstract

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This study focuses on the manifestation of mediated experiences in digital media environments in the visual arts, conducted by human-computer interactive technologies such as virtual reality and augmented reality, in order to construct a framework for understanding experience through diverse artistic experiments. My inquiry is constructed through analysis of the connections, indications and reflections of mediated experience in various interactive virtual environments, and discusses the profound and related connections among media, technology and experience in the context of digital interactive arts. Further, a number of representative artworks, particularly in the territory of digital interactive arts, are examined in order to map the concept of mediated experience. The study of the philosophical, social and cultural roots of experience is at the center of this project. This research can be considered a trial that brings theoretic discourse into art practices, and vice versa. By situating the discussion through case studies of artworks, readers are better able to read abstract concepts in actual artistic practices and develop a deeper understanding of the topic. These considerations, from a broader point of view, pave the road for the future manipulation and application of interactive digital media in public visual art. Digital

interactive art as a complex of technology and conceptual exploration is an ideal vehicle for embarking on the research into the instinctive and emotional feelings generated by human-computer interactive experiences.

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EXORDIUM

The Role of an Artist in Modern Society

Marshall McLuhan described the research role of the artist in this way: "The serious artist is the only person able to encounter technology with impunity, just because he is an expert aware of the changes in sense perception."[1] Artistic creation is not only the vehicle of personal expression of artists, but is also varied by many other factors, such as media and technology. In exploring new technologies, contemporary artists have discovered great potential to create artworks not previously encountered in traditional art forms.

This study investigates the concept of experience in interactive arts in digital media and more specifically, in computer generated interactive virtual environments (IVE); it constructs a framework to form a support for understanding experience

through diverse artistic experiments. In order to gain deeper understanding, this project is enriched by a critical setting pertinent to pursuing experience in broad social, culture, and philosophical contexts, including its interpretation in Western and Buddhist traditions. To develop a comprehensive thesis, I will discuss experience in relationship to the above disciplines.

Intersections

Experience is a topic that has been elaborated beyond the boundaries of culture and nation. Eastern philosophies have embarked on a long journey of discovery of one's state of mind, as well as the relationship of the mind to its surrounding environment. For example, Buddhism attends to the human condition in a straightforward manner, and helps people find truth and meaning through practices and direct experience. This emphasis on experience is rooted in the distinctive notion of realizing a state of nonduality, and has inspired people's lives in many ways. The interpretation of experience in the cultural and philosophical context is coherent and complete. As Daisetz Teitaro Suzuki asserts, "personal experience…is everything in Zen. …The foundation of all concepts is simple, unsophisticated experience."[2] The Zen notion of experience has had tremendous impacted upon Japanese culture. In contemporary arts, exploring experience is a foundation of artistic practice and an essential component of artwork. In the context of aesthetics, experience as a cultural element has influenced "Western" artists as diverse as Mondrian, Wim Wenders, John Cage and Nam June Paik.

As vested social phenomena, art, culture, and religion are never partitioned from experience. Western philosophers also have also made this point. John Dewey states:

> Experience occurs continuously, because the interaction of live creature and environing conditions is involved in the very process of living. Under conditions of resistance and conflict, aspects and elements of the self and the world that are implicated in this interaction qualify experience with emotions and ideas so that conscious intent emerges.[3]

In the same vein, digital interactive technology has been employed by artists to develop platforms where participants can acquire mediated experiences. These mediated experiences work with technology to form a new artistic language with unique expressive power.

Experience in Interactive Virtual Environments

As Gregory Bateson remarked, "mind is an aggregate of interacting parts or components," and "mental process requires collateral energy."[4] Everything is interconnected so that the whole and the parts are mutually interdependent. In a similar vein, we are not simply conditioned by the environment and compelled to live our best within it; because there is no such thing as a completely individuated self, our lives actually affect the environment and vice-versa. In digital interactive artworks, this concept is embodied in various ways, for instance the diverse human-computer interfaces that provide visceral experiences to individual participants.

The personal experiences and feelings generated from a digital interactive environment may be a synthesis of various components. I will analyze two distinct but related art projects created in the cooperation of a team of artists, technicians and myself. The two projects, *Shadows & Light* in Xi'an (Digital Interactive Performance in 2011, China) and *Shadows & Light* in Victoria (Digital Interactive Installation in 2012, Canada), address topics such as differing forms of presentation, interactive modes of expression and related technologies, cultural reinterpretation, and the

intimate conversations between human and computer experienced in the individual or multiple-users' interactive environments. The two artworks are based on the tradition of Chinese shadow puppet performance. Both can be considered as new interpretations of the traditional spirit of a local art form, utilizing interactive digital media technologies and creating interactive environments that artists and casual viewers can access. The two different but related projects are designed to conduct research on the senses, cultural translation, and the components of experience, interactive activity, presentation, and co-presentation. A series of questions form the center of this discourse: How do interactive environments and people's activities, especially visual nonverbal communication, work with each other, affect both participants and artists, and help them shape their experiences?

Methodological Approach

This research mode that I employ is based on the belief that many issues in the humanities and sciences are most fruitfully explored through a cross-disciplinary approach. The digital interactive projects I have selected as examples all involve creative, dynamic and equitable encounters between art and technology, enhanced by mediated experience. Studying these examples facilitates understanding of the essence of interactive arts, and provides new methods to interpret experience as it relates to contemporary interactive art. In addition to the written component of my research work, I will also present multiple art practices that are informed by my study, thus affording the opportunity to explore the artistic consequences of this new research.

Studying experience in digital interactive art requires interdisciplinary research, in that the concept can only become clear through assembling knowledge

across multiple fields. In the first chapter, the theoretic aspect of my study references Marshall McLuhan, Walter Benjamin and Lev Manovich's theories pertaining to media and experience. McLuhan's theory provides a broad understanding of media. It also paves the road to study experience in the diverse media, in this thesis, more precisely, in digital interactive media. Walter Benjamin's theory about mechanical reproduction of media has been very suggestive of an association between our experience, media technology and relative natural and historical circumstances. I examine this connection further in the cultural context of digital interactive media and discuses the effects of technological improvement. As an author and scholar of high attainment, Lev Manovich's research on new media, especially on new media objects, provides a variety of angles to analyze digital interactive artworks. Inspired by Dewey's idea of "live creature", I also discuss experience and mediated environment and indicate the aesthetics and philosophy in the cultural context. For instance, experience in Zen Buddhism is linked with individual practice and thought of as interdependent with a person's view of the cosmos. Zen Buddhism emphasizes direct experience and has had a significant impact on cultural behavior and art forms such as the Japanese garden and tea ceremony. This provides another example of the context of cultural and social perspective, which is crucial to mapping the concept of experience.

Digital interactive technology is an open platform that has been utilized in many ways. In Chapter Two, I study representative diverse themes and forms presented in actual artistic practice. Artworks will be compared in order to study the essential components that help artists structure the viewer's interactive experience in a mediated environment. As in the real world, participants play or work with others in digital interactive artworks that usually contain virtual environments. Participants'

presentations are direct reflections of their experiences. I also analyze participants' presentations in digital interactive artworks, since these are crucial in understanding how mediated experience is developed and varies across different activities or environments within the same or different systems. In other words, how does what people do, or the type of environment they are in, affect mediated experiences?

The relationship between art and technology is normally thought of as being concomitant rather than conflictive. Art does not interfere with technology or vice versa. It is understandable that some artists chose to stay away from modern technology and prefer to work with techniques that have been absorbed by traditional art, not only because those conventions are deeply entrenched in people's attitudes, but also as traditional media provides artists with more possibility of controlling their activities and outcomes. On the other hand, new technologies need specialized knowledge, and the equipment required could both present a barrier to artists and limit access by audiences.

In Chapter Three I introduce an imagination of *Gesamtkunstwerk*, the total artwork, inspired the idea of creating the ultimate mediated experience, which has fascinated generations of artists and scientists. I also analyze a number of representative researchers and describe their landmark works in order to tackle the trajectory of collaborative processes of interactive arts and digital technologies, and develop discussions on the intimacy of human and computer. This chapter maps the evolution of technology and mediated experience and the development of digital interactive arts.

Chapter Four focuses on the first case study, the Xi'an version of *Light & Shadow*. *Light & Shadow* in the city of Xi'an was an educational and commercial

project that took place in Lantian County, China. It consisted of two parts, an interactive public performance and a ten-day workshop for the students of the Film and Animation Department of the Xi'an Academy of Fine Arts. The concept of the public performance derived from Jade Valley Wine and Resort, a modern development of a winery and hotel of creative architectural design, which in turn references the idealized harmonious life of a traditional farm.

The basic idea of the narration combines live, local Qinqiang-style opera performance with another traditional classical art form – shadow puppetry. The prerecorded excerpt of a shadow puppet play was projected onto the solid, gray brick façade of the building called Jingyu. An actress of Qingqiang opera holding an infrared wand performed in front of the projection and interacted with multimedia contents via Gesture and Media System (the technology platform used in the performance) at the same time. This merging of folk art, modern architecture and interactive technology revealed a new interpretation of culture, understanding, and aesthetics expressed through interactive and live performances. The interaction of real human performers, puppet characters, and the building itself is reflexive, reshaping the composition of traditional folk arts as well as the perception of the architecture.

Chapter Five focuses on the second case study of *Light & Shadow* in Victoria, Canada, a public interactive installation that utilized motion-capture and robot-controlling technology. Participants were allowed to interact with and control robotic shadow puppets in order to complete an episode of a Chinese traditional shadow puppet play. Two handmade shadow puppets equipped with mini-motors were controlled by a motion capture system that detected participants' movements. Participants followed the tutorial animations in order to learn the proper gestures that

triggered the actions of the robotic shadow puppets in order to move the narration forward.

Light & Shadow in Victoria was designed and made by me, together with a team of electronic and computer engineers from Limbic Media. Participants interacted directly with robotic puppets via the Gesture User Interface in a multimedia environment. The research emphasized different kinds of experiences that a participant acquired in the interaction with technology, artwork and himself. In addition, the work also experimented with reinterpreting a shadow puppetry play through digital interactive platform, where any one could be engaged in a cultural conversation without prior experience of Chinese folk art forms. In this work, each person's participation and his experience enriched the meaning of the artwork.

This thesis discusses mediated experience and the relevant topics in the context of digital interactive arts, associated with a variety of artworks, including my own projects. Because I believe that such questions should be studied deeply; they are best explored through a combination of theory and practice. Artists, as "the only person[s] able to encounter technology with impunity,"[5] were immediately aware the advantage of new technologies, and have used them as powerful tools to facilitate artistic practices. This provides a unique angle for my research on mediated experience and environment in a digital interactive context, which is vital for interactive products/projects in both academic and industrial fields. My research also has the nature of an interdisciplinary study, which connects and integrates. It has been developed from the overlapping of experimental art practices, digital technologies, social and cultural studies. I believe my research will contribute to furthering future practices in digital interactive arts, as well as the aesthetic of digital media in terms of interaction, participation and engagement.

1

MEDIA, TECHNOLOGY AND EXPERIENCE

Media and Mediation

When we read the term “digital interactive arts”, we immediately notice that there are two polar concepts: the word “digital” implies the notion of computing, science and rationale etc.; “arts” (here, I limit and categorize the term “arts” to mean fine art), on the other hand, tends to attribute the ideas of creation, humanity, sensibility, and so forth. I have no intention to claim that artists could not to be rational. It would, of course, be absurd to say computer scientists lack inspiration in

their perceptions. The bridge that links these two parts is interaction. The process of interaction itself in this case is considered as a practice that generates empirical knowledge primarily from sensory experience.

However, the concept of experience is rather ambiguous and obscure. In disciplines as varied as science, philosophy and religion, experience can be considered a distinct concept endowed with either a metaphysical or an empirical nature. First of all, in current usage the word "experience" is a general concept referring to the species of knowledge and the procedure of gaining knowledge. The Latin root of "experience" can be traced back to an adjective: *peritus*, which in English literally means skillful, expert, well skilled, able or adept.[1] In this sense, people must be involved in or expose themselves to the actual thing or event, in order to accumulate or acquire knowledge. This involvement/exposure and acquisition form experience.

Kant made a very complex analysis of experience. In brief, he claimed that experience refers to the knowledge of an object. However, acquiring experience or the knowledge of objects requires our sensuous ability as well as the power of thinking. In other words, an experience consists of both intuition and thought. As Kant states:

> In whatever way and by whatever means cognition may refer to objects, still intuition is that by which cognition refers to objects directly, and at which all thought aims as a means.[2]

Intuition, from this point of view, is a means that people use to acquire presentation of objects through their power of sensibility, which is considered as a way that people are affected by objects. However, those presentations or appearances

are only “raw materials” that we collect from objects through sense organs. They are fragments of information of objects that we can only see, hear, or feel, but we cannot say that we “know” or “recognize” those objects. For knowledge of objects, we require thought to help us to understand that information.

I argue that if those raw materials have already been thought, designed, filtered or mediated and distributed through manipulated means, both our intuition and thoughts will be impacted. The experience we acquire from objects will be mediated.

It could be very interesting to examine experience from the perspective of focusing on its fundamental aspects in mediated society digital technology: how we live with the tendency of digital interactive technology to become ubiquitous, and how we educate ourselves in terms of interactive experience. However, experience is not a concept that can be explained by simply relying on either rational thinking or observation; it is necessary to develop a framework that consists of a few collaborative theories to explain experience in diverse phenomena and map its concept as a whole. As part of this framework, I must discuss media, since it is an important concept carried along with the evolution of experience.

The Latin root of “medium” is *medius* meaning “middle” or “midst,” a middle state or condition; a mean. Derived from *medius*, the English word “medium” is used as a noun. *Medius* has also evolved into other words in English, such as mean, medial, mediate and immediate, etymologically meaning “acting directly, without any mediation.” The meaning “an intervening agency, a means, or an instrument” developed early, first appearing in newspapers two centuries ago. In the 1920s “media” began to appear as a singular collective noun, sometimes displaying

the plural form "medias."[3] Media has also been used collectively, as a noun, to mean an intermediate agency, a means, an instrument or channel, such as newspapers, radio, television, and so on, vehicles of mass communication.[4]

The English word "mediation," in Latin *mediātiō*, as a noun means division by two; division into two equal parts; halving, bisection. It also signifies an agency as an intermediary; the state or fact of serving as an intermediate agent, a means of action, or a medium of transmission; instrumentality. The verb "mediate" comes from the Latin root *mediat-*, meaning to occupy an intermediate or middle place or position; to be between, usually as a connecting link or a transitional stage between one thing and another.[5]

Media appears as either physical form, whether an architectural structure or a piece of film, or immaterial form, such as a spoken language. It has both connected and intervened between us and the outside world by providing mediated information and shaping our experience since the beginning of civilization.

It is very interesting that in city planning of ancient Greece and Rome, large-scale theaters were a very important part of all public architecture. For instance, in cities like Rome, Athens and Ephesus large theaters were capable of holding about 25,000 spectators. The functions of those theaters were initially for entertainment such as drama and gladiatorial combats during later Roman times. They were also stages for public speeches and announcements. Another interesting example is ancient constructions for monumental or religious purposes, for instance the Parthenon, where a series of structures were decorated with statuary, painted embossments, and carved texts that narrate the Greek mythology of Athena. Athenian citizens went to the temple, not only to worship the gods, but also to be educated in a

highly mediated environment. Medium, in the ancient age, appeared as a concrete concept with a solid shape, carrying information that could only be acquired by people in a specific location, and by a specific social class who were able to read. On the other hand, people formed their religious experience based on those architectural structures. Even today, those historic remains are still part of our experience of Greece.

Fig. 1. The open-air theater in Ephesus in Roman period. Photograph by Yifan Wang, 2012.

Fig. 2. The Parthenon temple in Athens. Photograph by Yifan Wang, 2012.

Connected, Accelerated and Shaped by Digital Technology

The contemporary idea of medium is linked with the modern process of assimilation and dissimilation of information by a variety of means of communication. It is refers to not only some particular materials or channels, but also in a broader sense to institutions that broadcast and print information for the masses, the so-called mass media. This is the opposite of the natural form of human communication in terms of an interpersonal interactive approach. Mass media is a powerful system that sends information in a one-way direction from few to many. This approach has worked very efficiently in modern societies since profession and class divided social structures and labor. Individual professionals and particular social classes tend to live in a more and more segregated fashion, so that there is

increasing needs for mass media to deliver information outside of a particular environment. Interestingly, the desirability of communicating, interacting and learning hastens our contemporary social experience, which is characterized by a global tendency toward mediated societies.

The concept of media has expanded tremendously through the evolution of our civilization and the development of technologies, far beyond its rhetorical meaning to become a more complicated system that shapes and mediates our experience. This can be recognized in the integrated histories of technology and culture, in which two forces stimulate one another and drive individuals and societies forward. More precisely, contemporary technologies and associated utilities, facilities, and institutions work together with contemporary culture as a system to develop a mediated world. The concept of mediation has thus been a dynamic process. In his essay "The work of art in the age of mechanical reproduction,"[6] Walter Benjamin claimed that in the age of mass media, the way that people acquire information has shifted from a convergent to a divergent approach. Instead of pursuing the traditional media resources by themselves, a vast audience can be given information simultaneously by the distribution system and technologies of mass media.

Other than in the 'disseminative' approach, media also plays a very important role in social rituals, appearing as a variety of forms embedded with religious or cultural elements. Through attending and participating in those mediated events or activities, people are able to share cultural and social experience. For instance, in Eastern culture, the tea ceremony, martial arts, gardening, architecture, and calligraphy are all employed to convey or enhance the learning practice and personal experience of Zen Buddhism. As D. T. Suzuki insisted, "Zen is the wellspring of Japanese culture … the traditional arts of Japan – tea ceremony, monochrome

painting, martial arts, landscape gardening, Noh theater, etc. – are all ultimately expression of a Zen gnosis."[7] Those highly designed forms of participation in forms of sociality can thus be recognized as the foundation of our cultural communities, which exist not only in the traditional concept of society, but also in virtual space, such as the online communities and virtual environments that I will address later.

Fig. 3. *Landscape of the Four Seasons* by Tensho Shubun (Zen Buddhist monk) in 15th century. Ink on paper. Tokyo National Museum.[8]

Fig. 4. The Zen rock garden of Ryōan-ji, late 15th century. (Photographer unknown)[9]

Marshall McLuhan states in his most famous work, *Understanding Media*: "All media are active metaphors in their power to translate experience into new forms."[10] Rather than being focused on media contents, he focused his study on the forms of media. Television, print, radio and digital media are all different modes of communication or means of delivering information, which have their own distinct impacts on the approaches of human communication. It is very easy to understand how much electronic media influences our contemporary life. Compared to the previous examples I mentioned, people do not have to flock together in a specific location in order to gain original information. Electronic technologies shape and disseminate the same message to everyone in the world. McLuhan thus claimed that we are living in a mediated "global village" where humanity's modes of communication and approaches have been changed. Most importantly, our experiences of the outside world have been molded by electronic media and tend to be convergent. In other words, while all people could have their own opinions of things, the experiences they gained from media are from the same source and mediated.

The digital media or computer-based media that have developed rapidly since the 1990s are now considered to be the "hot topic." Internet and web-based media enhance the possibility and speed of spreading and reproducing information, and we have been endowed with individualized and interactive power as never before. From the sociological perspective, this trend is transforming our current age into a more democratic future. Other radical technologies such as virtual reality and augmented reality are taking advantage of the interactive nature of digital media and have a progressive effect on our approach to communication.

When our everyday lives are fully filled with different kinds of screens: televisions, computers, games, cell phones, and more, the generation relies on modern technology and has become 'Screenagers'[11], a term that was first introduced by Douglas Rushkoff in 1997. In his book *Playing the Future*, Douglas argues that young people who have used computers and other devices with microchips since infancy will have effortless advantages over their elders in processing information and coping with change when they reach adulthood. The fact is that the young generation, especially those born in the 1980s, 90s and later, who spend most of their day sitting in front of computers and using mobile devices, have a tremendous ability to manage the latest technologies and process multiple steams of information simultaneously.

That the young generation possesses these abilities cannot be simply explained by assuming they are smarter. Consider the case of foreign language study. Educators now widely accept the "premiere age" of language learning is between 2 and 12. Children in this age range have much stronger ability to adapt themselves to a new language (a form of media) environment than adults who are, on the contrary, slow and inefficient. If we consider the current society as an environment mediated by digital technologies, in which children and adults all live, it becomes easier to understand why the young have such an advantage in digesting and managing new mediums and have become a techno-savvy group – they have been immersed in a digitally mediated environment since the very beginning of their lives when their communicative capacity and knowledge first developed.

The environment mentioned above refers, first of all, to the man-made surroundings that contain not only the hardware, such as mobile and interactive devices, but also its related culture, including cyber communication and online

communities. All human activities in this mediated environment are definitely influenced by these tangible and intangible media. The approaches of acquiring information and the approaches of intercommunication have become diverse and tend toward multitasking. It seems normal to see someone simultaneously play online games, bargain on eBay, watch television, and text friends on a cell phone. The powerful one-way communication systems that constitute that mass media have transformed, and once again become interpersonal and interactive forms of communication.

The change of media can be closely related to the evolution of technology and our contemporary society. When the dominant form of modern media shifted from print to digitalization, it triggered a concept that we are all familiar with now – visual culture. Visual culture has reached the point that all transformational cultures attain when no longer controlled by just a small group of professionals: achievement of mass acceptance and ubiquity. From the general point of view, there are three essential elements that contribute to this shift.

Information, as we know, needs to be carried by some form of media so it can be transmitted and disseminated. During the past few centuries, the forms of media have been changed from traditional materials, such as animal hide, paper, or canvas, to new materials including compact discs, computer hard drives and mobile devices. The approaches to information transmission are also profoundly changed. Digital video cameras, cell phones, the Internet, and such all represent information through a variety ways and create diverse "new media objects." As Lev Manovich mentions in his book *The Language of New Media*:

> New media objects are culture objects; thus, any new media object – whether a Web site, computer game, or digital image – can be said to represent, as

> well as help construct, some outside referent: a physically existing object, historical information presented in other documents, a system of categories currently employed by culture as a whole or by particular groups.[12]

Traditional media represents and records what we see and hear in our everyday life. The invention of printing and recording technology enhanced the distribution and popularization of knowledge and information. However, the traditional method of learning from printed materials requires skills such as reading and writing, which are possessed exclusively by highly educated people. Visual culture, especially in a digital context, rather than using the form of text, visualizes information to the maximum limit and breaks through the information barriers in different social class.

The technology with which new media simulates reality has been much more enhanced than anything available in traditional media. The ancient person who made paintings in Cro-Magnon caves in 15,000 B.C. might have made the first intelligent art works – those paintings could be considered the earliest human attempt to simulate the outside world. To this point, we have never stopped exploring new technologies in order to reach truth and reality. From daguerreotype to cinema photography, from Richard Wagner's *Gesamtkunstweek* to virtual reality, we push the limits of technology again and again. As Lev Manovich described, "Simulation refers to technologies that aim to immerse the viewer completely within a virtual universe – Baroque Jesuit churches, nineteenth-century panorama, twentieth-century movie theaters."[13]

To avoid falling into technological determinism that overemphasizes the effects and novelty of new technologies, we have to understand that technological

development, human experience and social culture are positively interdependent. As Walter Benjamin argued:

> During long periods of history, the mode of human sense perception changes with humanity's entire mode of existence. The manner in which human sense perception is organized, the medium in which it is accomplished, is determined not only by nature but by historical circumstances as well.[14]

To expand on this idea, human experience is thoroughly alive in, and changes with, the forms of media, media objects and mediated environment. We sense different objects and at the same time shape new modes of experiencing. As a "live creature," a human completes his or her experience as a whole through interacting with the surrounding environment.

Compared to traditional media, digital media has some particular features, which are considerably augmented and enhanced from a technological perspective. Digital media not only augments the power of mass reproduction, but also creates a new approach to accessing information and a new mode of communicating between audiences/users and technology. People are able to interact with digital devices, which allow us to not only share information, but also integrate personal experience at the same time. For instance, the Graphic User Interface (GUI) is a popular form of human-computer interface that allows people to interact with electronic devices such as computers and computer-based media. It is now extensively used in the much broader field of virtual and augmented reality environments, such as Google glass. The influence that GUI exerts on us goes much deeper than an advanced technology – the use of graphic icons and visual indicators has become a type of cyber culture which combines with our daily visual experience to form a type of image-reading experience.

Considering the notion of interface from a broader viewpoint, Lev Manovich claims that culture can also be considered an interface where people communicate by using media. Digital media facilitates this communication by its technological advantage and allows artists to reinterpret traditional culture through new aesthetic experiences and expressive languages. For instance, in most music videos, traditional linear narrative is completely broken apart and replaced by rapidly cut images, the typical visual "chaos" of our contemporary media culture. The majority of MTV videos that we see today are collections of segments. These image fragments fly by too quickly to be comprehended on an individual basis, and are very hard to view as a conventional narrative genre. Different from regular film editing techniques, which create the illusion of moving images and narratives, MTV juxtaposes the moving image so independently, quickly, and disjointedly that it creates another level of imagery. This disjointed, even rough, media style is precisely the most popular landscape and accepted by the new generation. It made coercion through traditional, narrative thinking impossible, and spontaneously required that a new media language – the chaos language – be developed. Some primetime program television programs and especially advertisements quickly adopted this particular editing style appropriated from MTV to make commercials with rapid cuts, juxtaposition of screens, and most importantly, non-linear stories.

The influence also appears in the way media is distributed; Douglas Rushkoff notes the way new and traditional media "evolved from a top-down, unidirectional forum into the interactive free-for-all it is today." [15]As mentioned above, one of the characteristics of new media is that it allows users to interact with electronic devices. In addition, new media liberates people from the boundary of space and time, so they

are able to communicate with each other anytime and everywhere. Scholars such as Rushkoff analyze this phenomenon from variety of perspectives:

> Some explain how the media used to be "one-to-many," meaning that just a few broadcasters controlled what millions of viewers absorbed, and go on to rejoice that now the media is "many-to-many," because anyone with a modem or camcorder can tell his stories to the rest of the world through public access, television or the internet.[16]

It is obvious that Social Network Service (SNS) plays a very important role in the online community, and people use YouTube as a tool of self-expression. Again, the new technologies associated with communication generate the new mediated environment that shapes our experience.

Walter Benjamin argued that mechanical reproduction is an external condition applied to the mass production of traditional media objects such as works of literature and paintings. However, this is the basic function of motion picture technology. That is to say, mechanical reproduction is simply the nature of movies. Mechanical reproduction liberates the work of art from its parasitical dependence on conventional ritual and traditional culture. In the same vein, in the context of new media, more precisely digital media, objects including works of art have been designed for reproducibility. For instance, in opposition to the standardized mass production that traditional media usually relies on, new media inherits mass standardization which can be considered as one of the features of post-industrial culture, but actually kicks it up a notch by applying modularity and individual customization.

New media objects have the advantages of regular media, spreading their impact over large groups through mass-reproduced information. As in the industrial assembly line, a new media object goes through a particular production process from

idea to finished product, and can be elaborately designed for each targeted small group or individual. During this process, a new media object will be assembled through different media elements. These media elements, as Lev Manovich described, "be they images, sounds, shapes, or behaviors, are represented as collections of discrete samples (pixels, polygons, voxels, characters, scripts)." More specifically, "these elements are assembled into larger-scale objects but continued into even larger objects – again, without losing themselves independently."[17]

For example, a multimedia product such as a movie or an interactive installation could contain visual effects, animation pieces, still images, video footage, and soundtracks that are created individually or borrowed from elsewhere. Because all of the elements are individually created and independently stored, they can be modified at any time as the artists wish without having to change the whole product itself. Another example is the World Wide Web. Anyone who has had experience with web design will know that media content can be modified in a web page by changing the HTML code: images, soundtracks, and videos can be altered part by part without changing the entire webpage. From the perspective of microstructures, each image, soundtrack, and video is a small and self-sufficient module, which is assembled into the larger program, the web page. Likewise, each web page is a bigger module, which is assembled into the web set, the ultimate product. This pattern is the dominant production and programming model in contemporary media industry, especially in digital media.

Each kind of media in its corresponding age has its advantage. A digital media object also has its own technological property. Different objects, no matter whether originally created by computer or converted from traditional media sources, are all composed of digital codes. Lev Manovich developed two principles:

1. A new media object can be described formally (mathematically). For instance, an image or a shape can be described using a mathematical function.
2. A new media object is subject to algorithmic manipulation. For example, by applying appropriate algorithms, we can automatically remove "noise" from a photograph, improve its contrast, locate the edges of shapes, or change its proportions. In short, *media becomes programmable*.[18]

These two principles explain why digital media objects can be treated as independent models and how they can be modified without changing the entire system. On the other hand, they also raise some new questions: If a new media object consists of media elements which are "premade" and modulated, how can we determine its originality and authenticity? What kind of personal experience we can acquire from a digital media product?

The Value of Being Interactive

It is easy for people to understand that traditional media involves considering the original creativity of humans. Artists express themselves through visual, audio, and textual elements using specific media. Even in the mass-reproductive context, when an artist makes hard copies of his or her artworks, we can tell that those copies are from the original works of the artist and in limited numbers – they are identical. However, it is very hard to identify the originality of new media works. The nature of producing a new media object, according to above principles, is to assemble premade digital elements instead of creating them. This variability is an important feature of both digital media technology and its products. In this context, the manner in which our experiences are organized, and the media in which they are accomplished, is

influenced not only by historical and cultural circumstances, but also by technology itself. Lev Manovich describes this as follows:

> Stored digitally, rather than in a fixed medium, media elements maintain their separate identities and can be assembled into numerous sequences under program control. In addition, because the elements themselves are broken into discrete samples (for instance, an image is represented as an array of pixels), they can be created and customized on the fly.[19]

This feature must have some kind of value to explain its current dominance. The commercial significance is too obvious to relate. Digitally based products, both hardware and software, are the primary economic engine of the world now. From the artistic perspective, value comes on different planes. Walter Benjamin claimed that the work of art has two "polar types" of worth, cult value and exhibition value. As the reader is no doubt aware, the cult value has been very important since ancient times, especially in the context of religion. However, from the standpoint of communication, the opposite is the case with exhibition value. The former tends to favor the view that artworks should remain hidden, only to be worshiped by a particular group, such as priests and followers, while the latter encourages sharing and participating.

In the age of mass reproduction, exhibition value has developed tremendously, so that a work of art has been endowed with entirely new functions. The best example is artworks that are employed in movies, on television, and in broadcasts as the tools of propaganda. In the context of digital media, works of art have added another layer of value, to shape and complete the interactive experience in the interpersonal and human-computer perspectives. This movement, in contemporary social circumstances, facilitates the democratic and independent tendencies in our culture today, which encourages humans to explore new territories they never visited before and liberate individuals to engage in self-expression.

In interactive arts, this feature has been employed by artists to create works of art that allow exploration of a virtual world, which could never be constructed using traditional media. Technologies such as virtual and augmented reality have been used not only to simulate the real world, but also to provide humans with an interactive experience of the outside world as well as manmade reality.

An excellent example is Australian artist Jeffrey Shaw's *The Legible City*. In this work, Shaw has not only created a three-dimensional virtual environment but also created a new model of human-computer interaction that gives full play to new media technologies. *The Legible City* is a digital virtual city that exists in cyberspace. Users are allowed to travel in and interact with the space by riding a bicycle fixed in the space in front of a screen on which the image of city is projected. Instead of copying an actual city model, Shaw uses written text to construct the urban environment – letters and words simulate the entire virtual architecture. As the users choose their own path to ride through the space, he/she reads the texts composed by the letters. These texts are chosen from documents that describe the city's history. Therefore, every user creates a unique experience to interact with the virtual city and also has his/her own interpretation of the city's history. Shaw described this in his article *Modalities of Interactivity and Virtuality*:

> He/she is traveler and discoverer in a latent space of sensual information, whose aesthetics are embodied both in the coordinates of its immaterial form and in the scenarios of its interactively manifest form. In this temporal dimension the interactive artwork is each time restructured and reembodied [sic] by the activity of its viewers.[20]

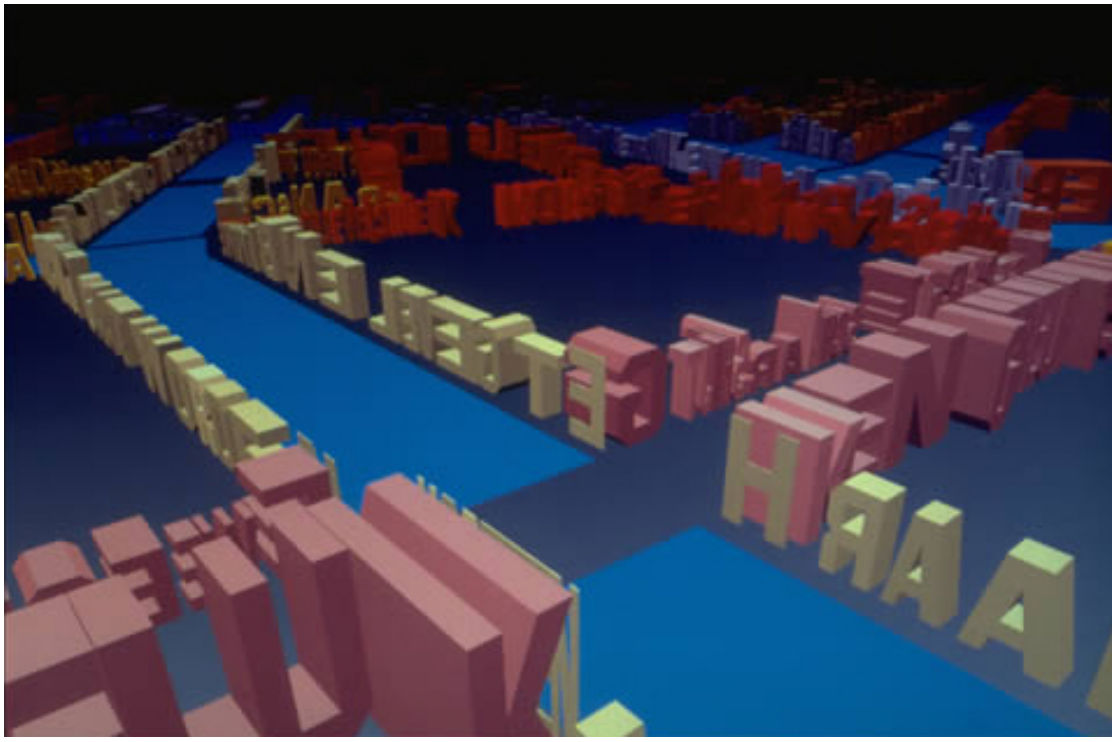

Fig. 5. Jeffrey Shaw, *The Legible City.* Interactive Installation. A virtual city composed of text, 1988-1991.

Fig. 6. Jeffrey Shaw, The Legible City. Interactive Installation. Traveling in the virtual world by riding a real bicycle, 1988-1991. (photographer unknown).

The Legible City provides a unique form of navigable virtual space, a conjunction of virtual and actual environments. In *The Legible City*, the participant travels in the virtual city by riding a bicycle in the real world. Instead of creating a virtual space that is completely divorced from actual physical space, Shaw combined a traditional media interface, text, with a new media interface and created a city's deep structure rather than simply its surface. Shaw believes that the confluence of the real and fictional is "the most interesting and challenging" opportunity that exists for "artistic propositions."[21]

In digital media, there is a subtle balance between machine and human. Through mass-reproduction and assembling customized media elements, digital media have not only designed a manmade environment, but also designed our experience. Then again, it creates an interactive approach to communication that provides us with unexpected latitude. Our immediate experiences are based on daily life and constrained by time, space, and other physical laws or principles. The digital interactive approach liberates humans from the constrained world and gives them the potential to experience a virtual world that is unfamiliar to our usual sense perception. This mediated experience is different from any previous experience generated through traditional media. It continues to evolve with our contemporary culture. As Lev Manovich said:

> To use a metaphor from computer culture, new media transforms all culture and cultural theory into an "open source." This opening up of cultural techniques, conventions, forms, and concepts is ultimately the most promising cultural effect of computerization – an opportunity to see the world and the human being anew, in ways that were not available to "a man with a movie camera."[22]

2

MEDIATED EXPERIENCE IN VIRTUAL AND INTERACTIVE ENVIRONMENT

The Third Category

In this discussion focused on digital arts, particularly in the context of interactive media, when we expand our concepts of the topic questions are raised, such as: What kinds of themes and forms have artists explored in their practices? What types of experiences do people have when they engage with interactive works of art? An integrated concept of digital interactive arts is assembled not only by computer hardware and programs, but also the human beings who participate in many activities including viewing, moving, touching, and so forth. To understand the way that their experiences work, we must find some way to simplify our thinking, for instance categorizing diverse themes and forms in order to develop a general view.

More importantly, it is also worthwhile to study artworks so that we will have authentic interpretations of the theoretic framework. As it is not necessary to examine too many cases to illustrate each category, I have selected only the representative works that most closely relate to my investigation of the mediated experience.

In this chapter, I will discuss the representative components that are essential to interactive mediated experience. In order to acquire experience in the context of digital interactive media, one has to be involved or immersed in a virtual environment, which in some cases may be shared with multiple users. In fact, multiple user virtual environments (MUVEs) dominate current online culture. Dr. Ralph Schroeder states in his book *Being There Together* that "the range of MUVE settings" can be put into two categories:

- Instrumental uses with research or prototype systems.
- Leisure uses for gaming and socializing, using PCs and widely available and commercially developed software.[23]

I agree with this division from the perspective of the technology itself as well as the audience's objectives. This indeed provides a clear view of the current chaos – it is, compared to other technologies, harder to draw a clear line between laboratory experiments and leisure products. Schroeder distinguished between the features of the two categories, including technological platform, purpose of use, and audience group. In the first category, only a small group of people use expensive high-end devices, such as Head-Mounted Display (HMD) or CAVE-type systems, with specially designed programs for work in military, industry, medical, or engineering fields for experimental research or making prototypes. The leisure use category is characterized by its ability to accommodate a massive number of users who use inexpensive

devices or software such as PC platforms to do routine and everyday activities, including downloading, gaming and Internet-based socializing.

I will argue is that there is another category that has many similarities with the other two, but has a purpose that does not fit precisely with either. The artistic use category is, compared to the other two, a "superstructure," an idea borrowed from Marxist theory to divide necessities and amenities of use. Instrumental uses are aimed at improving the technology itself, pushing it to the limit and exploring its potential. They are operated by a small group of people who have professional backgrounds, and designed to solve specific problems. Artistic uses are designed for both professional and leisure users. This type of use may involve cutting edge technologies relating to virtual and augmented realities, or may simply require the most popular resources such as the World Wide Web and mobile devices. The choice of technologies and devices really depends on the content of the work and the idea that an artist intends to convey.

From the perspective of the users or audience I also ask: What are the most "valuable" components of works of digital interactive arts? I do not underestimate any elements in the whole system, but as I proposed before, we need a new methodology to examine digital interactive arts, because due to its complexity we cannot understand it with the knowledge of only one discipline – we need to map out the entire picture with the integrate knowledge of several domains. In fact, each study contributes different results, which may head in the same direction – mapping mediated experience.

Smell, taste, touch, hearing, and sight are the five senses through which people acquire information from the outside world. Analysis of them is crucial

toward understanding how mediated experience varies across different activities or environments within the same or different systems. In other words, how does what people do, or the type of environment they are in, affect mediated experiences? The related analysis of experience components in Digital Interactive Environments (DIEs), including place, task, interpersonal interaction and communication, addresses issues of people's behavior in a mediated environment and how they interact with others. The mode of existence and performance of individual or multiple users in online games or interactive installations generally reflects the relationship between DIEs and users. Examining them in real artistic practice will help us to understand deeply how a user's experience is developed during his participation, and most importantly, may guide our approach toward ameliorating working conditions of DIEs in the future.

The essential qualities of a complete experience include autonomy, accomplishment, and wholeness. As Dewey states:

> We have an experience when the material experienced runs its course to fulfillment. Then and then only is it integrated within and demarcated in the general stream of experience from other experiences. A piece of work is finished in a way that is satisfactory, a problem receives its solution; a game is played through; a situation, whether that of eating a meal, playing a game of chess, carrying on a conversation, writing a book, or taking part in a political campaign, is so rounded out that its close is a consummation and not a cessation. Such an experience is a whole and carries with it tis own individualizing quality and self-sufficiency. It is an experience.[24]

In this light, digital interactive technologies and devices could enhance our sense organs and improve our natural cognitive system. Technologies and devices do not, however, make the complete experience of the world. More particularly, in works of interactive art, technologies are essential parts engaged in building the meaning of artworks, and serve the ultimate process – generating experience.

However, we tend to describe this process simply as actions of perception and reaction, a dynamic loop of input and output that consists of specific activities. To avoid falling into this tendency, which overemphasizes the technological perspective, I will examine some representative art works, in order to support my opinion.

Artificial Life

As I stated above, there are diverse themes that artists have explored and are exploring. Christiane Paul lists "Artificial Life," "Telepresence," and "The Body and Identity" as primary themes in her book *Digital Art*.[25] I will focus on Artificial Life and discuss the general concerns of two representative artists working within that thematic framework, concentrating on how each artist's work exemplifies the thematic concerns of the digital as a medium, and how their works affect user experience. An American computer scientist and one of the most important pioneers in the field of art and science, Christopher G. Langton, defines Artificial Life as follows:

> Art' + 'Life' = Artificial Life: Life made by Man rather than by Nature. Our technological capabilities have brought us to the point where we are on the verge of creating "living" artifacts. The field of Artificial Life is devoted to studying the scientific, technological, artistic, philosophical, and social implications of such an accomplishment.[26]

Langton coined the term "artificial life" in 1986 and attached it to a new discipline that studied man-made systems that exhibited the behavioral characteristics of natural living systems. Instead of dissecting live organisms or taking samples into the laboratory, artificial life study primarily relies on computer technologies that use computer models, robotics, and biochemistry to simulate the process of evolution. In this sense, artificial life creates biological phenomena that only occur in theoretic

endeavors and man-made environments, for instance a digital environment or cyber space. In Langton's words,

> Artificial life ("AL" or "A-Life") is the name given to a new discipline that studies 'natural' life by attempting to recreate biological phenomena from scratch within computers and other 'artificial' media. A-life complements the analytic approach of traditional biology with a synthetic approach: rather than studying biological phenomena by taking living organisms apart to see how they work, we attempt to put together systems that behave like living organisms.[27]

In other words, the general idea and methodology of artificial life is rooted in computer science and engineering. Termed "synthetic biology," it is an attempt at interdisciplinary study that encompasses multiple areas: biology, chemistry, mathematics, and computer science. Therefore, the philosophical model of artificial life is different from that of traditional science, as it studies not only "life-as-we-know-it," but also "life-as-it-could-be."[28] From a broader point of view, artificial life also links art and science together. Although this is not a brand new idea (it has been explored by numerous scholars for centuries), its practical applications visualize abstract concepts and breathe life into esoteric notions. It has also introduced a new medium to visual artists, permitting them to express their creativity through rational avenues.

A landmark art project between art and artificial life is the installation *Galápagos*, made by Karl Smis, a computer graphic artist and researcher. The project was inspired by Charles Darwin's 1835 visit to the Galápagos Islands. Darwin put forth his theory of evolution based on his study of the unusual varieties of wildlife on the islands. The isolated environment of the Galápagos provided a relatively independent evolutionary process that was not normally observable. In *Galápagos,*

viewers face an arc composed of twelve computer screens. The computers simulate the growth and behaviors of abstract computer-generated animated forms, which could be called organisms. Standing on sensors in front of the screens, viewers are able to participate in the evolution of these organisms by selecting which forms they find most aesthetically interesting. In response to viewer input, the selected organisms survive, mate, mutate, and finally reproduce. Those organisms not selected are removed, and their onscreen displays are replaced by the offspring of the survivors. These offspring are not simply copies of their parents; rather they are products of random mutations. Because of the random nature of the mutational process, the results are not exactly predictable. That is, the "babies" do not inherit their entire gene load from their parents; they could, in fact, be more interesting than their ancestors. The many-layered process of interactive evolution enriches the meaning of this project. As Christiane Paul described it:

> The simulated evolution is the result of an interaction between human and machine, where users' creative control consists [of] the aesthetic decision of preference, while random alterations are executed by the computer. Galápagos thus simulates the ability of evolution to create a complexity that transcends the influence of either human or machine and becomes a study of an evolutionary process.[29]

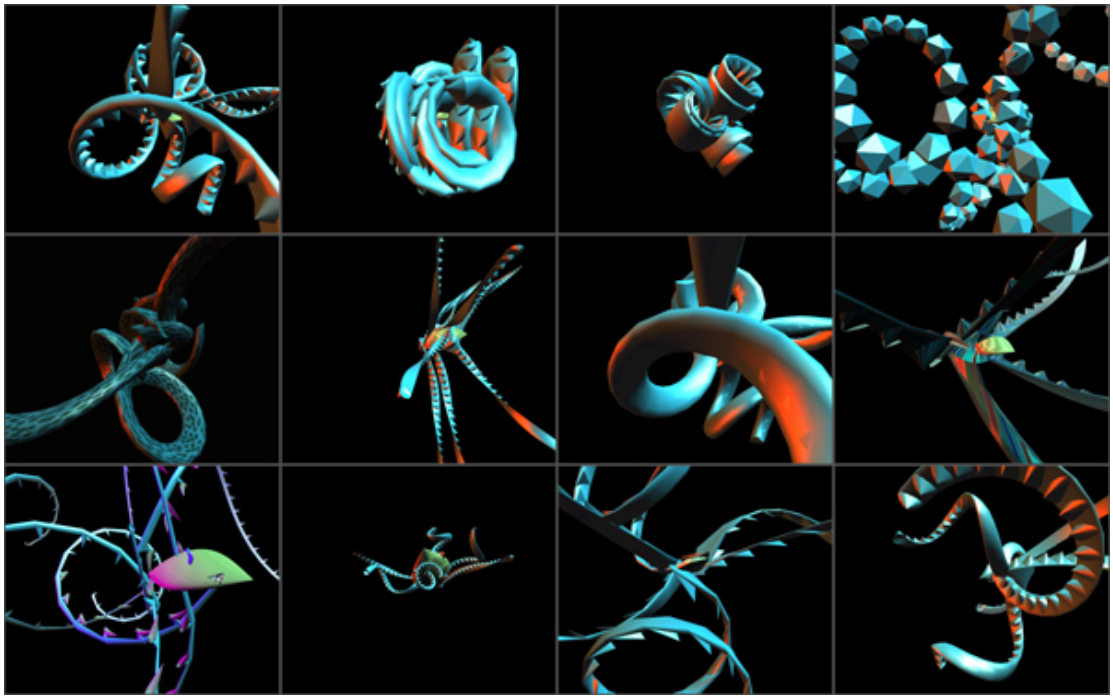

Fig. 7. Karl Smis, *Galápagos*. Interactive Installation, 1997.

Fig. 8. Karl Smis, *Galápagos.* Interactive Installation. The arc of 12 computers, 1997.

(photographer unknown).

The ideas of using the computer as the medium to generate "creatures" and to interact with them was also employed by Australian artist Christa Sommerer and her partner Laurent Mignonneau. Differing from Smis's installation, Sommerer and Mignonneau combined an actual physical environment with a virtual world to establish the installation of *A-Volve. A-Volve* consists of a water-filled glass pool and a touch screen computer system. By touching the screen to design shapes and profiles, viewers create virtual three-dimensional creatures. The images of these creatures projected into the pool appear to be alive as they swim in the real water. By simulating evolutionary rules, viewers design and create creatures whose behaviors depend on their designed forms, which are in fact aesthetic expressions. In other words, the movements of these creatures are closely connected with how they look. The better the form a creature possesses, the greater the mobility it will display. The ones with the fittest forms will survive the longest and will have the chance to mate and reproduce. Very similar to real world situations, these creatures include both predators and prey. As the predators hunt and consume their prey, they acquire greater energy for survival. By touching the screens, viewers interact with the creatures and influence their evolution. For instance, viewers can take a creature by the hand (of course it will try to flee), in order to protect it from predators. Two strong creatures can produce offspring, which inherit the genes of their parents. Creatures can also mutate and hybridize to produce newly born offspring with which the viewers can interact as well.

Behavior patterns, the evolutionary process, smooth interactive movements, and so on are all based on algorithms; this is an exclusive feature of computer-based visual arts. Mignonneau and Sommerer use computers to provide the perfect media in which to create a combined multiple sensory environment. In comparison to

Smia's work, *A-Volve* emphasizes real time interaction between humans and the virtual living space of the creatures. It blurs the boundary between the physical and the virtual, creating a future possibility of multiple interfaces and real time interaction. We can see its impact as augmented reality.

Fig. 9. Christa Sommerer and Laurent Mignonneau, *A-Volve*, Interactive Installation, 1995. (photographer unknown).

As mentioned previously, art works based on the idea of artificial life are closely related to scientific notions and concepts. Such works address the evolution of digital organisms by using computer-generated programs. People are able to participate in the artworks, and particularly to become involved with an evolutionary process. The implications of such art on human-computer research, at both the conceptual and the practical level, are far-reaching and extensive. The questions that arise must address both humans as participants, interacting with virtual creatures and environments, and the co-existence of human and virtual worlds, as well as the relative influences exercised by both humans and computers on each other. For

example, viewers have to adjust their behaviors in order to ensure that their influences are not only effective but also able to co-exist with others (either virtual or actual) in the virtual world.

Experience of Living Independently or Together

By using algorithms to specify behaviors of autonomous objects and characters, some artists focus on issues of co-existence and address these in their works. In the project *The Bush Soul #3: Emergence*, American artist Rebecca Allen and her team present a very convincing example of how the role of the artist is shifting from isolated individual practice to something closer to being cooperative, team-oriented, and interdisciplinary work. Inspired by a West African myth that a person has more than one soul, one of which lives within a wild animal, they created an interactive environment where viewers, represented as avatars, can interact with autonomous, animated creatures in real-time. Viewers are represented, in this virtual world, in the form of "live," responsive characters. Each character can communicate and interact with others in real-time, through gestures, sounds and emissions of energy. A multiple participant complex social environment can be developed through these behaviors. As the link between the virtual character and the real person (the physical body), a haptic, force-feedback joystick provides both navigation and tactile sensations to the viewer, who feels vibrations emanating from the joystick as he/she encounters certain creatures and significant places.

Fig. 10. Rebecca Allen, *The Bush Soul #3: Emergence*, 1999.

It seems as though the social order and behaviors developed in such a virtual world are based on random communications and interactions. However, behind these accidental encounters is a sophisticated "behavior scripting language" designed by programmers and used to define the desires and behaviors of artificial lives. By exploring the role of artificial life and human presence through interacting with other users and surround environment, one is able to develop the intimacy not only with digital avatars, but also with the technology. *Emergence* allows participants to develop the multiple dialogues between their avatars and the virtual world. It both marks a significant advancement of interactive arts and enhances the interactive experience,

Another Rebecca Allen project, *Coexistence*, particularly focuses on the human-computer experience and the world, both real and virtual. The unique feature of this installation is an interface which mixes a player's real feelings with a virtual environment by utilizing HMDs (Head Mounted Displays), breathing sensors, and tactile feedback. Through the HMD, a player first sees a cloud of virtual three-dimensional forms that obscures the view of the real space between two players.

Initially, with the cooperation of his/her partner, the player blows into the breath sensor to change and dispel the virtual forms. The breath is visualized as streams of particles, and the player feels vibrations in the hand-held force-feedback device when his/her partner is blowing. Players can hear each breath through headphones build into the HMD as well. Two players can also work together to create an animated display of a group of colorful shapes that appear in the virtual world.

In comparison with previous art forms, the value of coexistence is found not only in blurring boundaries between physical and virtual space, but also in our simultaneous awareness of our own physicality intermingled with virtual life. The computer, as a medium, again permits blending the human body with virtual forms and physical space. In such digital interactive artworks, one acquires experience depending on the contents of media, the“raw materials,” such as visual and audio components which are produced by artists, carried by digital devices, and delivered through interactive methods. The experiences of individuals or multiple participants are highly mediated.

Fig. 11. Rebecca Allen, *Coexistence*. Interactive Installation, 1999.

Fig. 12. Rebecca Allen, *Coexistence*. Interactive Installation, 1999. (photographer unknown).

Artworks such as those described here were mainly created in the 1990s, subsequent to the development of the first electronic computers in the mid-twentieth century. What I refer to as "digital enlightenment" offered not only the technological development of unprecedented digital media speed, but also underlying digital concepts, which changed and continue to change our entire perception of both the real and the virtual worlds. The issues these changes raise extend far beyond the merely technological level. Artificial intelligence, intelligent agents, cyber culture, the identity of the human body, and the like come to mind. More and more questions are focused on human beings per se.

The whole process of interaction develops a behavior pattern in which interactive activities, participants, and interactive patterns in turn affect each other. In group, human-computer, or avatar-avatar interactions, coordinated patterns sustain the connections between individuals, and those in turn affect individual behaviors and thus empower participants as interactors. Therefore, in a co-presented environment, coordination plays a very important role in group interaction. In the other words, if interactive activities happen on a larger scale, there must be some kind of coordinated pattern involved.

However, individual autonomy is an essential element in social interaction as well. For example, in *The Bush Soul #3: Emergence,* if we consider all the activities as social interactions, each individual in this work must and will have autonomy, including digital avatars. Any interactant should not lose autonomy, which would lead to subjugation by other interactive objects. Similarly, an individual in contact with other interactants and the surrounding environment in a social process may only acquire a complete experience. Individuals may certainly "learn" experiences from others; however, these are imported rather than original experiences.

In the 1960s, Joseph Carl Robnett Licklider, considered one of the most important figures in computer science, first introduced the concept "Man-computer symbiosis," which he defined as "an expected development in cooperative interaction between men and electronic computers. It will involve very close coupling between the human and the electronic members of the partnership."[30] More than a mere scientific hypothesis, the deep value of Man-computer symbiosis exists in the change it produces in our way of looking at things. Reflected in digital interactive arts, some artworks are designed for individuals, but some are intended for the involvement of large groups of participants, which allows multiple users to interact with the work simultaneously. This coordinated mass-interaction has become a very important aesthetic approach in digital interactive arts. Artworks focused on individual interaction present intriguing aesthetic reflections on subjectivity and inner spirituality, such as Canadian artist Char Davies' work *Osmose*. *Telesymphony*, a digital art performance created by Golan Levin and his team, sets an example of group interactive experiences with large scale participation in contrast with the intimately personal experience explored in *Osmose*. Through comparing and contrasting their different aesthetic approaches, we may cultivate a deeper view of the real value of works of digital interactive arts.

Interactive Experience as Artistic Language

In our contemporary understanding, a digitally based virtual world is generally considered to be a simulated environment, either of the real world or a creative fantasy; most virtual environments are primarily presented as some kind of interactive experience. *Osmose* is one of the best interpretations of the idea of individual interactive experience in a three-dimensional virtual environment.

Osmose comprises, first of all, a three-dimensional virtual environment, a stereoscopic HMD and a motion-tracking vest that monitors the breathing and balance of the "immersant."[31] In the virtual world, the detection of chest movement – breathing – enables movement up and down. Moreover, by shifting their balance, users can move forwards, backwards, and from side to side. At the same time, the HMD apparatus renders the three-dimensional environment, thereby providing the visual experience of immersion. The immersive virtual environment helps people to experience complete sensory and cognitive capabilities and visceral interaction. In *Osmose,* Davies uses the unique technology of a body vest and balance control interface that enables users to communicate with the virtual environment. By measuring a user's thorax and balance, *Osmose* allows interaction with the immersive virtual environment without hands, gestures, or any of the other voluntary actions usually associated with joysticks or hand-held game controllers. Another feature of *Osmose* is an attempt to accommodate multiple participants: the immersant wears all of the paraphernalia, while an observer monitors the immersant's journey. The observer wears polarized glasses in order to watch a stereoscopic projection of the view the immersant sees. Everything about *Osmose* emphasizes audience interaction, immersion and participation.[32] As an interdisciplinary art experiment, it not only challenges the borders of conventional art presentation, but also breaks down barriers between human, technology and artistic self. It also draws our attention back to humanity, instead of only focus on the technological spectacle.

> It must be a landscape where the immersant can sense unity with nature; where the "edges of the mind and the enveloping horizon become one," where "we can effectively pass-on this experience of 'Nature' as sacred space," where "we can hopefully alter the way people will 'see' nature." She wants to compensate "for our collective loss of nature/sacred space, for our increasing

> distancing from the mature world." Her goal, at this time, is to "attempt to reestablish this lost link by re-creating a mystical experience of nature."[33]

Clearly, we can sense that Char Davies is not satisfied with just improving the technical modality of human-computer interactions. Our normal recognition usually splits "user" and "tools." This ingrained notion of the dichotomy of a frontally facing subject staring at target object must be changed. In *Osmose*, the interface inspired by scuba diving that Char Davies designed provides a visceral feeling that both focuses on and enhances the immersive quality of the context in which the user is engrossed. This shift, from the dichotomy of the "user-tool" model to the deeper "content-delivery" model, offers unlimited potential to artists who dare to challenge traditional conventions. Moreover, it elicits a challenge to our dualistic ontology of worlds. As Michael Heim states in his article:

> The focus shifted from ego-subjects and object substances to the larger fields in which the individual egos and substances could arise. Subject-object philosophies gave way to broader understanding of the context in which substantial entities and psychological subjects could arise. The central "problem of world," as Heidegger formulated it in 1927 (*Being and Time*), began to take precedence over studies of the epistemological subjects and its fixated target objects.[34]

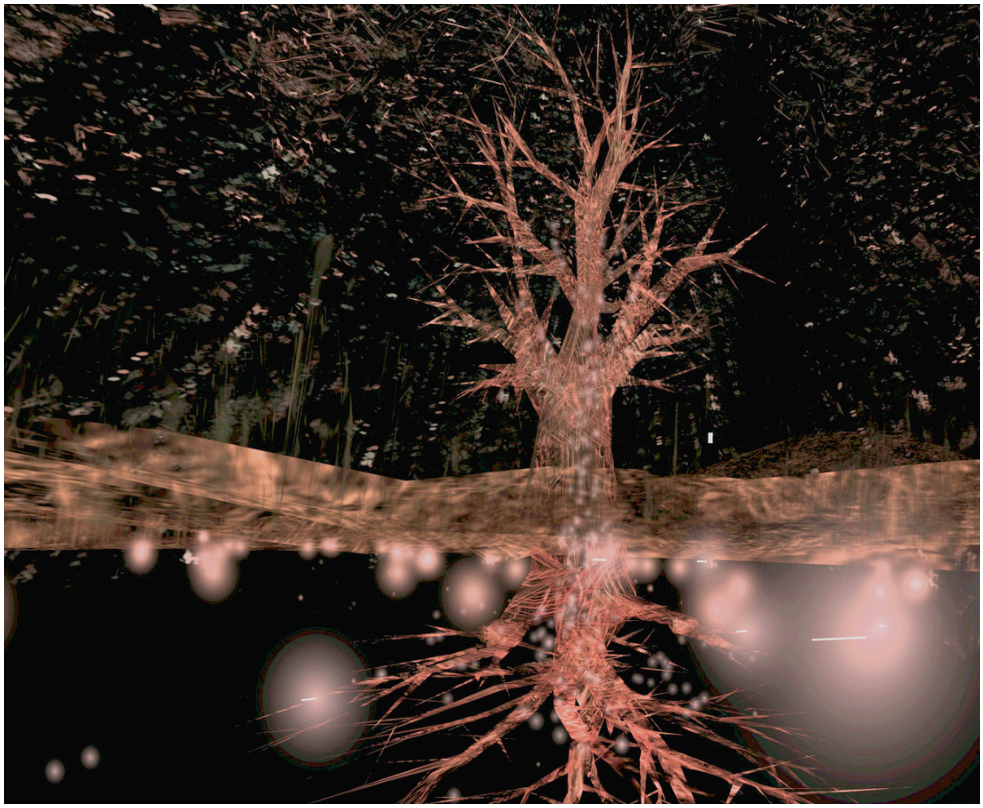

Fig. 13. Char Davies, a three-dimensional tree and the virtual environment in *Osmose*. Interactive Installation, 1995

Fig. 14. Char Daives, an immersant wearing HMD and body vest, Osmose. Interactive Istallation, 1995 (photographer unknown).

If we understand that *Osmose,* as an artwork, focuses primarily on the spiritual level, it may also be seen as art that exclusively enhances private experience, even if there is an attempt to offer it to an audience for observation. In this sense, the new form of digital-audio installation/performance, *Telesymphony*, created by the American artist, composer, and designer Golan Levin and his team, distinguishes itself from *Osmose* by implementing a vast interaction between a group of people and computers.

Telesymphony, composed and performed by Golan and his team using computer technology, is a live concert consisting of 200 ringing cell phones. Before a performance, at a cluster of web kiosks, audience members register their cell phone numbers. In exchange, those who register receive assigned seats in the concert hall and new, previously composed ring-tones that are automatically downloaded to their cell phones. When a performance starts, the composers use a specially designed, visual musical software instrument to dial up all the registered phones en masse. Because of the location of each participant in the audience, and the predetermined nature of the ring-tones, the composers can create spatial melodies and chords which are combined with visual effects: the illumination of a particular group of the crowd when their cell phones ring. *Telesymphony* also includes a large projection system connected to the composers' interface, which permits the artists and audience members to see each other in real-time.

Fig. 15. Golan Levin, cell phones being used in *Telesymphony*. Interactive Concert, 2001-2002. (photographer unknown).

Fig. 16. Golan Levin, *Telesymphony,* audience and participants (left), and an artist controlling the ring tunes (right). (photographer unknown).

From a general point of view, *Osmose* and *Telesymphony* belong in the same category: digital interactive art. However, the inherent concepts of the two projects are fundamentally different. As mentioned previously, *Osmose* focuses more on individual experience and tends to reveal the inner spiritual world of human beings in a virtual reality context. It is Davies's intention to attempt to reproduce digitally the experience of the heightened sense of being associated with meditative practice; in her article "Changing Space: Virtual Reality as an Arena of Embodied Being," she describes unusual emotional and psychological sensations that result in response to her art, similar to religious experience.

On the other hand, *Telesymphony* provides a rather "mass produced" experience. The involvement of 200 audience members, plus a group of performers, takes its scale is far beyond that of a regular art performance, and becomes more of a social event. The message delivered is that the value of performance art, especially of multimedia performance art, is in its ability to build a mediated environment by using a variety of technologies. A participant is immersed in such works in order to gain a complete experience, which is enriched by not only by the content embedded in the work, but also by personal or coordinated interactive activities. Most importantly, this value can only be maximized through large-scale participation. Without interactions occurring between the audience, artists, and computers, such projects would be meaningless. As Golan Levin maintained:

> In the *Telesymphony,* the phones, and not their owners, speak to one another. By summoning a communication between communications technologies in which there is no interlocutor, the *Telesymphony* invites its participants to perceive an order in what is otherwise disorganized public noise, and ratify it as a chorus of organized social sound. Thus, the over determination of the world of Work is countered with an equally determined Play, as the ringing of mobile phones—ordinarily, the noise of business, of untimely interruptions,

> of humans enslaved to technology—is transformed into a sound of deliberate expression, startling whimsy, and unconventional beauty.[35]

In addition, because of the "networks" that all the participants create, and the cyber culture based on them, the notion of world, in both the subjective and objective sense, should be reconsidered. Another idea that Levin explored in *Telesymphony* is the attempt to discover a new approach to embody the relationship between an individual and a group. Each cell phone user is a particle of the global communication network, "a single communal organism." "*Telesymphony* is to indelibly transform the way we hear and understand the twittering of this monumental, multicellular being."[36] If we understand that *Telesymphony* expresses the relationship between an individual and a group through music, then *Osmose* primarily visualizes a strange virtual world and allows individuals to explore it. As Michael Heim addressed in his article:

> The notion of "world" as a "context of relationships" (Heidegger's *Bewandniszusmmenhang*) emphasized the subject's involvement in constructing networks to connect entities, persons and concrete projects. World is a construct that opens spaces for event-based interactions and for further constructions.[37]

As previously indicated, Licklider's idea of man-computer symbiosis is very conceptual. Ideally, man and computer live together in "intimate association," a concept different from the idea of the "mechanically extended man." In the common understanding of the man-computer relationship, the usual tendency is to split man and computer in the same way as notions of subject and object are separated. The computer becomes merely an extension of a part of human function, perceived, for instance, as an enhanced ability to reckon. Even though contemporary technology endows computers with ever-stronger powers, and despite man's replacement in

some areas by automation, as the role of helper has shifted to that of the one being helped. In computer-centered information and control systems, human operators are still irreplaceable. Licklider considers that such systems are not symbiotic, but are " 'semi-automatic' systems, systems that started out to be fully automatic but fell short of the goal."[38]

Osmose and *Telesymphony* have many differences in their artistic language, forms of presentation, fundamental ideas of expression, and the aesthetic interests of their specific technologies, but the basic man-computer communicative approach they address are by and large the same. In these works of digital interactive art, actual encounters, instead of simply generating simulation from a scientific or engineering perspective, are much more dynamic and enhanced in the spheres of both individual and co-presented experience. In the interactive process, individual experience may be directly shaped by co-presented experience, or more precisely, coordinated interactive activity. To make sense out of a digital interactive artwork, individuals must have interactions with the mediated environment and other participants to complete a socially coordinated interaction. Individuals also must obey rules designed by the artist(s), or developed by the participants during their interactions – so-called coordination pattern. An interactive individual experience is shaped in the interactive process, and also acquires coherence through the process. That is to say, the value of a successful interactive artwork is that individual experience can affect all participants during their interactions; completely new experiences may be generated that isolated individuals cannot access. In other words, in an interactive process, there are no purely isolated activities and all interactive activities happen between individuals and environments in a socially cooperative interactive pattern. Individuals and other interactive agents mutually shape and affect one another. This

dynamic process can enhance experience in every aspect of an artwork and deepen our understanding. Most importantly, it delivers the integrative new experience as a whole. This is the most valuable quality a digital interactive artwork can have.

3

ON THE DEVELOPMENT PATH OF MEDIATED EXPERIENCE AND DIGITAL INTERATIVE ART

The Total Art Experience

> Digital art did not develop in an art-historical vacuum either, but has strong connections to previous art movements.[39]
>
> ---- Christiane Paul, *Digital Art*

Just as digital art incorporates many influences from previous art movements, the concept of experience has been developed through time as well. Experience can be understood as a result of knowledge gained through our interaction with the outside world, or even as a mystical personal feeling in religious practices. Like other interpretations of abstract concepts, the mediated experience discussed in this paper

would not make sense without putting it into a certain context. In other words, we need to examine it in the same trajectory of development as digital interactive art.

In the movie *The Matrix*, our 'normal everyday life', including all our personal and social behaviors and emotions, are 'dreams' - the artificial environments produced by the human nervous system and controlled through a 'cable' plugged into the human brain. The protagonist can shuttle back and forth from the 'real world', which is quite horrific, to 'Matrix'. In the virtual environment, sensation is provided by a variety of external stimuli so real that the protagonist can be hurt or even killed in a 'dream' world. What occurred in the science fiction movie is far more sophisticated than what is possible with our current technology, but discussions about the concept of experience should not be restricted by what can by achieved with technology today. The relevant experience is always connected to media and influenced by cultural and social circumstances.

The concept of *Gesamtkunstwerk*, literally translated as "the total artwork", was introduced by the German composer Richard Wagner. As a passionate and progressive person, Wagner worked as a composer, conductor, theatre director and essayist. Unlike other composers, he wrote both the script and libretto for his operas. He benefited from these cross-disciplinary experiences and created outstanding works while remaining critical of the opera of his time, especially grand opera. Large-scale orchestras and lavish, spectacular stage effects and design characterize grand opera, but Wagner felt that these elements alone did not guarantee quality poetic drama. He sought the drama provided by other art forms, and was "convinced that the separate branches of art – music, architecture, painting, poetry and dance – would attain new poetic heights when put to the service of the drama."[40] In his article *The Artwork of the Future*, written in 1849, Wagner discussed his assumption about

"the highest artistic aim – the Drama".[41] He believed that "the Drama" and believe that this art form should contain many different branches of art. These branches, according to his article are architecture, landscape painting, craft art, dance and orchestra. Every branch contributes its own power to the whole performance. At the same time, however, the separate artists must quell their selfish impulses. In other words they have to be treated equally and strive to serve the highest common purpose: the Drama. In *The Artwork of The Future,* Wagner challenged the conventional roles of Architecture, landscape painting, artistic man, dancer and orchestra and endowed them with new life. For instance, Wagner stated that in the building of a theater set, architecture should not simply be a luxury. "The master-builder needs only to comport himself as artist, to keep a single eye upon the art-work. In a perfect theatrical edifice, Art's need alone gives law and measure, down even to smallest detail."[42] Wagner's ideas extended beyond the function of particular art forms to incorporate the role of artists themselves. From environmental and acoustical design to visual and lighting effects, Wagner utilized these branches of arts to render a controlled environment where audiences could gain the richest art experience. His practice can be considered as one of earliest examples of using multimedia to provide the sense of an immediate experience.

Art is always the reflection of a certain social milieu, cultural pattern and, of course, public mentality. In the era of the industrial revolution, separation and categorization were entrenched in people's minds. Wagner's idea of *Gesamtkunstwerk*, therefore, was rather radical in the 19th century. However, he only explored in practice the notion of uniting separate art forms to make the "perfect" theatre. Even though audiences received their most real theatrical experience through the efforts of different artists, they were still "spectators" and sat in their chairs facing

The Fourth Wall, the imaginary boundary set between the audiences and the stage.[43] The audience facing the stage is the dominant configuration in most theatres and cinemas even now, but artists have always experimented with ways to shift "spectator" to "participant"

Intermedia: the Idea of Crossing Disciplines

To really create a different experience, experiments have been made through interdisciplinary practices. The tendency of connecting different media and genres was profound and pervasive in the 1960s. It was the standard of the new generation to rebel against the 'old' norms, conventions and regulations. This tendency was especially reflected in political and cultural areas. The previous social orders and political norms were challenged by a series of upheavals around the world. This newly liberalized society was questioning authority and government. The sexual revolution occurred, as did the feminist movement. This provided the perfect soil for counterculture. Artists, the most creative group also attempted to rethink the nature and scope of art and to defy the boundaries of traditional media

The term *Intermedia* was coined by Dick Higgins, one of the early Fluxus artists. He believed that through engaging a variety of uncategorizable mixed-media forms, "any available object and experience can (sic) be incorporated into the artworks."[44] This was the 'core spirit' of Happening, a form of performance described in Higgins' article *Intermedia.* Impacted by the chaos of the 1960s, his attention was focused on the interstices between the arts. As Higgins explained, " [in] the interstices between the arts, mixed-media forms coalesced: Happenings, performance art, kinetic sculpture, electronic theater, as well as a variety of deliberately uncategorizable works." His interest was in exploring in the territory that

lies between "the general area of art media and those of life media,"[45] rather than traditional art forms. Higgins was critical of most of art the forms we are familiar with. These 'old' art forms, in his opinion, are highly compartmentalized, and belong to the social approach of the past generation. In the context of categorizing and classification, people are used to separating art from science, and by extension classify art into a variety of subdivisions. They believe that paintings should be painted on canvas, drawings should be made of the same colors and sculpture should not be painted. These outmoded conventions and customs are deeply embedded in people's minds. Because of the ubiquitous hierarchy, the intrinsic value of artwork itself is also impacted. Higgins believed that artworks were mostly used for their didactic, moral or utilitarian function. "What are they after all?" Higgins stated, "Expensive, handmade objects, intended to ornament the walls of the rich or, through their (or their government's) munificence, to be shared with the large numbers of people and give them a sense of grandeur."[46]

Regarding 'new' art forms, such as Pop art and Op art, Higgins did not think they were the future of art either. "Pop and Op are both dead," because even through their content and artists' intentions are apparently new, they "confine themselves, through the media which they employ, to the older functions of art, of decorating and suggesting grandeur."[47] It seems like the notion of "L'art pour L'art". But more than that, what Higgins really suggested is some kind of "dialogue" between artist, audience and artwork. In other words, their roles, creator, spectator and outcome, could be shifted in the art practice – the audience could be incorporated as a part of artwork or an artist could be a spectator of the performance executed by audiences. The "dialogue" has to be achieved in the context of intermedia, a collage breaking the boundary of category and involving all kinds of mediums and forms. The "paradigm

shift" in the roles of artist, audience and artwork has profoundly influenced many artists including John cage, Robert Filliou, Joe Jones and Nam June Pak. Most importantly, it influenced the evolution of interactive media art and the notion of human-computer interaction.

The concept of intermedia is inextricably related to a complex subject: the relationship of art and technology. Generally, art and technology are concomitant rather than conflictive. Art does not interfere with technology or vice versa. It is understandable that some artists choose to stay away from modern technology, preferring remain utilizing the techniques that have been absorbed into traditional art, not only because those conventions are deeply implanted in people's perceptual frameworks, but also for the reason that traditional media provides the artist with more possibility to control their activities and outcomes. On the other hand, new technologies need specialized knowledge and equipment which could be a barrier both for the artist, and for the audiences. However, there are always some energetic and sensitive artists who respond to the high-end science and technologies, interpreting and utilizing high-tech in their own way.

Experiencing Interaction

Myron Krueger is an American artist who is considered the pioneer in interactive art and among the first generation of researchers of virtual reality and augmented reality. Interactive art, as we have seen, usually features computers, sensors and, of course, human activities – the crucial element of interactive artworks. Krueger's contribution to interactive art is "the notion of the artist as a 'composer' of intelligent, real-time computer-mediated spaces, or 'responsive environment'".[48] In Krueger's interactive artworks, 'intelligent' could involve both spectator and

participant in interaction with 'responsive environment'. As Krueger described in his article *Responsive Environments*, "the participant chooses his next action and anticipates the environment's response. If the response is unexpected, the environment has changed the context and the participant must reexamine his expectations. The experience is controlled by a composition which anticipates the participant's actions and flirts with his expectations."[49] Within this context, spectators are not separated from artworks rather are involved in and help create artworks. The spectators' art experiences generally concern procedural knowledge which is exercised in a specific performance or task. When a computer 'built environment' is specifically designed and managed in order to establish human activity, people's behaviors are changed by the mediated environment and vice versa. They are not a leisure audience or a group of observers who passively stand in the gallery or sit in the theatre, but instead take the initiative to attain the sense of grandeur of the artist. Krueger describes the spectator's experience: "He is stripped of his informed expectations and forced to deal with the moment in its own terms. He is actually involved, discovering that his limbs have been given new meaning and that he can express himself in new ways." Further, "the experience he achieves will be unique to his movements and may go beyond the intentions of the artist or his understanding of the possibilities of the piece."[50] In this sense, participants share the creation with artists.

The impacts of Krueger's exploration are profound and multiple. In his work *Videoplace*, Krueger, using projectors, video cameras and other special purpose equipment, created an artificial reality that surrounded and responded to users. Through display technology, *Videoplace* allowed users in separate locations to communicate and share all information including sound, visual and physical

dimensions. *Videoplace* is an 'aggregation' of Krueger's previous works, such as *Glowflow, Metaplace* and *Psychic Space*. *Videoplace* is recognized as the ancestor of global communication technology, including video-conference, on-line chats and networked virtual worlds. As Krueger said: "the responsive environment has been presented as the basis for a new aesthetic medium based on real-time interaction between men and computer."[51]

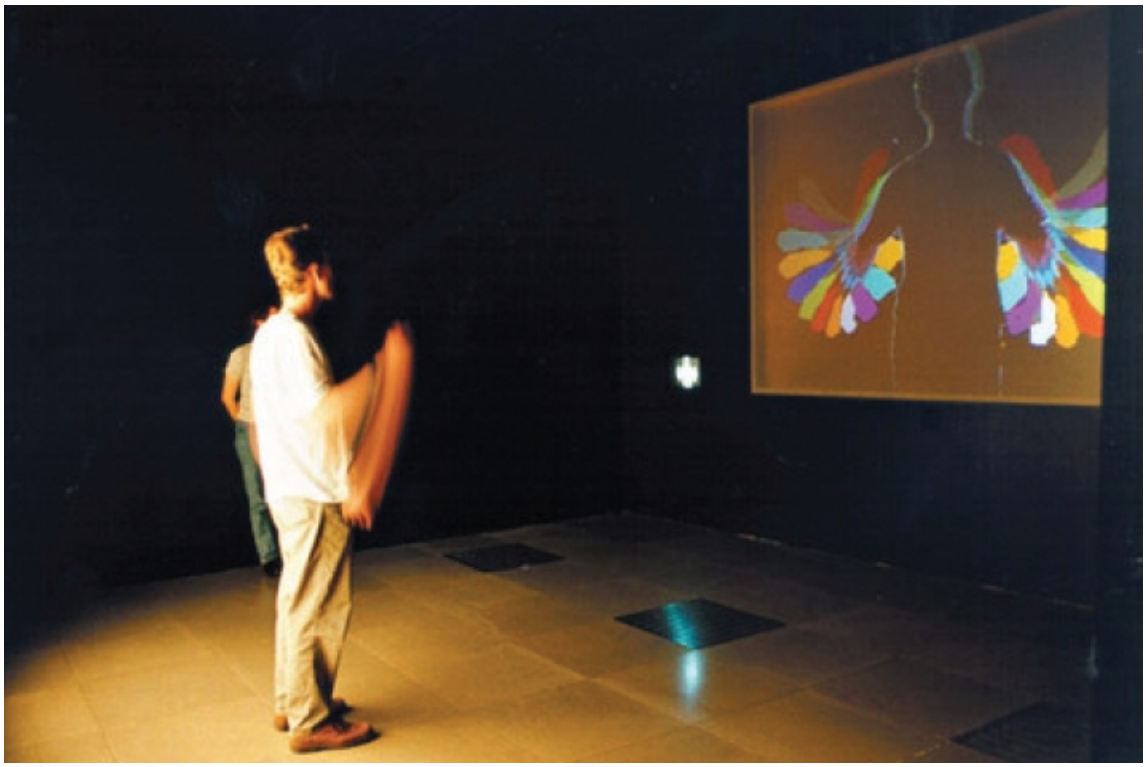

Fig. 17. Myron Krueger. *Videoplace*. Augmented Reality Interactive Installation, mid-1970s. (photographer unknown).

The first painting in caves undertaken in 15,000 B.C. by Cro-Magnon man may be thought of as the earliest visual aesthetic. From animal figures to Mona Lisa, from Renaissance to Postmodernism, it is humankind's nature to express its experience and emotions by using different skills and media. In most traditional art, we choose the representation reality as our ultimate criterion of sensory-emotional value, and the critical reflection on art, culture and nature is defined as aesthetics.

This traditional ‘paradigm’ has been challenged since the modern age, but never fundamentally changed – even Duchamp limited himself through the media that he manipulated, and the form of his artwork. However, in the era of unprecedented technical and informational complexity, it behooves artists to respond to that complexity. Myron Krueger explored human-computer interaction as a form of art. Morton Heilig, recognized as the ‘father of virtual reality’, was the first person to attempt to create a virtual reality that fully involved the senses, and embodied his theory by inventing a machine called *Sensorama,* which used a variety of technologies to provide an immersive mediated environment.

In his article *The Cinema of the Future*, Heilig systematically discussed the possibility of creating the full sensational experience. Heilig analyzed the very basic cycle of orientation and action of living beings dealing with the outside world: Observation is “the reception of isolated impressions or facts”; Integration is “the combining of these isolated facts with the inner needs of the life force into an emotional unity that prompts and controls action.” Action, is “a change in the creature’s physical relation to the world.”[52] Heilig believed these were the three phases that human beings engaged with in order to develop civilization, including science, art and industry. Art specifically “has evolved no clear-cut methodology to make it as efficient as science and industry in creating its product.” He also claimed that the laws of art, similar to those of science and industry, “lie hidden in the subconscious of man.” Through the evolution of our language and materials, more complex information needs to be conveyed through manipulating more complicated media. In response to these requirements, people combined separated, ‘pure’ arts to create opera, ballet, cinema and so forth. Artists have also created innumerable sophisticated artworks in the traditional art forms. Heilig was still not satisfied and

claimed: “let us, according to our first law, deliberately turn to life and study the nature of man’s consciousness.”[53]

Fig. 18. *Sensorama* by Morton Heilig, 1961.

Heilig proposed what he viewed as the ultimate mediated experience. Enhanced by scientific knowledge and technology, an artist could control "the multisensory stimulation of the audience, he could provide them with the illusion and sensation of first person experience, of actually 'being there.'"[54] In *Sensorama,* participants can experience riding a motorcycle on the streets of Brooklyn. They can feel the wind on their face, the vibration of the motorcycle seat, a three dimensional view, and even the smells of the city.

These assemblies of multi-mediated experience endow artwork with new meaning, which goes far beyond simply technological evolution or cultural interpretation. Digital interactive experiments are liberated from the shadow of instrumental rationalism; its value cannot be evaluated only by demonstrating the novelty of recent technological developments, nor constrained into some kind of spectacle. One has immediate experience through direct interaction with technology, but most importantly, through reflection on some elements of thought, thus providing experience with meaning. In other words, a meaningful experience is not only simply generated by interactive activities, but also stimulated by a rich mediated environment.

Interaction and mediated experience constitute the aesthetic characteristic of interactive art. The concept and technology are not only confined by the professionals who practice and experiment in the art-science interdisciplinary fields, but also permeate the lay public sphere, for instance, Graphic User Interface. Through the popularization of human-computer technology, tremendous opportunities are available to people for enhancing abilities and amplify sensations. One of the challenges, during this process is the reproduction of natural reality by using current technologies. Multichannel stereo, polarized glasses, three-dimensional computer

graphics etc., most of these inventions are applied to enhance visual and acoustic sense organs. But the genuine virtual reality, ideally, should explore stimulations to engage all the senses.

In *Sensorama,* Heilig built the "experience theatre" using a short film clip and displaying it as stereoscopic three-dimensional images in a wide-angle view in order to give participants the feeling of visual immersion. It may not be as good as what the four-dimensional theatre in Disney Land has now, but many other innovators such as Ivan Sutherland carried on Heilig's research and vision. Sutherland created an installation called *The Sword of Damocles* in 1968, which elaborated on Heilig's notion of virtual reality. Unlike other individual previously mentioned, Sutherland is a computer scientist and Internet pioneer rather than an artist. His abundant knowledge of computer science and engineering is a huge advantage for him to implement his visions and those imagined of by his predecessors.

For his PhD thesis, Sutherland wrote a revolutionary computer program called *Sketchpad* which allows users to utilize a Graphic User Interface by using an X-Y point plotter display and Light Pen. The remarkable achievement of Sketchpad is that it provides an alternative method of interaction with the computer which can be used for both artistic and technical purposes. Continuing on his studies, Sutherland developed the virtual reality and augmented reality head-mounted display system, *The Sword of Damocles,* which is widely considered to have been the first completely VR display system. The name was inspired by the appearance of the device. The whole system is too heavy for the user to carry, so it had to be suspended from the ceiling. Through a binocular periscope-like display, the user could see a simple wireframe environment, where the perspective changed as the user's head moved. For this reason, Sutherland also embedded the head tracking sensors into the device. The

user interface and the virtual environment comprised in this system were rather primitive but it garnered excitement as the first display which "connected to a digital computer gives us a chance to gain familiarity with concepts not realizable in the physical world. It is a looking glass into a mathematical wonderland."[55]

From Sutherland's point of view, all kinds of information could be expressed in any kind of form, through using different interfaces. That interface could be a keyboard that connects with the personal computer, or a three-dimensional environment which imitated the real world. In *The Sword of Damocles* the whole head-mounted display system is the interface that allows users to interact with the computer and obtain information during the experiment. In his article *The Ultimate Display* Sutherland introduced a variety of hardware and software which could be used as user interfaces between human and computer. He speculated that the future computer display should endow the user with better ability to explore realities that are unfamiliar. Sutherland states: "by working with such displays of mathematical phenomena we can learn to know them as well as we know our own natural world. Such knowledge is the major promise of computer displays."[56] Sutherland not only contributed to developing the cutting-age computer technologies of the day, but also explored a new method for humanity to acquire knowledge and new experience.

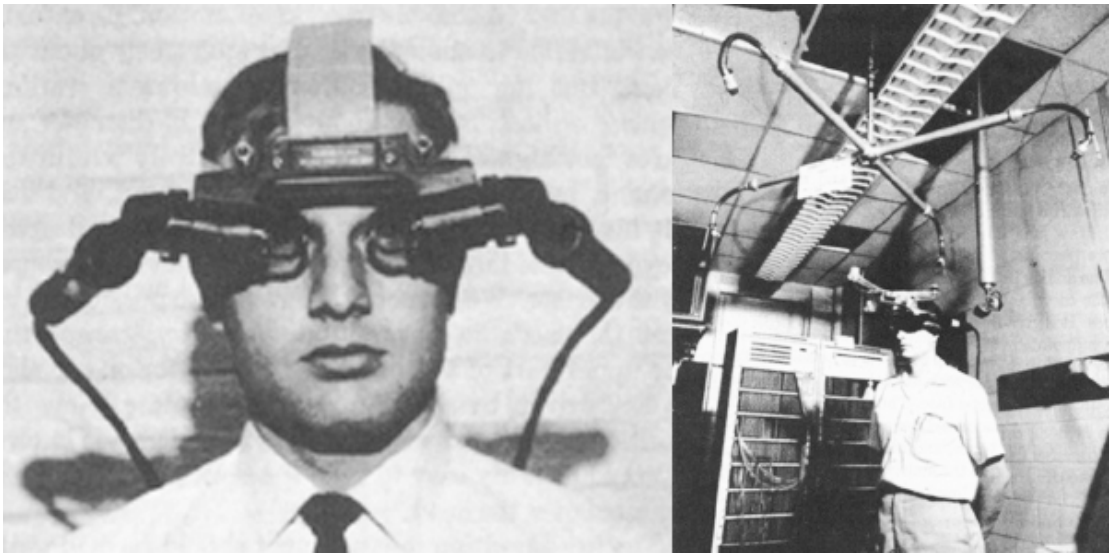

Fig. 19. *The Sword of Damocles* by Ivan Sutherland, 1968.

Morton Heilig believed that the illusion and knowledge of "first person" experience could be created through the control of sensory stimulation. In other words, an artist can use digital technology to create a mediated environment where people's sense organs can be controlled. In my view, a complete personal experience is much more complicated than just immediate physical experience. A complete personal experience lives in an inter-communicating relationship between human and mediated environment. The process of experience does not simply consist of impressions acquired passively through the power of human sensation, but rather through taking the initiative to interact. In this relationship, the mediated environment impacts one's experience at a much deeper level of subjective thought and spiritual domain.

Char Davies's work *Osmose* is one of the most representative interactive artworks in a three-dimensional virtual environment. This work also provides us with a good example to study how a digital interactive artwork impacts one's personal experience. In her book, *Char Davies' Immersive Virtual Art and the Essence of Spatiality*, Laurie McRobert said: "this, in combination with her use of spatial

ambiguity and semi-transparency in the visuals, is the suspected underlying reason why her immersive virtual art plunges people, within a matter of ten minutes or less, into a reverie or dreamlike state."[57]

In Davies' article *Changing Space: Virtual Reality as an Arena of Embodied Being*, she discusses a series of psychological effects immersants felt when they expwrienced *Osmose.* These unusual emotional and psychological experiences include:

- A feeling that they had indeed been somewhere else, in another "place"
- Losing track of time (a fifteen-minute session was nearly always experienced as five a thirty-minutes session as ten)
- Heightened awareness of their own sense of being, or as one immersant described it: " as consciousness embodied, occupying space"
- A deep sense of mind/body relaxation
- An inability to speak rationally or put logical words together afterward
- A feeling of freedom from their physical bodies and an acute awareness of them at the same time.
- Intense emotional feelings, including euphoria and/or an overwhelming sense of loss when the session was ending, causing some to cry and others to exclaim they were no longer afraid of dying.[58]

When art and technology are used together, especially in our current world of unprecedented technical and ecological complexity, the consequences are inevitably far beyond our expectation. The artist, of course, is the "composer" working on a

variety of pioneering technologies, even more, seeking the "resonance" of different disciplines of our knowledge. Technology, however, seems like a double-edged sword. If entirely relied on, it could induce the demise of the traditional "shelters" where we usually find spiritual comfort, such as philosophy and religion. Davies realized this "significantly disheartening aspect" and mentioned it in her article, "For even as 'places' like *Osmose* may one day be accessible on line as virtual sites of contemplation, so too such sites may signal the demise of traditional places of self-reflection and tranquility."[59]

Fig. 20. Char Davies. *Osmose*, 1995. A participant wears HMD. (photographer unknown).

Fig. 21. Char Davies, landscape of 3D virtual environment in *Osmose.* 1995.

This dilemma, as I have understood it, could be caused by disconnecting the connection between primitive spiritual culture and technological civilization. The dualism could not represent the unique aesthetic value of, and most importantly, explain the complete art experience in those artworks. The outside world is not separate from humans. The relation between a "live creature" and the environment is what really should be our focus. The process of interaction between them creates experience, including that which one undergoes in the environment, or the other way around, that which one does to the environment. In this way an interactive experience is not only passively given, but also initiatively applied through initiative.

Furthermore, we also need to understand that the most aesthetic feature of digital interactive art is the mediated dynamic experience. During the process of interacting, the individual and the environment adapt to and shape each other at the same time. In this sense, in digital interactive art, a mediated environment does not exist apart from its participant/user. It is the environment in which the participant immerses and adapts. In this way, the experience generated from this dynamic interactive process is neither purely subjective, nor purely objective. It represents the point at which humans meet the environment. In other words, in digital interactive art, the mediated experience is the "first principle." We must first have the experience

and then have thought or reflection upon it. All theories, thoughts or cognitions about subject and object are "second principle," and are developed from the experience mediated by digital technology.

This mediated experience provides a path towards understanding the aesthetic experience of digital interactive art. The aesthetic experience, however, should not be seen as some kind of "internal sense" and opposed to "external sense" acquired through smell, taste, touch, hearing, and sight. It is based upon and is developed from interactive activities. In other words, a unified, rich, accumulated and completed interactive experience itself is equipped with the aesthetic property. In Char Davies's *Osmose,* participants would not be able to explore the virtual world with their visual and auditory capacity without using gestures to communicate with the artificial environment. They certainly would not acquire any sensory understanding, not to mention an aesthetic experience.

In *Osmose* participants also had some unexpected emotional effects, which were not normally observed in digital interactive artworks. In digital interactive artworks, emotional expression is not just interpreted through the gestures, images and audio created by artist. Emotional expression here is a bidirectional process applied by both participant and artist. Artists can convey their emotions through the creative process of artwork. In *Osmose*, misty atmosphere, three-dimensional trees, twitter-like stereo sound and sparkling streams imply spiritual flow. All these were designed by Davies and her team. This mediated environment, in my opinion, is a metaphor for Davies's understanding of the spiritual world and an expression of her emotion. When making art, an artist automatically choses the most appropriate materials/media for their expressive acts. In *Osmose* Davies chose digital interactive technology as the media.

In traditional art forms, the emotional expression of viewers neither belongs to the artwork, nor is it a part of the process of developing artwork. In digital interactive artwork, a participant is allowed to express his/her emotion in a variety of acts, because of the connection between him/her and the mediated environment. Dewey states that:

> Erroneous views of the nature of the act of expression almost all have their source in the notion that an emotion is complete in itself within, only when uttered having impact upon external material. But, in fact, an emotion is *to* or *from* or *about* (sic) something objective, whether in fact or in idea. An emotion is implicated in a situation, the issue of which is in suspense and in which the self that is moved in the emotion is vitally concerned.[60]

In *Osmose,* the mediated environment reflects the artist's emotion and thought. The participants are implicated into what the artist designed; they feel what the artist suggests. On the other hand, the participants' own emotions and feelings are generated *from* the interactive acts, *to* express their emotion through their bodily gestures. By controlling their own physical actions, they can choose wherever and whenever to go or stay, to appreciate or detest. In other words, the participants are not only impacted by the surrounding environment, but also initiate the expression of their emotion initiatively. This interactive experience is mediated and presents itself as the most outstanding aesthetic feature of *Osmose*. For this reason, we call people "participants", not viewers or audience members because they are able to create the artwork from their own perspective, just like the artist. Without their participation, the artwork would never be completed.

The intimacy that *Osmose* created between participants and technology is an important aesthetic experience of most digital interactive artworks. It is attractive for participants in a single-user interface, as well as in a multiple-users interface. In

digital interactive media, interface is a vital link between computer and us. All interactive activities, such as clicking a button or moving our body, are conversations between participants/audiences and technology. Participants are acting in and affected by this pre-programed, mediated environment, which is a significant feature of digital interactive art. It follows that participants' activities are not always predictable.

Mexican-Canadian artist Rafael Lozano-Hemmer's interactive performance/installation *Body Movies* is a recent instance of this unique relationship, and transforms it into a large scale multiple users/participants' experience. It has taken place in different cities around the world, including Rotterdam, Liverpool, Hong Kong and Wellington. In *Body Movies,* thousands of portraits are taken from local streets and projected onto building façades in sizes from 400 to 1800 square meters. Those portraits only appear inside of shadows of participants when they stand between the façade and the xenon light source. When all the projected portraits are revealed, a video surveillance tracking system will trigger new portraits which encourage participants to interacted with it. *Body Movies* was inspired by an engraving *The Shadow Dance* made by Samuel van Hoogstraten over 300 years ago.[61]

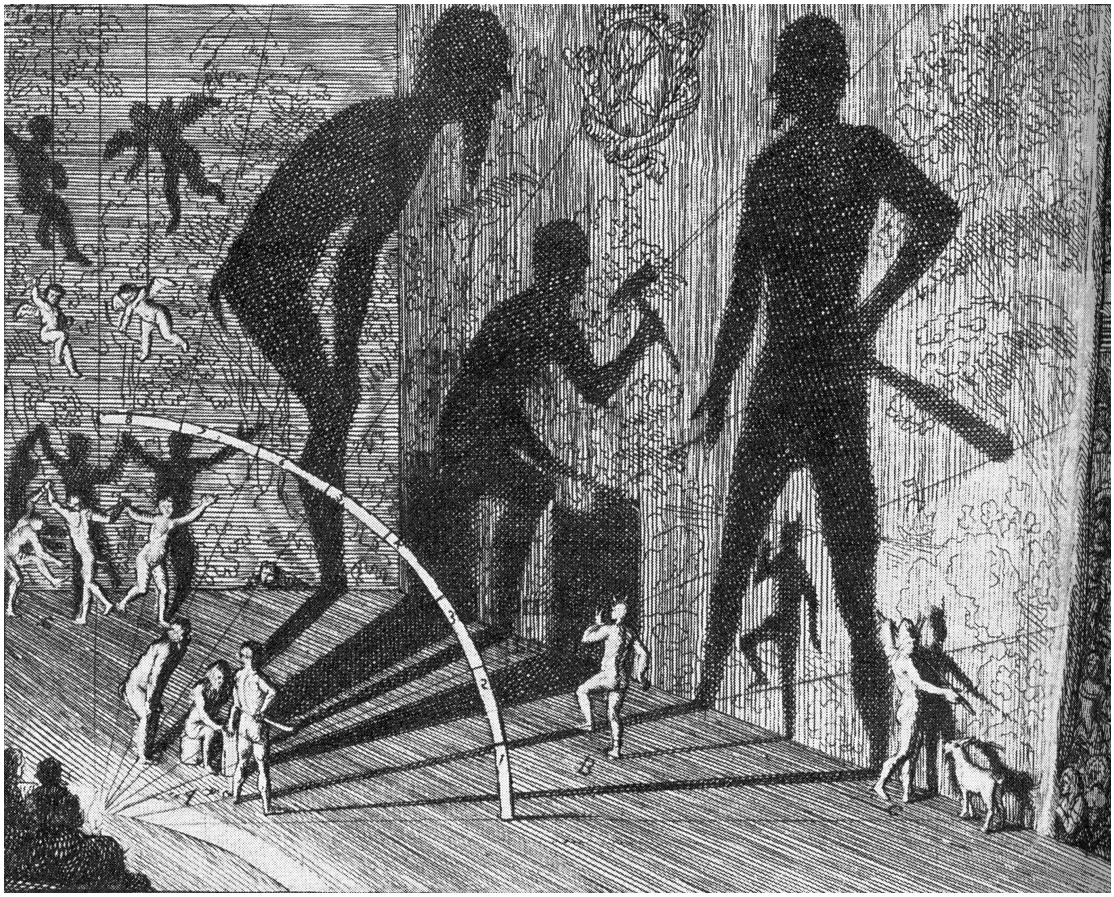

Fig. 22. Samuel van Hoogstraten. *Shadow Dance*. Engraving, 1675.

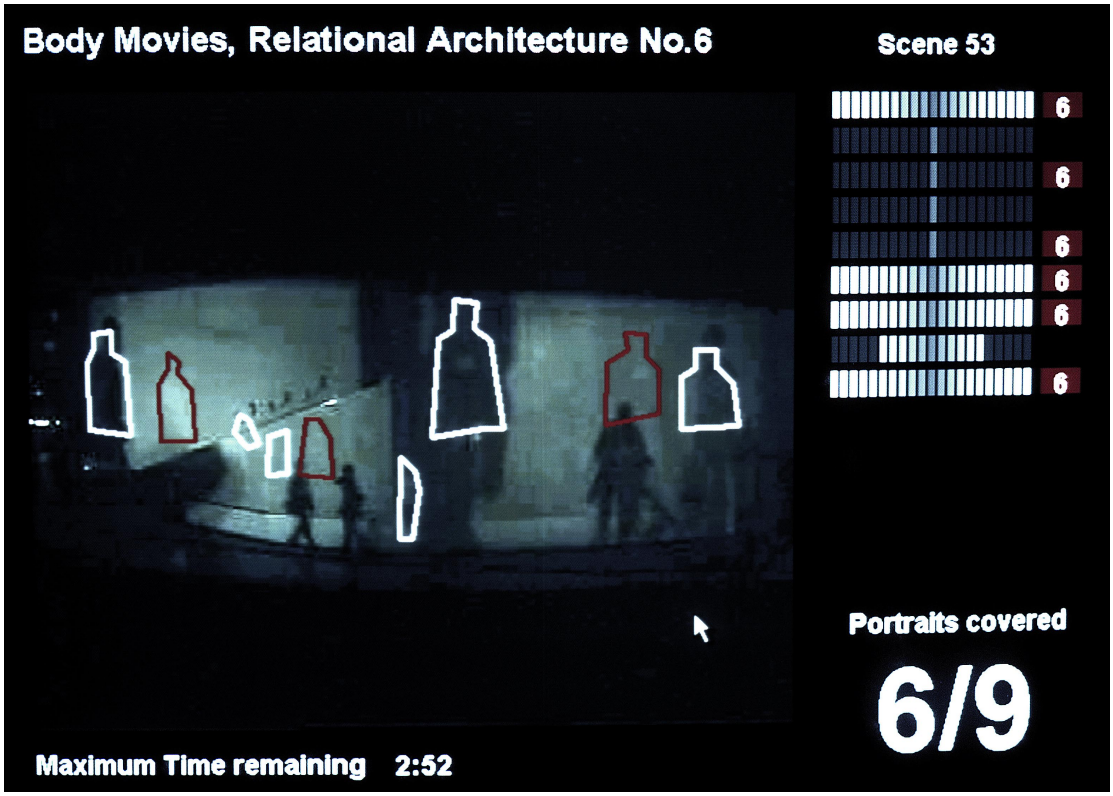

Fig. 23. Rafael Lozano-Hemmer, video surveillance tracking system in *Body Movies*,2002

In a multi-users installation such as *Body Movies*, which is opened for people in a public sphere, we must inquire artistic practices in association with culture and social acts. What a participant expressed in a mediated environment, the installation, is an interpretation or reflection of his/her current and past experiences. In other words, media and experience effect in our behavior and vice versa. This makes art, more precisely digital interactive art, no longer for *Art for art's sake.* In *Body Movies* Lozano-Hemmer remarked that participants' behaviors were different in Liverpool from Rotterdam. People were very uninhibited in their participation, which ranged "from very sexual or homoerotic behavior to playful or violent" in Liverpool which is "a very energized, somehow aggressive town." But in Rotterdam, "people started bringing props. Breakdances appeared. More eccentric behaviors."[62]

Fig. 24. *Body Movies* by Rafael Lozano-Hemmer in Linz, Austria, 2002. (photographer unknown).

Different media have their own advantages and limits. For instance, written texts are a very important media of our thoughts. However, they have limitations. There are many meaning or thoughts that cannot be presented by texts. Painting and music can be seen and heard by people so they can convey some meaning that written text cannot. However, when we attempt to describe those meanings, we have to transform those visual and acoustic experiences to oral language or written text based experience. This transformation would inevitably lose the essence of an experience and the unique meaning of an artwork.

In a digital interactive artwork, an artist tends to choose and fully manipulate the advantages of the best suited media to create intimacy among participants, technology and artists. In *Body Movies*, through making the connection between participants' body-gestures and their representations (shadows and images projected on the wall), Lozano-Hemmer created a conversation between human and computer, individual and the city, personal experience and public spatiality. He said that:

> I am interested in more collective and connective experiences that several people partake in. The idea that you are sharing in the complicity of a performance and watching something with people you don't know goes beyond computers. There is a communion. Robert LePage has said that computers are great for communicating. What they are not good at is communing.[63]

A Summary of Key Concepts

In previous chapters I have discussed the connection between media, culture technology and experience in order to extend my argument beyond the domain of visual arts and establish a multidimensional understanding of the concept of experience. Digital interactive art is a common thread in all chapters. In chapter 3 diverse themes were analyzed to aid in discovering the special features of digital

interactive artworks and mediated experience. In chapter 4 and 5, two of my art projects will be analyzed in order to examine those theoretic concepts and questions in a practice setting. The two projects were designed to address questions of mediated experience and mediated environment. Through these chapters, we can see how the concept of experience was developed (or evolved) along the path of the technological and art wave. From social and ethical perspectives, I also address the raised issues in contemporary aesthetic tends – the study of digital interactive art should be developed beyond the conventional aesthetic theory and the expression forms should not be restricted by any concepts of "gallery art".

To summarize, the main points of the concept of experience in digital interactive arts are:

1. Instead of being understood indescribable and exclusive, experience is fully mediated, dynamic and adaptive. When a novel media provides a new expressive mode, experience is liberated from the traditional discipline.

2. Mediated experience is not only private, but also communal. A democratic tendency presents as a shift toward decentralization at social and cultural spheres. Artwork has been mass reproduced for centuries since print was invented as a form of mass media from the late 15th century. Digital media allows the artist to create interactive experience accessed by an individual as well as a group at the same time.

3. There is no "direct experience" in digital interactive experience. Experience is mediated by designed or preprogrammed expressive methods. In fact, constructing "roles" is crucial for both artists and participants to operate the work. Therefore,

4. A complete art experience derives from a complete design of artwork/product. The mode of acquiring experience is no longer passively accepted from outside, but initiatively generated from inside.

Digital interactive arts, therefore, should be considered in a broader context than just as a new form of artistic expression. In the future, digital interactive arts should be developed:

1. In a more interdisciplinary context, with the engagement of social and cultural studies. Technology provides the media platform of artistic expression. Humanities are the backbone of the artwork.

2. By investigating a new aesthetic mode and taking a critical approach. As I stated before, digital interactive arts are a technological evolution in art. Most importantly, they challenge our traditional aesthetic conventions. A systematically theoretic study is crucial and urgent.

3. In a new market where digital interactive artwork is not treated as traditional artworks. As I argued before, digital interactive artwork should not be collected and exhibited in museums or galleries. Its artistic and business value can only be maximized in the public arena.

4. Last but not least, as a new challenge for the role of artist. An artist who works on digital interactive media should not only provide originality, but also direct the creative process and work with others in different backgrounds. I named him ‘Artesigner.’ Because digital interactive media has the capacity of mass reproduction and strong impact on individual’s personal experience, an artesigner also must take more social and moral

responsibilities than ever before.

4

CASE STUDY ONE

Shadows & Light in Xi'an, China[64]

The technological advantages of digital interactive arts have blurred the boundaries of many disciplines. In point of fact, interdisciplinary cooperation has become an important feature of all works of digital interactive arts. In most cases, a digital interactive artwork does not identify itself as fine art work in the same way as works in traditional media– a digital interactive artwork is not likely a single and discrete piece composed by one artist. It is more likely a project which consists of a series of works done by multiple members in a team. This way of working involves diverse knowledge, engages broader participation, creates more experience, and certainly carries more responsibilities for each team member.

In August 2011, I had a great opportunity to organize and work on an international digital interactive art project *Shadows & Light* in Lantian County, Xi'an, China. The motivation for planning this project had its roots in my belief that a digital interactive art project should encourage a richer aesthetic experiences than traditional artistic forms and be designed to facilitate intimacy between audiences/participants, artworks and artists, more so than traditional artistic forms.

In general concept, *Shadows & Light* in Xi'an is a project intended to achieve with both educational and experimental goals. It took place in Lantian County in Xi'an, China. The basic framework of the project consists of two parts: a public interactive performance and a ten days workshop for the students of Film and Animation Department at Xi'an Academy of Fine Arts. The concept of the public performance derives from the philosophy underlying the Jade Valley development – an assemblage of a vineyard and creative architectures – the harmonious coexistence of traditional agriculture farm in contrast to modern conceptual artificiality.

The performance linked the live local opera singing and gestures with another traditional classic shadow puppetry play through motion capture sensors. Live performance interacted with a pre-recorded shadow puppetry show, which was projected onto the façade of the building. The solid gray brick solid façade of the Jingyu building permeates the projection of the prerecorded shadow puppetry excerpt and the live performance of Qinqiang, the local traditional opera. The combination revealed a new interpretation of culture, conception and aesthetics as expressed through virtual projection and human presentation. The interaction of the real performer, the virtual character and the building itself had a reflexivity act that had the effect of reshaping the constitution of the traditional folk art and the spatial perception of the architecture. Through the use of a Gesture and Media System, the

artist interrelated with live video and audio media. It is a single person interactive performance which could be extended to multiple participants playing simultaneously.

Fig. 25. Concept image of *Shadows & Light*. Made by Yifan Wang, 2011.

The educational component of the project consisted of two related parts, a ten days workshop and an on-site participation in the development of the project. The course design aimed at fostering a progressive learning experience so that students could access an unfamiliar area without difficulty. Students who participated in the workshop were volunteers from the Film, Video and Animation department. All of them were trained with standard visual media making skills and some of them were very experienced with video and animation production. Starting with an introduction to the basic theoretic information, students developed a general definition of digital interactive arts, and how it has evolved, historically. The *Shadows & Light* project ensured that everyone was engaged in the project from the very beginning. During different workshop themes, students were taught from the framework of the theory of digital interactive arts, learned fundamental knowledge of interactive technology including programming and electronic engineering, and had opportunities for hands-

on experience with a variety of devices. After ten days, all students worked as team member in the final *Shadows & Light* performance. To design the project in this mode there were three considerations:

1. A digital interactive project requires cooperation from a number of team members who have different backgrounds working in a feasible framework.
2. Due to the fact that digital interactive art is still a fairly new field in China, especially for college students, pre-training is necessary for most of the team members.
3. For the best learning-by-doing experience, develop an environment where students are able to connect what they learn to what they do.

Key Technologies

Gesture and Media System:

The Gesture and Media System consists of signal emitting devices (small infrared wands under 250 grams), data-detecting devices (cameras), and an output system including various video and audio media contents. Single or multiple users carry wands walking through the room. Wands emit high frequency infrared light detected by the cameras mounted the four corners of the ceiling. The positional data, including height and distance, is circulated in relation to the center of the room. By moving the wands to different positions, users are able to trigger multimedia contents.

The system generates a 3D digital space where users can become immersed in a mediated video and audio environment. Using body movements to reposition the wands in the space, users are able to control protocols such as “DMX512 (for

lighting), serial or UDP data output (for programming and network control) and MIDI (for music and video)."[65]

Modul8:

Modul8 is a software designed for live performance and real time video. World wide, major groups have used this software to work on diverse projects including video jockeying, digital media arts, live performance, contemporary theater and video production.

The interface of Modul8 is designed based on the idea of graphic interface, so that both amateur and expert users can manipulate the software visually and intuitively. Video footages are presented as distinct layers that the user can compose with adding special effects immediately and seeing each change simultaneously. It maximizes users' improvisational creativity and enriches the quality of live performance and digital interactive works. Different media materials appear as layers that users can fully control, for example, adding filters, composing pieces, moving, resizing and rotating in real time.[66]

During the performance of *Shadows & Light*, we were able to determine exactly which pre-loaded video images were sent to the screen, and were allowed to add concurrent soundtracks or sound effects simultaneously. We could even distribute or complement those media materials, so that the images covered on walls of screens or spread across a façade, depending on how the actress interacted with the projection.

Fig. 26. Translating Dr. Steve Gibson's lecture on Modul8. Photograph by Zhen Qian, 2011.

Fig. 27. Dr. Steve Gibson screening the video of Stelarc's work *Third Arm* in the theme of The Body and Technology during the workshop. Photograph by Zhen Qian, 2011.

Cooperating organizations

Two organizations were primary supporters of the project. Xi'an Academy of Fine Arts (XAFA) is one of the Top Eight art schools in China and the only one located in the northwest. The school fosters academic research and students cultivate connections all around the world.[67] *Shadows & Light* was produced particularly with cooperation of the department of Film, Video and Animation. The department offered 57% of the project funding.

Another local sponsor, Jade Valley, is a winery and resort located in Lantian County in Shaanxi province, about 70 km away in the southeast of the provincial capital, Xi'an. The founder Qingyun Ma is now the Dean of Southern California University School of Architecture. Jingyu, also called the Well House, was designed by Ma, inspired by the Guan Zhong (the center of Shaanxi province) folk houses. Considered contemporary architecture, the design of Jingyu is adapted to its physical environment harmoniously and also inspiring people to new ways of living and understanding the relationship between nature and humans.[68] The concept implied by Jingyu accords very well with that of *Shadows & Light*, which creates an immersive environment that blends nature and culture together and creates conversations between different media[69]. Jade Valley offered 43% of the project funding.

Fig. 28. Concept image of Jingyu (the Well House) No. 1, No. 2, No. 3. (photographer unknown).

Fig. 29. The front yard of Jingyu No. 1. Photograph by Yifan Wang, 2011.

The Transformation of Shadow Puppetry Play

Shadow puppetry plays are one of the most ancient and grass roots folk art forms in China, traceable to Han Dynasty in 121 BC. They might closely relate the stories of daily life experience, or be the educational means for spreading legends of heroes. Since the Song Dynasty (A.D. 960-1279), shadow puppetry play, consisting of improvised talking and singing, was one of the most popular folk arts, as well as a popular entertainment, consisting of casual talking and singing in the ancient tradition.[70]

Fig. 30. The back stage of shadow puppetry play from Yutian Shadow Puppetry Club. *Shadows & Light*. Photograph by Zhen Qian, 2011.

The shadow puppetry play we recorded originated in Hua County, Shaanxi province. Recording the performance was a significant step to transform a traditional art form to a multimedia object that would be assembled as a part of the total performance. The original narrative called *A Peddler Man,* contains two characters, a peddler and a young lady. However, we create and filmed a special version with only one character. Thus in the actual shadow puppet component of *Shadows & Light*, there was only the peddler with a landscape background projected on the façade. The female character of the story was replaced by a living actress who was standing in front of the projection and using the infrared wand to control media contents. This transformation of traditional theatre into a mediated environment with an interactive performance not only appeared in the artwork as presented, but also changed audiences' aesthetic experience.

Fig.31. Pre-filming video footage of the back stage. *Shadows & Light*. Photograph by Zhen Qian, 2011.

Fig. 32. Pre-filming footage from the front stage. *Shadows & Light*. Photograph by Zhen Qian, 2011.

Making the Conversation

The critical part of the project was to build an interactive space where the actress could perform and interact with all the various media contents. This space was also the core of a mediated environment which could hold over a hundred audience members. It was the first time Gesture and Media system was employed outdoors. Setting up the equipment in an outdoor context signified a healthy challenge for the team.

For instance, the four cameras were only able to detect infrared signals within a space under 256 $m^{3,}$ which is about 8 × 8 m, and 4 m tall. In order to make all devices work, we had to build a scaffolding which was slightly smaller than the restricted space and which could support all the cameras and connecting wires. Because the infrared detection and projector worked best in the darkness, the performance took place after sunset.

Fig. 33. Façade of Jingyu No. 3. Photograph by Yifan Wang, 2011.

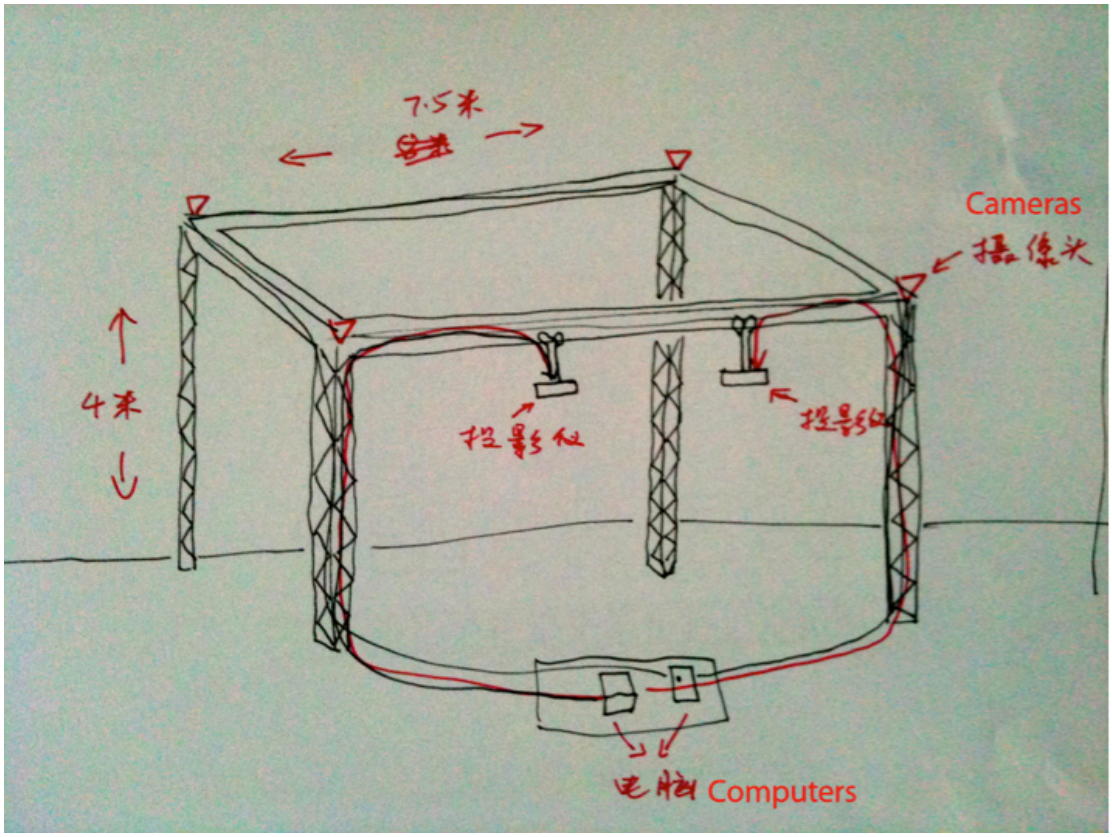

Fig.34. Sketch of scaffolding. Yifan Wang, 2011.

Fig. 35. Scaffolding on the real site. Photograph by Zhen Qian, 2011.

Fig. 36. Location of projector. Photograph by Zhen Qian, 2011.

All the technical challenges we faced were invaluable learning experiences for the team in terms of how to create outdoor public digital interactive projects, which, in my opinion, will become a prevalent form in the future of public art. Its technological advantages allow the artwork to be created and installed in a variety of forms in diverse publicly accessible spaces. These aspects will contribute to developing intimacy between human and technology and provide aesthetic experience that people cannot acquire from traditional art forms. Such cultural and technological interventions embrace diverse art practices and forms which involve multiple disciplinary approaches.

I must reiterate that artists and their works, in the age of digital media, should carry more responsibility from the perspectives of society and culture. This is not only because new technology provides more possibilities for the future, but more

importantly, because it changes the present as well. In this context, digital interactive arts serve as a platform where we can study not only new technologies, but also new social and cultural possibilities that are created or provoked by those technologies. More precisely, in *Shadows & Light* in Xi'an, the digital interactive platform created an aesthetic experience without the didactic tendencies of most mass media, instead inviting audiences to explore their own artistic experiences through multiple ways. For instance, in contrast to the traditional form of shadow puppetry play, the interactive performance allows for audience members to have a conversation between their current observation and their past experience, and this might compel them to seek more information about the artwork.

In *Shadows & Light* in Xi'an, the onlookers in the audiences are not passive observers. They engaged in a process where organic (audiences) interacts with surrounding environment and objects (the multi-media contents). This dynamic process causes changes on both sides – an individual experience is changed by its interactive objects and vice versa – and in doing, this interactive relationship will deepen.

Artists in the interactive platform manage a technology that holds remarkable creative powers. However, there are also challenges for artists to create their works in this new context. With this new platform, an artist's creation is not a solitary conversation with him/herself. A digital art project is strongly connected with contemporary social context and certainly has an impact on cultural setting. Such an undertaking requires not only cutting-edge technologies, but also management skills and the ability to work in interdisciplinary fields.

In a broader sense, in the Industrial Revolution-fuelled contemporary productivity, social structure and cultural development to such a great extent that it also generated previously unheard of problems and promises never had before. We are facing the same situation in the age of "digital enlightenment". In the 19th century, Impressionism changed the traditional painting techniques and compositions – it focused on common or ordinary subject matter, had a fascination with light and was no longer restricted to the oil medium. It also undertook efforts to examine the emerging social and cultural changes and needs. Likewise, digital interactive artists should consider not only the use of digital media as technology but also scrutinize and elucidate its potential impact.

As the case studies demonstrate, digital interactive technology essentially creates and facilitates human to human and human to computer communication. All works of art based on it should and will reflect their real-world connections with social and cultural issues. *Shadows & Light*, in this vein, is not simply a technological experiment; it also addresses a series of questions: does a digital interactive artwork belong to an individual artist and only represent his/her inner world? What is its aesthetic position and artistic approach? Does it represent a specific culture? Or, does it just represent a medium carrying other culture?

In *Shadows & Light*, technology was a neutral means of communication which was manipulated by an artistic team to transport a very localized cultural form and content. This hybridized artistic and cultural aspect of digital media interaction, in the case of shadow puppetry play, has more practical significance in terms of reinterpreting a traditional artistic language, reconstructing the traditional story-telling pattern and exploring new ways of retrieving the public sense of identity with their cultural roots.

Fig. 37. Making up the actress. Photograph by Zhen Qian, 2011.

Fig. 38. The audience, Justin Love and Yifan Wang. Photograph by Zhen Qian, 2011.

Shadows & Light attracted a great deal of experts and many artists, as well as we audiences from the local village that had no background in digital interactive art. The performance specifically challenged the aesthetic conventions and cultural identity of those audiences. Shadow puppetry plays use puppets to simulate real person's movements, with the artist singing from backstage, telling legendary stories. Lyrics and puppet's movements are highly formalized. That formalization is an ideal way to ensure that no story information is left out of the performance and all the play's actions are carried out by the different performers.

However, in *Shadows & Light*, when a living actress replaced the puppetry character, the conventions and rules were broken. The actress had to use her personal performance experience to interact with the virtual character and could only complete the story telling through their interaction. In addition, the sensor held in her hand allowed her to trigger animation videos and audio effects through her gestures. Those interactive features created a very expressive artistic language which became a new aesthetic, different from the highly formalized performance in traditional puppetry.

Walter Benjamin argued that "the conventional is uncritically enjoyed, and the truly new is criticized with aversion."[71] In his view, people have "reactionary" attitudes toward new artwork that uses traditional media with a rebellious spirit, as was the case with Picasso's paintings, but have progressive reactions towards new media, as with Chaplin's movie. "The decisive reason for this is that individual reactions are predetermined by the mass audience response they are about to produce… The moment these responses become manifest they control each other." [72]

In the same vein, *Shadows & Light* fascinated audiences who similarly had an open-minded reaction, not only because of the reproduction produced by digital

technology, but also because of the trans-cultural interface that digital interactive art delivers in the process of constructing the mediated experience, as well as the mediated environment.

Any successful or influential art form must be fully explored for the basis of the intrinsic meaning of its medium. Using a unique medium and its best suited language is crucial for the artist to make his/her works expressive. The most expressive language of digital interactive media artwork is created in the interaction between a live creature and the environment in which and with which it resides. Using this unique language to interpret one form of Chinese traditional folk culture was a challenge for the artistic team. The experience was also a challenge for the local audiences. *Shadows & Light*, therefore, connected the raw (or original) artistic form to a new media object from which gave rise to a unique aesthetic experience of digital interactive art. To reiterate the assumption discussed in chapter three that there is a third category where artists can use the technological platform to create artistic experience. In the case of *Shadows & Light*, I attempted to develop a consistent conversation between conceptual artistic experiments and traditional folk arts.

Artistic languages, including that of artistic expression and regardless of the media that carries it, immediately provoke two questions: what and how does the language express? In other words, two elements are fundamental in any artwork, content and form. In *Shadows & Light*, these two fundamental elements are articulated in the following ways:

1. Preserving the traditional story and local music, and its foundation of storytelling, entertainment and education: The content.

2. Using digital interactive technology to not only transform the traditional art into a new form, but also endow it with new expressive language: the form.

An art piece must work in the best medium – one that is chosen for a specific expression which can convey the artist's idea in a more complete manner than any other medium. This expression or communication cannot be simply translated into written text without any loss. Actually, in fine arts, such as music and visual arts, the direct experiences delivered by the proper media are first-hand and unique.

In a digital interactive platform, the audience is not just passively receiving whatever the artist conveys to them. They actively participate in art works and become part of the process in terms of working with other elements to complete the art experience as a whole. In fact, mass participation has had a strong impact on art forms from the very beginning of art history. The increased or decreased number of participants has produced changes in the mode of participation, which of course has many other influencing factors. This is most obvious with regard to digital interactive art.

Fig. 39. People from nearby village. Photograph by Zhen Qian, 2011.

Fig. 40. The interface of location mapping program. The actress performed in front of projected shadow puppetry play. Photograph by Zhen Qian, 2011.

Shadow & Light, it was a performed by a professional actress solo, but the Gesture and Media system could potentially allow for multiple individuals who manipulate sensors. Multi-participants could interact with not only the projected narrative video, but also with each other through using their own sensors to control different media streams. The system also has the capacity to connect participants in different locations – they could use the same system in different places to control media elements via Internet. In short, in the process of constructing the meaning of his or her experience, each audience member contributed to establishing interactive media communication in *Shadows & Light*. When onlookers are willing to engage with the artwork, different conversations are developed – conversations among audiences, internal conversations and conversations between the audiences and the artwork. As mentioned before, an audience can actively share their aesthetic experiences and questions about the artwork with others. During the performance of *Shadows & Light*, the audience compared their past experiences about traditional shadow puppetry play with what they were seeing and enjoyed sharing ideas. This experience of external conversation ran throughout the performance. Another conversation happens internally with each audience member, which reflects the audience member's personality, cultural background and his/her past aesthetic experience. It is certain that audiences of *Shadows & Light* asked themselves questions such as "What was this?" and "Why did those guys make this?" This stirs a conversation between the audience and the artwork, which connects their past experiences with what they are observing.

As Dewey states, experience is an interactive process where subject and object are not standing independently, but exist in an interdependent relation.

> The nature of experience can be understood only by noting that it includes an active and a passive element peculiarly combined. On the active hand, experience is trying – a meaning which is made explicit in the connected term experiment. On the passive, it is undergoing. When we experience something we act upon it, we do something with it; then we suffer or undergo the consequences. We do something to the thing and then it does something to us in return: such is the peculiar combination. The connection of these two phases of experience measures the fruitfulness or value of the experience. Mere activity does not constitute experience. It is dispersive, centrifugal, dissipating. Experience as trying involves change, but change is meaningless transition unless it is consciously connected with the return wave of consequences which flow from it. When an activity is continued into the undergoing of consequences, when the change made by action is reflected back into a change made in us, the mere flux is loaded with significance. We learn something.[73]

In *Shadows & Light*, this immersed and engaged experience developed only when audiences were actively involved with the artwork. The interactive process linked not only human with computer, but also the expressive form with rich mediated contents. The conversations emerged while the performance revealed the relationship between subject and object. Most importantly, it revealed the unique aesthetic experience which was encouraged by digital integrative art.

5

CASE STUDY TWO

Shadows & Light in Victoria, Canada[74]

Shadows & Light in Victoria is another digital interactive art project I created with technical assistance from Limbic Media, a Victoria based company which specializes in real-time digital interactive media technologies "for use in multi-media entertainment, markets, education, research and fine arts."[75] This project was supported by Interactive Fund, a program created by BC Film + Media and BC Art Council, "intended to support the production of high quality, original, interactive digital media content owned and controlled by BC companies or individuals."[76] *Shadows & Light* is a public interactive installation as well as a research platform where cultural immersion is presented as a series of physical practices via Gesture User Interface. Two Chinese shadow puppets are attached with mini-motors

controlled by participants through a gesture interactive system. Robotic shadow puppets' movements are triggered by people's body gestures based on the traditional Chinese shadow puppetry story.

Compared with *Shadows & Light* in Xi'an, this installation was designed to encourage users participating. Instead of one professional actress interacting with pre-recorded visual and audio materials, inexperienced participants were able to successfully take part in the installation in spit of a lack of training. The same traditional puppet story was the basis of both project, however, in the Victoria presentation of *Shadows & Light* participants manipulated the robotic shadow puppets in the programmed sections in order to drive the narration forward. As originally designed, the installation was intended to provide multiple users with an interactive environment where they not only controlled robotic shadow puppets but also were able to interact with each other.

Shadows & Light in Victoria primarily focuses on two research areas, cultural reinterpretation and Gesture Users Interface, and wile each had its own research objectives, these worked together to develop the rich, immersive mediated experience in the project. These two components can be analyzed from both artistic and technological perspectives.

Cultural Reinterpretation

Why do we feel the need to reinterpret a cultural art form, in this case a shadow puppetry play, when it is introduced to a group of people who have other cultural backgrounds? Can it be understood and accepted by people without translation or explanation? Some people argue that fine arts, such as visual arts and music, are the "universal language" naturally comprehensible to people from

different heritages. This idea implies that some art forms increase acceptance of common aesthetic interests, values and forms by people all around the world.

People in most societies share some kind of basic aesthetic values and have a similar "sense of pleasure", a very fundamental intuitive sense of like or dislike. If this is what is called "universal language", it is profound, but has nothing to do with cultural interpretation; it does not help people to understand different cultures. In addition, if this "universal language" is common to all artistic practices, how do we understand the distinct artistic expressions and experiences created by various cultural groups and traditions?

"Universal language" may refer to the aesthetic values, interests and theories shared by most people in different societies. However, attempting to read and understand an artwork in a particular cultural context requires learning about that culture in general. In other words, the "universal language" in this instance is held by a certain group of people who have professional background and knowledge. As an example: John Cage's *4'33"* has been considered as one of the most important compositions in contemporary art history. However, one who does not have the precise background knowledge would neither read the piece as having any relation with Zen Buddhism and the *I Ching*, nor as a example of automatism. In the case of *Shadows & Light*, most people in West would see shadow puppetry play as an exotic folk performance, but only few of them could appreciate its unique narrative mode and artistic expression. This "universal language", therefore, is exclusive to the professional realm rather than having deep roots among the masses in societies.

In previous chapters I argued that mass media had a tremendous impact upon people's live and has re-shaped our experience in many areas including fine arts.

Some people may have the idea that the power of mass reproduction and the evolution of digital technology are creating a universal cultural language. However, if we consider an artwork in a cross-cultural communication context, the idea is still facing a big challenge: proliferation of media or mass reproduction does not cultivate cultural identity. Digital media has profoundly influenced the way that human beings interact with one another, further, created "cyber culture" which is new in both Western and Eastern civilization. But it does not change the essence of culture of any societies. Therefor, the issue of how to reinterpret diverse culture elements becomes vital in the global media context.

In the case of digital interactive arts, because this art form is based on ubiquitous of digital technology, technology itself becomes a universal language for artists around the world. In this sense, technology is the world's way of communicating cross-culturally. For instance, a Chinese artist can use iOS or Android system as a platform to create a mobile devise's application of a virtual gallery. As a cross-cultural product, the Human-computer interface of Shadows & Light is developed based on the motion sensing technology of Kinect developed by Microsoft. However, this universal language is a cross-cultural collaboration; it is based on the existence of cultural difference. Digital technology is an efficient way of connecting and coping with cultural differences, not a way of eliminating them. For artists, it is an inspiring tool been employed to create. It is possible for a participant to simply interact with the robotic shadow puppets without being 'Sinicized' or reading the folk culture successfully.

Fig. 41. The traditional back stage of a Shadow puppetry play. Photograph by Zhen Qian, 2011.

Therefore, cultural reinterpretation becomes crucial in any intercultural artwork. It is not necessary for artists to force their work to adapt into another culture; instead they use the familiar cultural language to reinterpret their work and related cultural elements, in order to create an art experience makes it easier to understand and appreciate. Digital interactive art has fundamental advantages because of the diversity of technology and media, which offers the potential opportunities on arousing our sensations and shaping our experience.

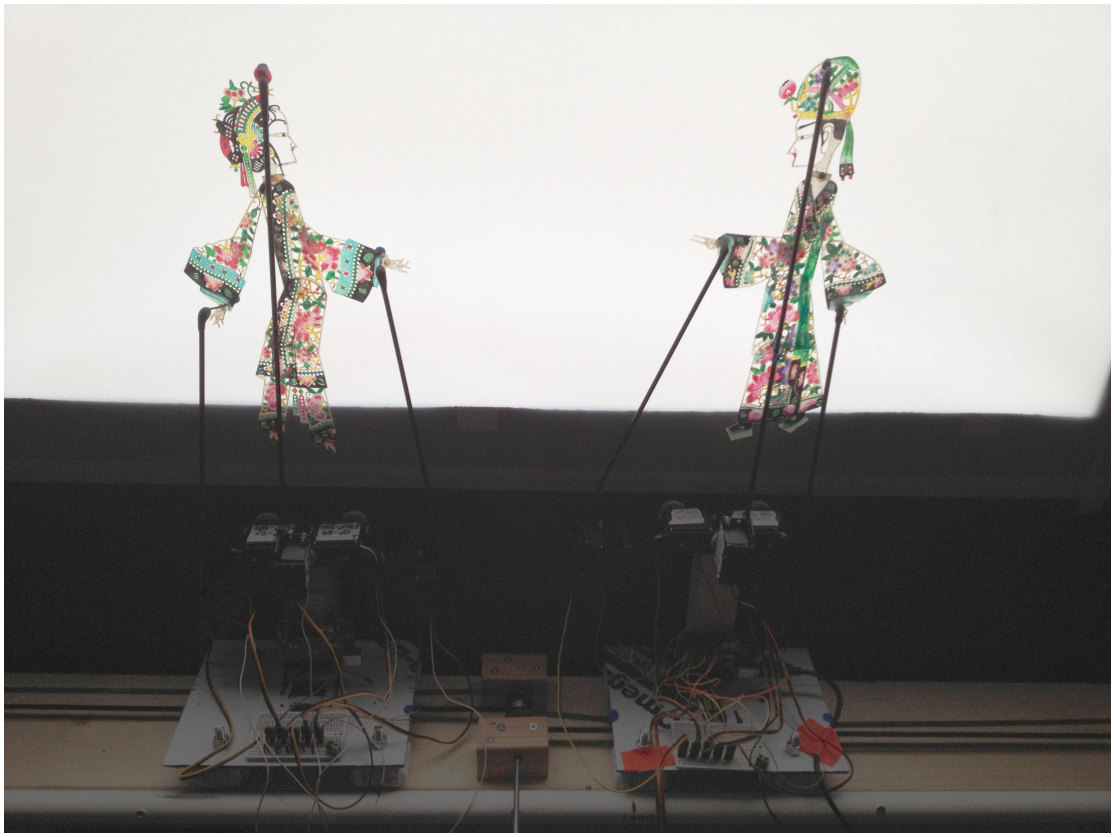

Fig. 42. The back stage of *Shadows & Light* in Victoria. Photograph by Yifan Wang, 2011.

In Shadows & Light, it is fatal to assume this intercultural communication works smoothly for casual participants who do not have professional knowledge about shadow puppetry play. For most of them, because using body language to communicate with machines may not be strange, but interacting with robots to enact an ancient foreign story is like to be a totally fresh experience. A good interactive experience should be intuitive – based in general daily behavior – and also learnable in terms of the cultural perspective. To achieve these goals, it is not enough to simply create an interactive mode based on human natural response. It requires more sophisticated game-like strategy so that the participants can learn by doing. We designed two intervention components to help encourage the interaction: a tutorial episode and animation cues running through the entire interactive process.

Both components consist with a series of visual elements including human

characters, birds, landscape and natural phenomena in the form of still images and animations. These still images and animations were in a style inspired by Chinese traditional painting.

Fig. 43. Traditional landscape painting projected as the background of scenes. (Artist unknown).

The first component is a short tutorial animation, taught the basic gestures that a participant needs to learn in order to achieve effective interaction. The tutorial video is played at the very beginning, before a participant starts his actual interaction. The participants learn the basic interactive skills and make themselves familiar with essential behavior patterns. Another component is a series of animations appearing at the beginning of each chapter of the shadow puppetry play[77]. The participants were given animated instructions for the next move and the animation returns after each complete move to indicate that they had fulfilled the task. In addition, a Chinese traditional landscape painting was projected on the screen as a still image background

to the scenes. This does not usually appear in traditional shadow puppetry plays and enhances the unique cultural identity and made it immediately recognizable as built on a Chinese art form.

Fig. 44. Gestures'' animation was used for tutorial.

As with most video games, we fund this tutorial episode was very effective for all participants. The tutorial helped them to learn the basic interactive skills and to build up the special relationship to the interactive space (or the mediated space). Most importantly, these components helped participants to enhance their sense of identity in the game: they were not just simply connected to the narrative via motion sensing technology, but were transformed into an avatar with strong cultural character – a shadow puppetry robot.

The Gesture User Interface

A team of electronic and computer engineers from Limbic Media designed

the human-robot interactive system. The interactive system is based on a Gesture User Interface which allows users to control and interact with robots, video and audio contents. Through this interface, a participant could use his/her body gestures to activate pre-programmed robots' movements. Every time a participant started an interaction with robots, a new scene of the shadow puppetry play began, keeping the storyline moving forward. Participants were able to "learning by doing" in the interactive process and were immersed in a rich traditional cultural context via the Gesture User Interface.

Distinct from the traditional computer interface with keyboard, mouse and monitor, Gesture User Interface is an idea that integrates various properties of assorted user interface systems, such as the Tangible User Interface and Organic User Interface. Tangible User Interface is an approach where a user interacts with a computer through the physical environment and the result is displayed as physical representation. For instance, Microsoft's Surface table (not the new tablet) works as a human-computer interactive platform by tracking the path of users' finger touch or any physical object attached with optical tags. Users can manipulate information by touching graphics displayed on the large table screen, or acquire information through optical tags and navigate by touching programmed menus.[78] Another example is Illuminating Clay designed by Tangible Media Group in MIT Media Lab, which is specifically designed for architectural usages. It allows users to interact with computational information through shaping clay landscape models and placing blocks to represent buildings.[79]

Fig. 45. Microsoft Surface table was interacting with a cell phone. (photographer unknown).

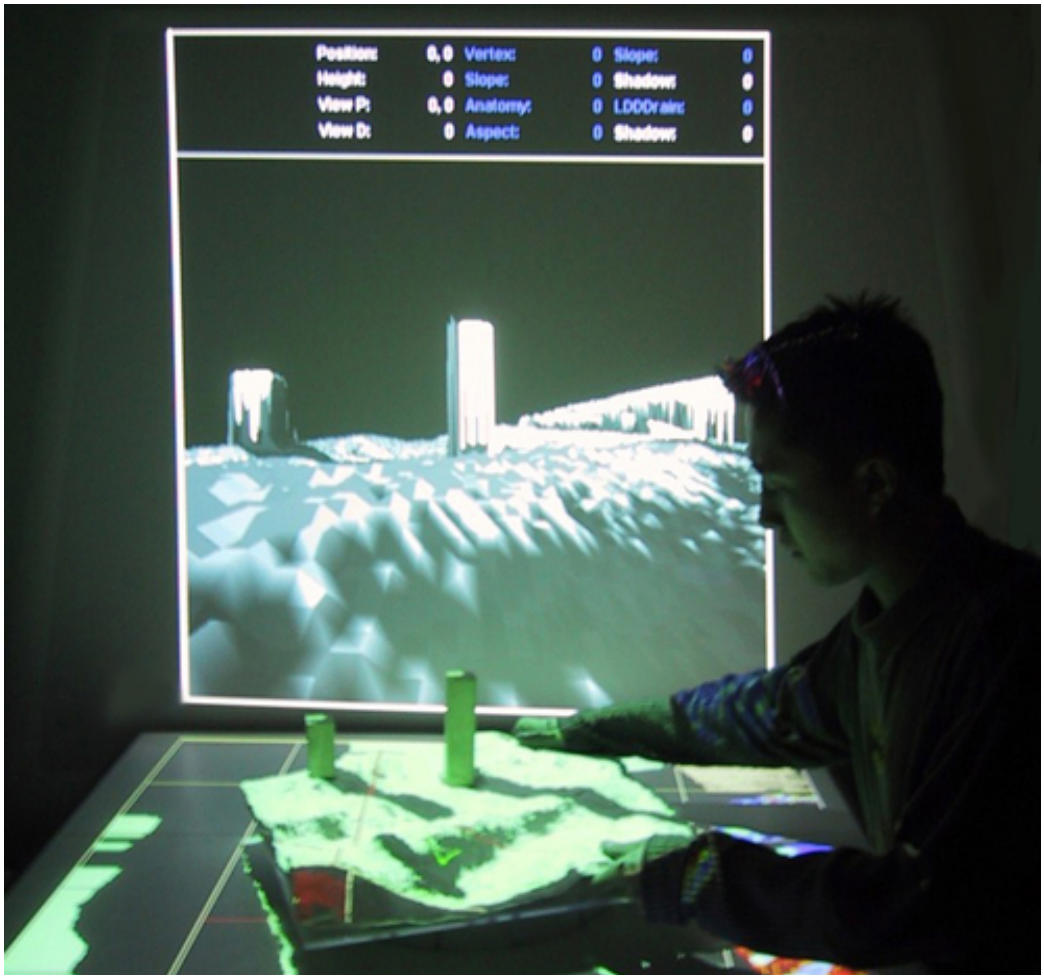

Fig. 46. Illuminating Clay designed by Tangible Media Group, MIT Media Lab. (photographer unknown).

In the same vein, the user in *Shadows & Light* has a physical existence and interacts with the robotic puppets in a real environment. However, with Gesture User Interface, the user does not need additional physical objects (such as a optical tags or clay) tracked as input. His/her body movements and hand gestures are the very input methods which are computed and coupled to actively mediated digital information, including audio and video components.

Gesture User Interface in *Shadows & Light* also presents output through common planar display and dynamic physical objects. These diverse forms of output are inspired by Organic User Interface. "An Organic User Interface is a computer interface that uses a non-planar display as a primary means of output, as well as input. When flexible, OUIs have the ability to become the data on display through deformation, either via manipulation or actuation. Their fluid physics-based graphics are shaped through multi-touch and bi-manual gestures."[80] In this sense, participants using their own bodies as the input device potentially make all mechanical devices redundant. It may not be like Organic User Interface where input devices are equal with output devices; however, Gesture User Interface provides the strongest immersive experience. Users manipulate their most familiar tool (their body) to interact with the computer through the most intuitive method. The users could adapt their physical form to whatever media contents. The output could reflect on either separated objects or the users themselves. For instance, in *Shadows & Light*, in order to improve their performance the participants need to adjust their activities (different gestures) to suit several narrative contexts: the function of a gesture equals its form.

In order to control robotic shadow puppets via human gestures, the team need to built three essential platforms: a data collecting platform to get observable data (raw data); a general data management platform to manipulate information in real-

time; an output platform including robotic animations, video and audio contents, which the user could observe. These three platforms form a loop with the users, facilitating communication with the computer in terms of real-time controlling and learning. In *Shadows & Light*, the data collecting platform is based on a system including Kinect (hardware) and OpenNI/NITE/SensorKinect (software application and middleware). Kinect consists in RGB camera, depth sensor (infrared laser projector with a monochrome CMOS, Complementary Metal-Oxide-Semiconductor, sensor) and multi-array microphone. The CMOS sensor captures infrared video image such as hands, knees, torso and head.[81] Those data are accessed from OpenNI/NITE/SensorKinect library by using OpenFramworks, an open source toolkit which allows designers working with multiple libraries.[82]

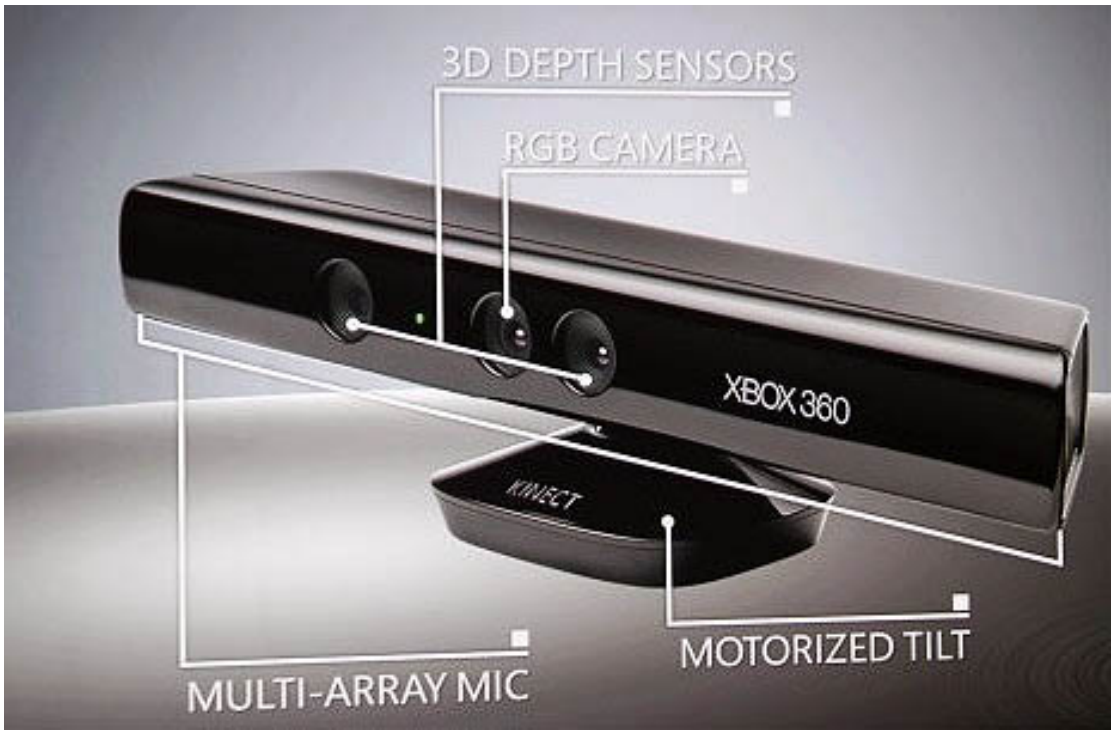

Fig. 47. Microsoft Kinect. (photographer unknown).

The raw data is then shared through a content format, Open Sound Control, (OSC)[83] with the main operating computer and manipulated by Max. Max is a visual programming software used for the main program logic and links all interactive modules together, such as gesture recognition, robotic animation and multimedia contents.[84] In this data management platform, the robotic animation information is sent from Max to servo-motors and step motors which control the robotic shadow puppets' movements. The output is an interactive process of projected video animations and images, audio soundtracks and robotic shadow puppets' movements. The user triggers a series of robotic animations – these required the team to create a program to train the robots how to move. The Computer reads and records positional data from the servo-motors and records it while moving a robot through a series of desired motions. Normally, servo-motors do not send positional data. To get position data for the servo motors the team connected an extra wire to an internal potentiometer that servo-motors use to determine their positions and read the data into an analog input on an Arduino, an open-source hardware and software platform to create interactive objects and environments.[85] In other words, the movements triggered by users' gestures were pre-recorded.

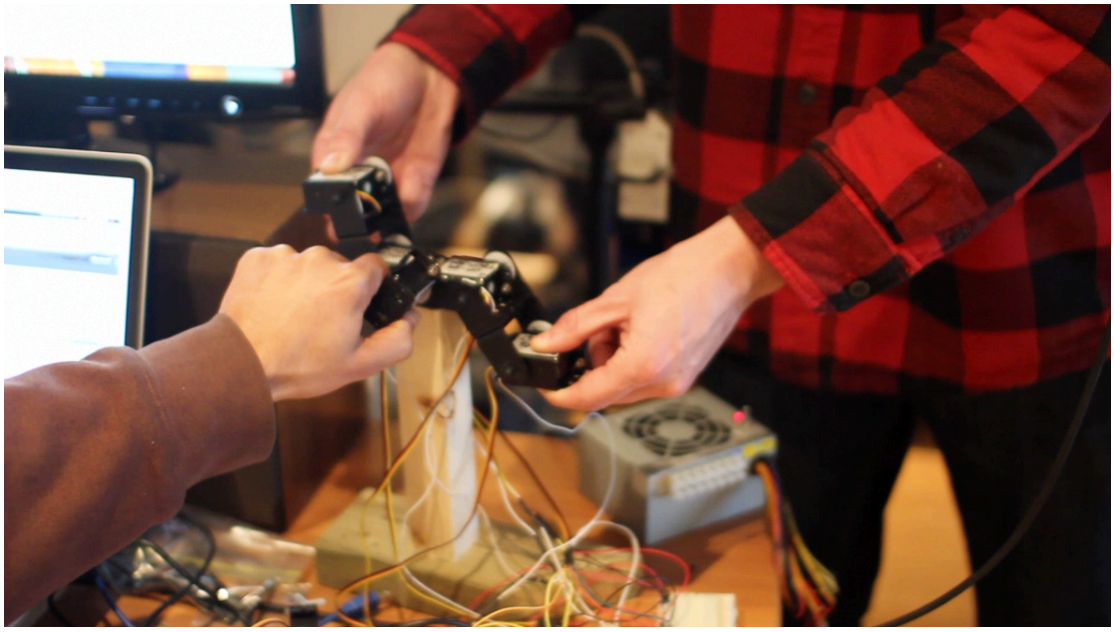

Fig. 48. Training robot. Photograph by Justin Love, 2011.

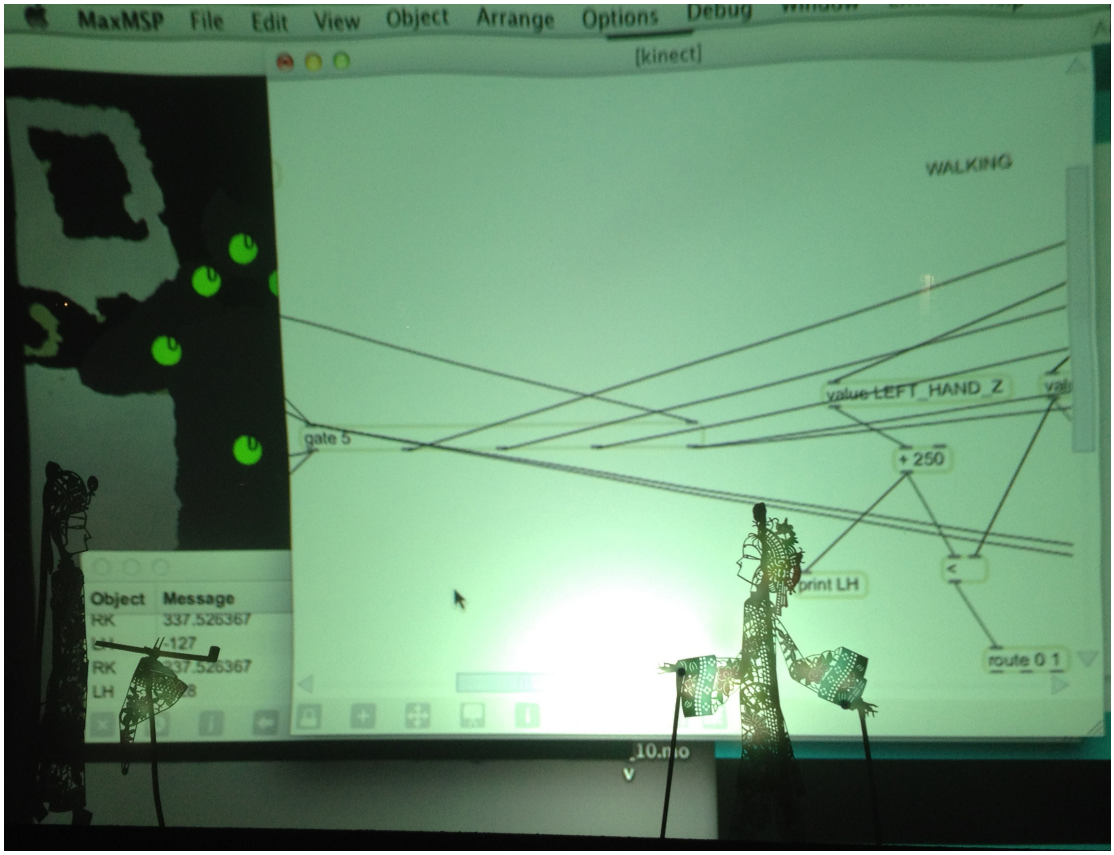

Fig. 49. The Application Programming Interface of Max, and the monochrome image of user's skeleton. Photograph by Yifan Wang, 2011.

Current Compromises and Future Possibilities

The design philosophy of *Shadows & Light* corresponds to the idea of assembling a digital interactive work (project) from a series of new media objects that can be adjusted or modified by the creator without changing the entire design. Still, the actual installation did not completely achieve the design of the team's original plan. Originally, the robots would have shadowed the participants' every move accurately and completely. However, we found that the most efficient way to allow participants who do not have certain cultural and technical backgrounds to learn interactive experiences is to give certain instructions that they can follow along with, rather than expect them to guess at the appropriate action. Another compromise was to employ single user interaction instead of multiple users interaction; Allowing for multiple users in the interaction process requires much more work to program special case scenarios; lack of time meant the team was unable to pursue this option. Since users triggered the preprogramed movements of the robots instead of improvised their performance, programming multi-player scenarios means design more interactive scenes in narrative, for example more dialogues, programming applications also became more complex. To illustrate: when the interaction contains more than one user, each time a new participant joins, the computer is required to assign the new user to the correct robot. In addition, when a user leaves and another participant took over his identification, the Kinect needs to be programmed to re-detect the person and automatically assign a new ID. We also faced a few other technical difficulties including: the robotic animation recording was not accurate enough because of the analog nature of the animation capture process; and stepper motor and servo-motor operated improperly. This last could be solved by using bi-directional digital servo motors for animation and direct FTDI-based motor control.

Generally speaking, *Shadows & Light* in Victoria is a digital interactive installation which demonstrates huge potential not only for artistic experiments, but also in the practical level of public entertainment. The project succeeded in achieving the goal of creating a series of experiences essentially for interactive works. For instance, users were able to acquire seamless interactive experiences through immediate real time responses and transitions between themselves and robotic shadow puppets, video and audio contents, as well as narrative scenes. The Gesture User Interface provided the feedback loop where the user's actions tightly controlled the whole interactive process throughout. The user was able to concentrate on his/her tasks without distraction from unnecessary operations. The user's experience was seamless, smooth and continuous. During the interactive process, participants were highly focused on each individual interactive scene in turn in order to accomplish tasks, using the correct gesture to active the robots and drive the story forward. Each design of gesture focused on a particular scene which was a part of the whole narration. The focused interaction with each scene from the beginning to the end represents a process of gradually exploring the entire story. This design improved the user's concentration on the cultural context and continually reinforced his/her interactive experience.

Fig 50. User was following the instructive animation to trigger next scene. Photograph by Justin Love, 2011.

In a future project, *Shadows & Light* could be improved in two major directions. First, being more connective. A multiple-user platform would allow participants from different geographic locations (even over long distances) to interact with robotic shadow puppets through separate Kinect devices connected via Internet. The connection also includes, through Kinect multi-array microphones, the potential for the interactive platform to develop audio communication. Users would be able to control the computer through their voice while also making gestural interaction. Secondly, *Shadows & Light* could be more intelligent interactive platform. In the future design, an improvising section would be opened after the story-based interaction. Users could use robotic shadow puppets as avatars to represent whatever actions they perform. The robotic shadow puppets would not be only activated by users' gestures, or simply mimic their moves, robots could gradually learn from users gestures and to anticipate what users are trying to do. The system would have the ability to capture, record, maintain and reuse users' gesture information to anticipate users needs.[86] In the perspective of cultural reinterpretation, this advance, automatic

and highly adaptable interactive platform would immerse users into a highly mediated environment filled with rich cultural essences. Participants would be able to experience a different cultural form through a new method relied on the 'role play' communication by body movements associated with visual/audio contents. This would provide participants with a more intuitive grasp on cultural essences and a more engaging experience that goes beyond the customary reading and observation method. Through the Gesture User Interface, the interactive process would stage the cultural reinterpretation as an active engrossing performance. This would take the user experience to the next level in diverse future research, educational or entertainment projects.

In my discussion of diverse art experiments and projects including my own practices, I have shown that digital interactive art is first of all a natural progression of digital technology that has shaped the form and expressive language of contemporary art. In such artworks, interactive experience becomes the major aesthetic interest of artists and the resource from which many draw their inspiration. Artists seek the path where technology and art meet, and at the same time create diverse artistic expressions for public presentation. This process has influenced the tendency of contemporary art, and shifted it away from being gallery-oriented and self-expressive to be more audience-oriented and interactive. For instance, a digital interactive artwork is no longer restricted by the common boundaries of fine arts. Digital art has been recognized progressively by people as an interdisciplinary project with public participation and interaction.

When digital interactive technology was first introduced to the public, it was considered as a new interface of human-computer communication. This interface has since developed to provide innovative ways for people to acquire information, and

the traditional notion of digital media has changed on a deep level. Digital media is no longer perceived simply as the output of cold machines, but as a platform where people are able to develop a dialogue with computers, in a real time send-receive loop of information. This is the primary difference between digital interactive media and traditional forms of art, and forms the basis for creating new forms of artwork.

Artistic expression is a two-way conversation in digital interactive art: artworks and their audiences engage in a dialogue. In this sense, people shift from being spectators to participants in artistic activities. A digital interactive artwork constantly changes as a participant interacts with it. The meaning and the form the artwork constantly develops, depending on the participants' actions. This provides artists with a much broader space for creation and inspiration, and offers participants dynamic mediated experiences, which go beyond the former boundaries of the visual arts.

Therefore, from a broader point of view, digital interactive art should not be studied isolated from the perspective of visual art; rather, such an inquiry must be instigated across multiple disciplines. Yet, as I argued, the mediated experience generated by these artworks must be the central issue of our focus. This is the connection that links human and computer, as well as technology and art.

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[2] Immanuel Kant, *Critique of Pure Reason.* Translated by Werner S. Pluhar. (Indianapolis: Hackett Publishing Company, Inc, 1996), 71.

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[16] Ibid. 47.

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[18] Ibid. 27.

[19] Ibid. 42.

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[23] Ralph Schroeder, *Being There Together: Social Interaction in Virtual Environments* (New York: Oxford University Press, 2011), 14.

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[40] Ibid. p. 5.

[41] Ibid. p. 5.

[42] Ibid. p. 5.

[43] Wikipedia, Fourth wall, http://en.wikipedia.org/wiki/Fourth_wall

[44] Ibid. p. 28.

[45] Ibid. p. 28.

[46] Ibid. p. 29.

[47] Ibid. p. 29.

[48] Ibid. p. 105.

[49] Ibid. p. 106.

[50] Ibid. p. 118.

[51] Ibid. p. 119.

[52] Ibid. p. 242.

[53] Ibid. p. 245.

[54] Ibid. p. 240.

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