Video Screen as Matrix of Sensations

A Multisensory Approach to the Artistic Development of Responsive Video Membranes

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ABSTRACT

Video Screen as Matrix of Sensations
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The immateriality of moving-images is manifest on a plethora of surfaces, shapes, and formats. Artists have access to an abundance of tools and mediums to develop different forms of interactivity between the body, media, space, and time. Thus, artists have been pushing the limits of both the virtual and the physical worlds, expanding and transforming the static, two-dimensional frame while attempting to escape completely from it. But, what if the video screen was to evolve into a responsive video membrane specifically designed for moving images? How could this catalyst of sensations push creativity forward? And how would people embrace this form of visualization as it moves them even closer to its subject?

In addition to involving an interdisciplinary inquiry into the artistic development of two responsive video membranes for projected moving images, this doctoral research comprised the study of different forms of social interaction with video screens. It explored the role of the senses and questioned how the elements of the screens' materiality, interactivity, and spatiality can alter perception and augment an individual's sensory, affective, and cognitive experience of a moving image.

Finally, using the method of sensory ethnography, it examined how participants respond to different forms of representation. The primary aim of this study is to define a multisensory approach to the design of responsive video membranes that will intensify participants' experience of the presented moving images by responding to them both conceptually and physically. This realization emerges from studies in the fields of fine arts, anthropology of the senses, computer science, and mechanical engineering.

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Table of Contents

Introduction: Evolving Screens

How the world is framed may be as important as what is contained within that frame.[1]

– Anne Friedberg

Video screens are ubiquitous in both private and public spaces, and their proliferation makes a significant impact on people's lives. Interactions with video screens have become so strongly ingrained in today's culture that they have transformed and framed the way people perceive the world.

Since the first film projections in the 1890s, a certain tension has emerged in the dialogue between the materiality of the screen and the virtual space it offers. For decades, artists have been inspired by this continuous interplay between the tangible object and the virtual, untouchable subject.[2] In 1902, the short *Film within a Film*, *Uncle Josh at the Moving Picture Show,* directed by Edwin S. Porter, portrayed the spectator's confusion between the on- and off-screen realities.[3] This film depicted a genuine parody of the earliest cinema experience, such as that which occurs in the 1895 film by The Lumière brothers, entitled *L'Arrivée d'un train en gare de La Ciotat.* Specators watching that film were frozen in panic because of the moving image of a steam locomotive coming directly toward them. Such embodied experience was extremely visceral for the audience members despite the fact that they were comfortably seated in the darkness of the theater. The borders between the physical space surrounding the screen and the space within the screen became even more blurred and indeed began to fade away with

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[1] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 1.
[2] Friedberg, *The Virtual Window*, 59.
[3] Ibid., 58.

the avant-garde films. For instance, Maurice Lemaître of the Lettrism Movement introduced the S*yncinéma* with his 1951 film, *Le Film est déjà commencé?* Lemaître offered the audience a completely immersive experience, whereby unexpected events happened as soon as visitors entered the lobby of the theater. A voice-over informed the audience of upcoming disruptions that were actually happening simultaneously. For example, water and talc were thrown on people waiting outside the theater, at which point they were all quickly encouraged to enter and have a seat. After a series of gunshots and loud voices, Lemaître began to physically tear up the screen. The police, who were present both on and off screen, promptly interrupted this captivating moment. Lemaître, who had meticulously planned the unfolding of each action, was offering spectators more than just a cinematic projection; it was also simultaneously a lived performance. With such a situation, Lemaître was questioning the role of the screen, as well as the limits of the interactivity between both on and off screen realities.

Today, more than ever, we are living within the optical illusions that screens create. As we have entered the era of materials with built-in sensing, processing, and actuating systems, screen responsiveness has reached another level of complexity. From the cathode ray tube computer screen to today's dexterous interactive multi-touch technology, static viewers have shifted into being active participants, and fixed moving-image frames have evolved into mobile devices, that vary in sizes and accompany people everywhere. The continuous progress of video projectors and displays demonstrates how new forms of communication stimulate humans, but at the same time raises concerns about the ways in which each invention interprets and alters reality.

Anthropologists of the senses, such as David Howes and Constance Classen, have drawn a sensory profile of Western culture that has reinforced today's understanding of the supremacy of audiovisual devices. In addition, some theorists have discussed the numerous effects caused by such technology. For instance, the modern media culture theorist Anne Friedberg considers that a video screen acts as "an organ of perception"[4], as spectators are continually guided through framed images, and in such a context, human perception is therefore constructed differently. But what if that screen was to evolve to become a sensible surface, a responsive video membrane that could react physically and conceptually to the presented moving images, while simultaneously interacting with participants? What if that video membrane referred to a metaphoric skin that mediates information, forming multisensory filters for both the physical and virtual worlds? How would people embrace this form of communication as it moves even closer to its subject?

To explore these questions, I have elaborated a trans-disciplinary research to define a multisensory approach to the artistic development of responsive video membranes designed to enhance people's experience of select moving images. Additionally, this study investigates how these membranes could be multifunctional, enabling the elaboration of artistic concepts and allowing the entire environment to move even closer to the subject, both the audience, as well as the presented content. It also concentrates on possible design issues, which were generated by the exploration of the ways in which the screen's materiality, interactivity, and spatiality can alter an individual's perception and how these properties are important factors in the

[4] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 1.

appreciation and understanding of screen-based installation art. Thus, a significant aspect in realizing the goal of this exploratory research is to include both an artistic production and a stage of case studies.

First, the artistic production implies the conceptualization, design, and fabrication of two responsive video membranes, as well as the interactive systems in which they are integrated. This creative process is followed by a stage of observations, in which targeted participants are invited to experience these unfamiliar environments and interact with the specially designed responsive video membranes. The artistic development of these two interactive systems allows the exploration of the various ways in which participants respond to and position themselves in relation to the properties of the video membranes within the context of an art exhibition. People's reactions are observed and analyzed using the method of sensory ethnography.[5] A key aspect of this research is an integrative collaboration between existing studies in the fields of digital arts, anthropology of the senses, computer science, and mechanical engineering, as discussed in the literature review, Chapter 1: *Multifaceted Screen*.

In this chapter, the focus is on acquiring extensive understanding of the moving-images screen's place in society throughout its history. From cinematic projections to televisions to mobile devices, the screen's characteristics are questioned, its technological evolution is traced, and the different forms of sensory responses toward screens are analyzed. This chapter also probes how artists have sought to extend the limits of video projection and screens since the 1960s. Artists such as Stan Van Der Beek,

[5] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003), 1-248.

with the revolutionary *Movie-Dome,* or Otto Piene and Elizabeth Goldring, with the retinal display of *The Visitor's Eye,* have redefined the screen through both its technological evolution and social history. A series of video installations is explored to demonstrate how the use of sculptural, architectural, and robotic structures as video surfaces has completely (re)materialized the interactions between bodies, sight, and interface. These topics are all examined within three distinct registers: spatiality (how do individuals experience and understand the illuminated screen, as well as its setting and environment?), temporality (what kind of interactivity can be defined between moving images, screens, the body, and space in relation to time and duration?), and qualitative characteristics (how do shape, format, material, and luminosity influence perception?). The creative processes and artistic expressions are studied, while questioning, how the video displays in these art installations have conveyed different visual identifications.

A section on interactive systems follows the review on screen-reliant installation art. In this segment, the experiential issues of my past interactive video systems are described briefly, including *Plato's Cavern* (2000), followed by *Cycle* (2001), *Passage* (2002), *Silence Inexistent* (2002), *Octopus* (2003), *Formica* (2004), *Vita* (2005), *Illusio* (2006), *Underlayers* (2006), and *Telematic Exchange* (2007). Discussing the artistic content of these systems allows to clearly points out the venue of exploration for this research, while keeping in mind my previous experiences. How different are the proposed responsive video membranes? How has my work evolved since 2000 and how does it furter inform the proposed artistic production of this study?

This section is followed by a segment on design research, which discusses the

different kind of possible dynamic systems in which the responsive video membranes could be integrated. It also investigates the advancement of smart and sensory materials, which could be used for the development of responsive video membranes. From tactile media to flexible organic light-emitting diode (LED) displays, this section discusses their formats, transformation, and responsiveness.

Finally, in order to propose a multisensory approach to the design of responsive video membranes, it is essential to review existing theorized multisensory approaches to creative processes in design, such as the model suggested by Rick Schifferstein, Robert Persig, Francis McGlone and Keith V. Nesbitt.

Chapter 2 then sets out the problem statement and establishes hypotheses, based on the research context presented in Chapter 1. It indicates how statistical projections have arisen daily, showing that people have less time to directly interact with the tangible world without experiencing it through screens. Thus, this chapter investigates how, when experiencing moving images, the senses are stimulated and affected differently in response to the properties of the video screen. With its ongoing development, there are numerous questions that should be asked. For instance, how can screens heighten people's experiences of moving images without leading to sensory domination? This chapter scrutinizes the main questions of this research on the multisensory approach to the artistic development of responsive video membranes.

Chapter 3: *Methodology*, is divided into two sections: artistic production and case studies. It primarily discusses the multisensory approach used in the design of the responsive video membranes for the *XIA* and *CEREUS* systems. The second section then

focuses on the sensory method used for the execution of the two case studies: one based on the *XIA* system, exploring the screen's materiality, and the other on *CEREUS*, questioning the screen's spatiality and interactivity. Details regarding the sensory ethnographic methods employed, as well as the process of each experiment, are also defined.

Chapters 4 and 5 describe the elements of each artistic production in detail. From conception to realization, the design's origin, and creative processes, as well as the multisensory methods used, are thoroughly discussed. This section also explores their systems and how the senses are engaged in these video installation art exhibitions. It presents the way in which the interrelationship between the visitor's bodies, the projected moving images, the responsive video membranes, and the abstract sounds of the environment, is built. It, then reveals the results of the accumulated data from both case studies.

Chapter 6 interprets the analysis and explains the results in detail. This chapter investigates how video screens remodel both people's physical and sensory experiences while revealing the interconnectedness of mind and body, temporality and spatiality. The importance of body language, nuance, and details are thoroughly examined with regard to the results of the visitors' experiences within the *XIA* and *CEREUS* systems. This chapter discusses how all details affect the road to perception in capturing reality and the essence of the sensible itself, as Francois Laplantine demonstrated in his book entitled *Le social et le sensible introduction à une anthropologie modale.* The results of this

research provided meaningful and informative guidelines for artists, curators, engineers, and industrial designers.

Finally, Chapter 7 concludes with a defined multisensory approach to the design of responsive video membranes and demonstrates how those membranes specifically elaborated can augment an individual's sensory experiences of the presented moving images. This chapter explains how the screen has the ability to change the face of reality. In addition, it offers extensive knowledge of how a screen's materiality, spatiality, and interactivity influence the perception of the visual presented within it, more precisely in the context of art exhibitions. Lastly, it discusses how video screens can be designed as matrices of sensations or transmitters of somatic experiences.

In a world composed of grids that divide digital images into arrays of discrete pixels, how could the senses be stimulated differently when experiencing moving images through a designed responsive video membrane? According to the philosopher Jean-Francois Lyotard, the matrix must be "beyond the visible, one that is out of sight, invisible, capable of joining logically incompatible elements."[6] What type of experience would these grids generate? Could they offer an augmented multisensory experience and, if so, what are the influential factors of such sensory responses?

[6] Sabine Eckmann and Lutz Koepnick, "*[Grid<>Matrix],* (Screen Arts and New Media Aesthetics. Washington: Mildred Lane Kemper Art Museum, 2006), 27.

Chapter 1: Multifaceted Screens

Technology incarnates the dreams of the world we have built and in so doing, tells the story of who we are and who we imagine ourselves to be.[7]

— Robert D. Romanyshyn

As luminous veils, grids, and virtual windows, video screens are continuously being redefined. It is now possible for moving images to be projected onto a plethora of surfaces, shapes, and formats. According to artist Gregory Chatonsky, the entire world is becoming a surface capable of receiving video projections.[8] How do people understand, define, and experience such surfaces? And how has the screen's technology and evolution modified the perception of moving images?

Today, users switch from the cell phones screens to computer screens, navigating their rectangular perimeters with ease. The ability to touch a visual display to explore virtual space has revolutionized people's senses. However, does this responsiveness affect the perception of the presented images?

The development of screen technologies has allowed artists access to an abundance of tools for creating different forms of interactivity between the body, media, space, and time. Therefore, artists have pushed the limits of both virtual and physical worlds, expanding and transforming the static, two-dimensional frame and sometimes trying to escape it altogether. But what if the screen were to evolve into a responsive video membrane specially designed for specific moving images and environment? How could this catalyst of sensations push creativity forward?

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[7] Robert D. Romanyshyn, *Technology as Symptom and Dream* (London: Routledge, 1989), 13.
[8] Gregory Chatonsky, "La repetition des limites," in *Proliferation des Écrans*, ed. Poissant Louise and Tremblay Pierre (Collection esthétique. Presses Université du Québec, 2006), 95.

To contextualize these questions and research in the broader literature on the artistic development of responsive video membranes, the literature review is divided into five parts: video screens, screen-reliant installation art, interactive video systems, design research and multisensory approaches.

1.1 Video Screens

Modern Western culture is the culture of the eye.[9]

— Constance Classen

This section starts with an introduction to video screens, examining how screens have been discussed and identified by media-culture theorists such as Ann Friedberg, Lev Manovich, and Marshall McLuhan, by media-art historian Kate Mondloch, and by psychologist Robert D. Romanyshyn. It is followed by an outline of the origin and evolution of screen technologies from theater screens to television sets, computer monitors, mobile devices, and hybrid displays.

Lastly, this section also investigates the senses that are engaged by the action of experiencing video screens while simultaneously examining the possible multisensory effects that this action may trigger. This investigation was based on theories such as those by anthropologists Constance Classen, David Howes, and Jojada Verrips, art historians Patrizia Di Bello and Chris Meigh-Andrews, media theorists Laura U. Mark, Marshall McLuhan, and Vivian Sobchack, and philosopher Dominic M. Lopes. In addition, it discusses the perceptual condition of mixed sensations and cross-modalities

[9] Constance Classen, *The Color of Angels. Cosmology, Gender and the Aesthetic Imagination* (London: Routedge, 1998), 1.

experiences based on literature by art historian Kathleen Forde, neurologist Richard Cytowic, and scientific researcher Cretien Van Campen.

1.1.1 Defining Video Screens

Artists have delineated moving-images displays as sculptural, architectural, and robotic, and they have re-structured its continuous interplay with bodies, media, and space. According to Kate Mondloch, it is the video's interface, the screen itself, that is the key factor in the embodied experience of any screen-reliant installation art.[10] Marshall McLuhan claimed that all media technologies are metaphors for transmission and, therefore, the transformation of experiences.[11] The relationship between the physical space that viewers occupy and the three-dimensional space enclosed by the screen is often questioned. For Lev Manovich, the video screen is "a window into the space of representation that itself exists in our normal space."[12] Yet, in the mid-15th century, Leon Battista Alberti first theorized that windows were frames of narrative representation in his book, *Della Pittura*.[13] Alberti taught painters "to *regard* the frames of rectangular paintings as opened windows"[14] through which they could offer a view into another space. In light of that theory, windows become a metaphor for screens, eventually appertaining to film, television, and computers, as proposed by Friedberg.[15] On the other hand, architectural windows are not only open views into other spaces.

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[10] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis: The University of Minnesota Press, 2010), 15.
[11] Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge: The MIT Press, 1994), 7-22.
[12] Lev Manovich, *The Language of New Media* (Cambridge: The MIT Press, 2002), 103.
[13] Leon Battista Alberti, *On Painting and on Scultpture: The Latin Texts of De piccontuatur*, Trans. Cecil Grayson, (London: Phaidon, 1972), 55.
[14] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 1.
[15] Friedberg, *The Virtual Window*, 11.

They are also perceived as barriers: a separation that protects viewers but also isolates them from the other world, providing a sense of distance as well as detachment. In relation to Robert Romanyshyn's theory, the window implies an insoluble boundary between "the perceiver and the perceived."[16] He explained: "Ensconced behind the window, the self becomes an observing *subject*, a *spectator* as against a world, which becomes a *spectacle*, an *object* of vision."[17] Romanyshyn also considered the window "a grid, fragmented self, analyzable parts where the spectator has gone into analysis."[18] Yet with the screen's continuous technological development, how has it been classified throughout its evolution?

Lev Manovich defines a screen's topology as being *classic, dynamic,* or *real-time*.[19] For him, the *classic screen* is a flat rectangular surface—a space for static images that compels a frontal viewing, such as the canvas of a painting or the paper on which a photograph is printed.[20] With the arrival of moving images by the end of the 19th century, the *dynamic screen* appeared. From the Zoopraxiscope and the Kinetoscope to the cinematic projection, television, and today's video, the screen has become a space for images that change over time, which according to Manovich requires a certain "viewing regime"[21] as a consequence. As we entered the era of telecommunications, built-in sensing systems, algorithm processing, and virtual reality, viewers have gradually shifted to being active participants, and the screen's responsiveness reached another

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[16] Robert D. Romanyshyn, *Technology as Symptom and Dream* (London: Routledge, 1989), 42.
[17] Idem.
[18] Romanyshyn, *Technology as Symptom and Dream*, 78.
[19] Lev Manovich, *The Language of New Media*, (Cambridge, Mass.: MIT Press, 2002), 95–115.
[20] Idem.
[21] Idem.

level of intricacy. Finally, Manovich argues that screens became *real-time* screens with immediate imaging, which was first experienced with radar. Thus, from the magic lantern projection to the cathode ray tube once used in television to the organic light-emitting diode display, the ongoing evolution of video screen technologies has provided continuous human stimulations created by this innovative form of audiovisual communication while expressing concern about the way each invention filters the world's reality (the physical space around the screen) and the virtuality (the virtual space offered within the screen).

1.1.2 Screen Technologies

Virtuality has spurred a human fascination that has led to inventiveness. According to Friedberg, that enthrallment inspired the realization of the *camera obscura*, the "device of illusion"[22] that was the first interface to "transferred three-dimensional space of the phenomenal world onto a two-dimensional virtual plane of representation."[23] Throughout the centuries since the *camera obscura*'s invention, the relationship between images and viewers has noticeably changed. Interactions between the virtual and the real worlds have become increasingly convoluted. As soon as moving images began to be projected and transmitted, the rectangular view revolutionized people's perception of the world and became the primary language of communication. In 1895, after the invention of the lantern projection, the Praxinoscope, the Zoopraxiscope, and the Kinestoscope, the cinematic projections appeared and modified the acuity of virtuality, according to Friedberg and Romanyshyn. Movie

[22] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 60.
[23] Friedberg, *The Virtual Window*, 48.

theaters sprang up around the world, presenting moving images that ranged from silent black-and-white films to those with sound and color.

However, with the arrival of the television screen in the 1950s, the film industry was presented with an unexpected competitor. As a consequence, new forms of film projections and theaters were swiftly designed. These included the CinemaScope, which consisted of a rectangular screen 86% wider than the standard ratio; the Cinerama, a 180-degree panoramic curved screen; the drive-in theaters, which was outdoor parking areas with giant screens; and the IMAX, which presented an oversized screen with special projectors and film. In all these formats, an immersive experience was offered to the audience, which was impossible to have within the comfort of their homes with their small TV sets. Only a few decades later, various hybrid displays were conceived for home use, such as the 180-degree *Elumens* vision screen, a reduced version of the Cinerama. In 1990, the *Fog Screen,* "a physically penetrable, flat, and translucent display made of dry fog"[24] was invented in Finland by Ismo Rakkolainen and Karri Palovuori. Thirteen years later, it was produced commercially and made available for both business-oriented, and commercial venues. On their promotional website, the company states that this technology makes "the prospect of virtual rooms and complete virtual spaces possible."[25]

During the same period, a thin, almost invisible 3D holographic film called *Trans Screens*™ was commercialized and used in show business and film effects. These thin,

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[24] "Inventor of the Week Archive: Ismo Rakkolainen," Massachusetts Institute of Technology, July, 2004, http://web.mit.edu/invent/iow/rakkolainen.html.
[25] Idem.

clear, plastic screens captured projected images and give the illusion of moving images floating in space. To create this impression, the images needed to be filmed with certain specifications, such as black background and bright light, to obtain a very high-contrast image. As early as 1935, however, *Mechatronix Magazine* first announced a novel idea for a moving images display. At that time, the concept proposed the projection of moving images via a magic lantern suspended under an autogiro's blades, which formed a screen that filled the sky.[26]

Hovering moving images in space is still a must to creativity today. With the arrival of tactile screens, the user has instantaneous physical interaction with the visual medium itself as if the moving images were floating inside the screen. In 1974, Sam Hurst proposed the first tactile display, a five-wire resistive technology consisting of a surface that detected both the presence and position of a touch.[27] Thirty years later, touch-screen technology flooded the market. Pervasive in modern society, tactile or not, these electronic displays all offer rectangular-shaped images frames. This shape is principally the result of the external control of the pixels, which is only possible at the vertical and horizontal intersection of the electrode configuration with liquid crystal display technology (LCD).[28] In the early stages of television's development, all screens were designed with rounded corners, if not completely circular, as was the first Zenith 16-inch diameter cathode ray tube technology, a round viewing screen encased in a wooden cabinet. However, rectangular screens became so ubiquitous that in 2007, it

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[26] *Mechatronix Magazine*, 1935.
[27] "Who Invented Touch Screen Technology?," *Inventors*, 2013, http://inventors.about.com/od/tstartinventions/a/Touch-Screen.htm
[28] "Toshiba Mobile Display: News and Event," October 17, 2007, http://tmdisplay.com/tm_dsp/press/2007/07-10-17.html

was considered revolutionary when the Japanese to proudly announced the design of a high-resolution circular LCD that used low temperature poly-silicone (LTPS) technology,[29] allowing for the development of new shapes of flat screens. Two years later, entirely round screens were found on a few mobile phones and global positioning system (GPS) devices. Today, circular video screens can be compelling and seem completely innovative, yet their widespread acceptance has been lacking, as has their market presence. Recently, the organic light-emitting diode displays (OLED) have dominated the headlines in scientific news. These flexible organic sheets of video can be rolled up without distorting the moving images. Such materials have awakened the imaginations of many designers and inventors, all searching for innovative applications for these screens technologies.

Video projectors have also evolved, becoming more accessible, versatile, reliable, mobile, and capable of creating sharp, bright images of almost any size. In 2009, the market was readying to launch micro laser video projectors, such as the MicroVision PicoP display technology, which was no bigger than a quarter and offered high-contrast, vivid colors, and projected images always in focus. Today, a few cell phones have integrated this technology, which will soon become the mainstay of a large variety of electronic devices. With such advancements in video projectors and 3D multimedia, as well as 4k definition screens,[30] researchers have developed a series of sensory room

[29] "Toshiba Mobile Display: News and Event," October 17, 2007, http://tmdisplay.com/tm_dsp/press/2007/07-10-17.html
[30] "4K resolution," Wikipedia, last modified October 8, 2013, http://en.wikipedia.org/wiki/4K_resolution

displays that completely immerses the audience. A simple presentation becomes a unique exhibitions that covers the space from floor to ceiling.

Moreover, with the recent popularity of the use of video projected on buildings, moving images have transformed architecture's immobility, virtually making works of construction come alive by changing color and shape instantaneously. The idea of large-scale floating images has been pushed forward with a series of giant video projections, which have been used on numerous famous public sites all around the world. In this way, 3D urban video projection mapping brings the virtual closer to the real world. However, despite the different formats and technologies used, video screens often simply represent a variety of surfaces that transmit, reflect, diffuse, or infuse light, whether or not the moving-images are interactive.

More rare is when screens are designed in direct relation to the presented moving images themselves, conceptually, physically, or both. Such consideration of technologies like fog screens, transparent film, and flexible sheets leaves one wondering how each screen's technology differentially affects people's experiences of the visuals presented. Do they offer any distinctions other than their format and materiality? Are the senses stimulated differently in relation to their setting and materiality? If so, do they engender augmented sensory responses? The next section considers some of these questions.

1.1.3 Sensory Responses

In modern society, people experience the world through a proliferating series of rectangular frames. Perception is culturally inflected by these frames, which in turn help to structure people's physical existence. Whether informative, inspirational, or

destructive, the frames may be as important as the images presented within them, according to Ann Friedberg.[31] As communicative vehicles, they affect individuals both emotionally and psychologically, influencing their perception of the world. In his book, *What Pictures Want,* W. J. T. Mitchell questions what images should aim to accomplish, rather than what they already do. Mitchell examines how traditional behaviors towards images function in today's society. He asserts that pictures "present not just a surface but a *face* that faces the beholder."[32] He even defines images as having their own intelligence, and he warns people to reevaluate the power of images and question their morals and desires. However, what happens when the frame presents moving images? How should people perceive audiovisual representations of a world in continuous motion?

The invasion of the modern home by televisions has reinforced the hegemony of vision within society, and its reach into people's lives has had a profound influence on the ways of living. Constance Classen discusses how difficult it is to think outside the realm of vision, which has come increasingly to dominate the senses since the Enlightenment.[33] However, she also examined the desire to adopt alternative models of perception and interaction, even though the visual aspect is so deeply ingrained in Western social customs.[34]

In response to the omnipresence of video screens, many have theorized about the screen's place and sensorial effects on people's perception of the world. For instance,

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[31] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 30.
[32] William J. Thomas Mitchell, *What Do Pictures Want?* (Chicago: The University of Chicago, 2005), 30.
[33] Constance Classen, *The Color of Angels. Cosmology, Gender and the Aesthetic Imagination* (London: Routedge, 1998), 109-160.
[34] Idem.

tactility could be considered implicitly part of the video screen experience by virtue of the light touching people's eyes, as Patrizia Di Bello points out with respect to photography.[35] For Classen, "pictures might convey tactile value not only through their subject matter but also through their representational style."[36] For example, Classen notes the way images of flesh, sumptuous textural materials, or those offering a certain sensation of proximity or intimacy, evoke a tactile appeal.[37]

Examining a similar phenomenon, Laura U. Marks stated that touch does plays a large role in the action of looking at particular moving images.[38] She proposed a theory of "haptic visuality" for tactile memories, referring to an embodied spectatorship.[39] Marks is interested in how such films and videos evoke memories through non-visual knowledge. She reviews various films and videos produced by young filmmakers from minority groups in the United States, Canada and Great Britain, and focuses on how they experiment with presenting cultural history and memory by means of embodied experiences produced through a fusion of the senses. She demonstrated how some images and sound can be haptic as well as how they can embody cultural memory by awakening memories of touch: a "haptic visuality for tactile memories."[40]

For other theorists, the sense of touch is always implied in every action, as Jojada Verrips has argued.[41] For him, people are physically touched when watching any

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[35] Patrizia Di Bello, ed., *Art, History and the Senses* (Farnham: Ashgate, 2009), 1-14.
[36] Constance Classen, *The deepest Sense, A cultural history of Touch,* (University of Illinois Press: 2012), 126.
[37] Idem.
[38] Laura U. Marks, *The Skin of the Film: Intercultural Cinema Embodiment, and the* Senses (London: Duke University, 2000), 127-193.
[39] Marks, *The Skin of the Film*, 145-153.
[40] Ibid., 162.
[41] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 14.

moving images. They experience an actual bodily sensation, rather than merely being passive viewers. Verrips' explications of such multisensory responses are understood as part of the fundamental haptic quality of film and part of the unique tactility of the medium.

This stance is contrary to the position taken by Marks, who argued that only some specific moving images involve the sensation and memories of touch. For Verrips, video screens must be referred to in the context of embodiment. He emphasized that the "world is known through the touch of the cornea of our eyes, the touch of the tympanum in our ears, of the receptors in the mucous membrane of our nose, of the papillae on our tongue, of the sensors in our skin and/or of our whole body."[42] However, this theory is not universally accepted.

The anthropologist David Howes suggests that in order for the eyes to be "touched" in the way that Verrips uses the term, there must be physical contact.[43] He provides the example of the haptic-thermic modulation of vision in the Basinjom cult in Nigeria, in which a person's eyes are touched lightly with a knife and submerged with hot drops placed in the eye. This example of "cultural modulation of perception"[44] involves no dominance of one sense over another and demonstrates the importance of the relationship between the senses. Howes also discussed the interactions among the fragrances, songs, and designs used in Shipibo-Conibo healing rituals, as well as the associations among scent, taste, hearing, and seeing in the Japanese incense guessing

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[42] Verrips, "Haptic Screen and our Corporeal Eye," 14.
[43] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[44] Idem.

game, the Kodo.[45] For him, such multisensory situations could not be expressed and understood via audiovisual technologies. These technologies completely "exclude the other sensory phenomena and present cultures as purely visual and auditory manifestations."[46] In the same school of thought, Dominic M. Lopes has argued that touch and sight are two different senses and two separate doctrines, and there is no such thing as a tactile image. He strongly believes that "tactile pictures are *terra incognita*."[47] For Verrips, however, the fact that screens are automatically associated with only vision is "a culturally biased, superficial, and confined association."[48] Art can touch the body in the same way people can physically feel something they see, argued Verrips.[49]

In contrast, Vivian Sobchack is of the view that these sensory manifestations differ in relation to the type of representations. In her article "The Scene of the Screen," she discusses the difference between the cinematic projection and electronic displays. She demonstrates that each radically informs and orients people's social, individual, and bodily existences differently.[50] For instance, Sobchack claims that cinematic projections, in reference to a film presented within a movie theater, offer the audience a bodily experience that engages all the senses, writing that the "spectator can alter the film's

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[45] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[46] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003), 6–8.
[47] Dominic M. Lopes, "Art Media and the Sense Modalities: Tactile Pictures", *The Philosophical Quarterly* Wiley-Blackwell. Vol. 47, No. 189 (Oct., 1997): 7.
[48] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 14.
[49] Jojada Verrrips, "Offending art and the senses of touch," *Material Religion*; Vol. 4 Issue 2 Academic Journal, (2008): 6.
[50] Vivian Sobchack, ''The Scene of the Screen: Envisioning Cinematic and Electronic 'Presence,'' in *Materialities of Communication*, Ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Stanford: Stanford University Press, 1994), 83–106.

temporality and easily possess, at least, its inanimate 'body.'"[51] She further argues that "cinematic projection exists as a visible performance of the perceptive and expressive structure of lived-body experience"[52] which, according to her, is impossible with electronic displays. In this argument, all electronic devices that can display video are of a disembodied nature.

Like Verrips, others—such as Chris Meigh-Andrews—have argued electronic screens such as television do includes a maximal interplay of all the senses.[53] Marshall McLuhan also insisted that all audiovisual devices trigger multisensory experiences that combine the senses, as the "television image is a haptic, tactile, or synesthetic mode of interplay among the senses."[54]

In this view, the screen could be considered a catalyst of sensations and synesthetic-like responses in which one sense directly triggers another, such as sight and smell, touch and sound. Processing one sense through another is known as *synesthesia,* or cross-modal experience. Van Campen's studies on synesthesia illustrated the way in which perception is the result of the experience of all senses mingled together.[55] In fact, numerous artists have explored the psychological, perceptual, and emotional influences of such sensations. Among the Symbolist poets, Baudelaire and Rimbaud are well known for their unpredictable associations entailing various sensory modalities. For

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[51] Vivian Sobchack, ''The Scene of the Screen: Envisioning Cinematic and Electronic 'Presence,''' in *Materialities of Communication*, Ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Stanford: Stanford University Press, 1994), 83–106.
[52] Idem.
[53] Chris Meigh-Andrews, *A History of Video Art: The Development of Form and Function* (New York: Berg, 2006), 1-318.
[54] Marshall McLuhan, "Inside the Five Sense Sensorium," in *Empire of the Senses: The Sensual Culture Reader*, Ed. David Howes, (Oxford, New York: Berg, 2005), 44.
[55] Cretien Van Campen, *The Hidden Sense: Synesthesia in Art and Science* (Leonardo Books, 2006), 97.

example, in the 1857 poem entitled "Correspondences," Baudelaire writes :

> "Vast as the dark of night and as the light of day,
> Perfumes, sounds, and colors correspond.
> There are perfumes as cool as the flesh of children, […]"[56]

These words trigger visual images, constructed with sensory metaphors and with the mix of color, sound, and odor.

Neurologist Richard Cytowic has argued that "synesthesia proper should be understood as an *involuntary* cross-modal association, triggered by some range of sensory events in one modality."[57] Yet Van Campen's studies on synesthesia demonstrated that "recognizing the concept of sensory channels can change our view of the human mind, and possibly of the physical world."[58] With this definition of synesthesia, it could be argued that moving images can certainly elicit sensory memories, imagination, associations, and experiences. These responses can drive the creative process, posing such questions as how unusual surfaces could influence the aesthetic understanding of the video projected onto it and transform audiovisual experience through the involvement of other senses. The next section will explore such questions in a discussion of screen-reliant installation art, where video displays are used as objects of meaning and sensations, evoking memories of those very senses. Integrated with robotic or achitectural structures and immobile sculpture, these displays transcend the familiar rectangular frame and present an innovative form of moving images.

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[56] William Aggeler, *The Flowers of Evil* (Fresno, CA: Academy Library Guild, 1954), 25.
[57] Kevin B. Korb, *Synesthesia and Method* (Australia: Monash University, 1995), Section 2.1.
[58] Cretien Van Campen, *The Hidden Sense: Synesthesia in Art and Science* (Cambridge: Leonardo Books, 2006), 7.

1.2 Screen-Reliant Installation Art

From movie screens to television sets, from video walls to PDAs, screens literally and figuratively stand between us, separating bodies and filtering communication between subjects.[59]

—Kate Mondloch

Contemporary artists have developed countless strategies to redefine the *classic screen*, explore the *dynamic screen*, and appropriate the *real-time screen*.[60] This section approaches the subject and traces distinct characteristics of artists' works that have expanded and altered the screen's definition. Thus, it is important to consider the screen's materiality, spatiality, and temporality as key factors that influence people's experiences of moving images, as demonstrated by Kate Mondloch.[61] In her book, *Screens: Viewing Media Installation Art,* she discusses how interfaces matter in the embodied experience of video installation art. She begins with an analysis of the work of Nam June Paik, an influential video artist who first introduced the television as a medium for artistic expression. He extensively explored the television in all its forms while questioning the symbiosis between moving images, spectators, and nature. From his screen-reliant installation art *TV Bed (1971)* to *TV Garden* (1974) and *TV Fish (1975)*, Paik stimulated the senses by redefining moving images as being physical objects in space and opening a query on where this media technology is leading people daily.

Decades later, Bill Viola, known for the unique way in which he paid attention to nature and material texture, finally removed the frames from the televisions, showing what is usually invisible, in his installation called *Heaven and Earth (1992)*. Since then,

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[59] Kate Mondloch, *Screens: Viewing Media Installation Art*
(Minneapolis: the University of Minnesota Press, 2010), xxi.
[60] Lev Manovich, *The Language of New Media*, (Cambridge, Mass.: MIT Press, 2002), 95–115.
[61] Mondloch, *Screens: Viewing Media Installation Art,* xi-xxi.

rectangular and framed moving images have been rapidly integrated into countless video sculptures, installations, and types of architecture, exploring different thematics while evoking a myriad of sensory responses.

This literature review on screen-reliant installation art draws a historical line from experimental cinema to today's interactive video installation art. It presents a series of selected video installation art. Included are discussions of architectural video installations by artists Luc Courchesne, Mona Hatoum, Rafael Lozano-Hemmer, Pippilotti Rist, and Bill Viola, closed-circuit video installations by Peter Campus, Dan Graham, and Daniel Neumann, sculptural video installations by Yacine Ait Kaci, Doug Aikten, Magali Desbazeille, David Gordon, Tony Oursler, Daniel Kupfer and Eyal Burstein, Naziha Mestaoui, Zaven Paré, and Alan Rath, and real-time video installations by James Cambell, Ken Goldberg, Lynn Hershman, Julius Popp, Daniel Rozin, Jeffrey Shaw, Christa Sommerer, and Laurent Mignonneau.

In this section, the screen is investigated in three distinct registers. First, it is defined in terms of spatiality, which explores how individuals experience and understand the illuminated screen, as well as its setting and environment. Second, temporality is discussed as the type of interactivity among moving-images, screens, bodies and space in relation to time and duration. Lastly, the screen's material characteristics, such as its shape, format, physicality, as well as its luminosity, are described as factors that influence perception. This section concentrates on analyses made by art historians and art critics, namely Florence De Mèredieu, Sylvia Martin, Kate Mondloch, Françoise Parfait, Christiane Paul, Michael Rush, and Christine Van Asche.

1.2.1 Spatiality

From closed-circuit installations to sculptural, architectural, and real-time video installations, Christine Van Asche investigated their evolution and researched their continous development.[62] She discusses how pioneering artists such as Daniel Neumann, Dan Graham, and Peter Campus redefined space, transforming spectators into users so that their corporeal movements were central to their aesthetic research. As Sylvia Martin explains, Neumann searches for the abstraction of the image and the limited space of both movement and frame.[63] Thus, spectatorship is revised to include the physical experience and its psychological effects while questioning the duality between spatial and temporal components. According to Françoise Parfait, video installations are always performative, regardless of how they are presented.[64] Additionally, for Julie Reiss, the spectator's participation is the essence of any screen-based art.[65] Sylvia Martin notes that when images are projected, a sensation of intimacy is created between the spectator and the artwork.[66] At the same time, when the projection allows people to walk on its moving images, a certain temporal-spatial disorientation occurs, such as in the *Corps étranger* (2004) by Mona Hatoum.

In Hatoum's installation, two thick and tall half-circle walls form a giant cylinder that stands in the middle of the exhibition room and frames the video projection on the floor. This intimate, dark space between the projected images and the circular wall is

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[62] Christine Van Asche, "Aspects historiques et muséologiques des oeuvres nouveaux médias," in *Collection Nouveaux Medias Installation*, Ed. Perez, Annie (Paris: Adagp, 2006), 14-31.
[63] Sylvia Martin, *Art Vidéo (*City: Taschen, 2006), 70.
[64] Françoise Parfait, *Vidéo: Un Art Contemporain (*Paris: Editions du Regard, 2001), 160–163.
[65] Julie Reiss, *From Margin to Center: The Spaces of Installation Art (*The MIT Press, 2001), 3-49.
[66] Martin, *Art Vidéo,* 13-15.

very limited. The video presented was captured by endoscopic cameras, which were inserted into seven holes of the artist's body. This imposing structure gives a sensation of intimacy or privilege to the spectators who penetrate into one of two small rectangular entrances that face each other. In this installation, Mona Hatoum explores the convoluted interactions between both the inner and outer worlds, as well as their apparent borders. She investigates the multifaceted relationship between the space and the sounds heard inside the body and surrounding the camera, as well as those around the screen limited by the structure and those outside the cylinder, framed by the exhibition room's walls. By passing through one of two narrow entrances to the cylinder, the virtual, unlimited dimension presented on the floor unfolds slowly to visitors once they are inside this circular structure.

Other artists, such as Luc Courchesne, strive for the sensation of total immersion, developing surrounding video and sound displays in order to transform perception, surprising people with a virtual world that enfolds their bodies in the material space.[67] On the other hand, *Passage* (1997) by Bill Viola offers a tactile dimension; the spatial configuration prompts the spectators to stand very close to the image, giving them the sensation of touching the image with their whole bodies, according to Florence De Mèredieu.[68] This installation presents a slowed-down video of a four-year-old girl's birthday party projected onto a wall at the end of a narrow, obscure corridor. Viewers are invited to walk one at a time toward the illuminated image, where they completely lose the sense of the physical space as their bodies receive the pulsing light and

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[67] Luc Courchesne, "L'horizon intégral," in *Proliferation des Écrans*, Eds. Poissant Louise and Tremblay Pierre, (Collection esthétique, Presses Université du Québec, 2006), 131-142

[68] Florence De Mèredieu, *Digital and Video Art* (Edinburgh: Chambers, 2005), 84.

themselves become a *dynamic screen*.[69] Immersed, the visitors enter the pixel's grid. "The image is inside your hand rather than in your eye," Bill Viola claimed.[70] For him, the camera is an extension of his whole body, and the visual data is tangible. Parfait discusses the physical and mental disorientation that such installations may trigger.[71] Their attention captured by the luminous screen, visitors often move in the darkness of the exhibition room while keeping their eyes fixed on the luminous images. Their bodies "float" between the reality of the physical space and the virtuality of the screen's space.

Offering a similar immersive experience, a few artists have developed large, outdoor interactive video systems projected on historical buildings, which Rafael Lozano-Hemmer described as "the technological actualization of buildings and public spaces with artificial memory."[72] As a consequence, a distinct tension is constructed between the physical architecture and the virtual space, as these dual architectural layers point out different historical, political, and aesthetic contexts as described by Christine Paul in her book, *Digital Art*.[73] Françoise Parfait further discusses the sensual installation, *Regenfrau – I am called a Plant* (1999), by Pippilotti Rist in which a space is projected onto another space.[74] Rist's work presents a white kitchen cabinet that serves as an oversized surface to receive the projected video of a rainy scene where the artists perform. The juxtaposition of these two distinct environments forms a certain temporal-spatial confusion, which inspires reflection on how the lived space, the body, and time

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[69] Lev Manovich, *The Language of New Media*, (Cambridge, Mass.: MIT Press, 2002), 95–115.
[70] Françoise Parfait, *Vidéo: un art contemporain*, (Paris: Editions du Regard, 2001), 246.
[71] Françoise Parfait, "Installation en collection", in *Collection Nouveaux Medias Installation*, Ed. Perez, Annie (Paris: Adagp, 2006), 51–55.
[72] Christiane Paul, *Digital Art* (London: Thames & Hudson, 2008), 72.
[73] Paul, *Digital Art, 1-124.*
[74] Françoise Parfait, *Vidéo: un art contemporain*, (Paris: Editions du Regard, 2001), 136.

are framed together in such an experience.

In contrast, Tony Oursler explored space in another manner in his installations. Human faces are projected onto the heads of anthropomorphous handmade dolls strategically placed in the exhibition space. Whether hidden under a stairway, squeezed into the corner of a decorated mattress, positioned on a stack of used, ornate floral pillows, hidden in open, dusty luggage, or installed within the ceiling structure of a museum, these puppets perform, grind, or snivel quietly in their loneliness. Therefore, visitors enter a theatrical scene and shift their roles involuntarily to those of active actors, with everything staged according to the artist's rules. Oursler offers both imaginative and open-ended environments where spectators are in two spaces, both "here, embodied subjects in the material exhibition space, and there, observers looking onto screen spaces,"[75] as Kate Mondloch said of screen-reliant installation art. For instance, in Oursler's work *Insomnia (1997)*, the spectators are restrained to a frontal view from a determined distance in order to observe the bawling character. Composed with a stack of pillows touching a wall on one side and delimited by the tiny projector installed on a delicate tripod on the other, the work uses a domestic setting to control the spectators, who are not allowed behind the pillow's pile or between the projector and the screen, but are only permitted to stand in front of the projector. This formal setting creates an invisible frontier between the tripod and the wall, giving the spectator the sensation of witnessing a filmed private moment. Finally, it is important to note that the scene occurs in a daily light environment, as though the character is unaware of the

[75] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis: the University of Minnesota Press, 2010), 62.

time of day, which raises the question of how a specific temporal context can also influence the overall experience of moving images.

1.2.2 Temporality

In order to discuss the various approaches of temporal experimentation, Kate Mondloch reviews a series of media installations, including *24-Hour Psycho* (1993) by Douglas Gordon and *Mapping Studio* (2001) by Bruce Neumann.[76]

In the piece, *24-Hour Psycho*, Douglas Gordon stretches time to its limit by slowing the famous film entitled *Psycho* (1960) by Alfred Hitchcock down to two frames a second, giving it a new duration of 24 hours. He projects that version onto a suspended translucent screen, where quasi-static moving images change very slowly over time, creating a swayed sensation of anxiety. As Michel Rush emphasized, "Gordon played with viewers' expectations as well as their memories and fear."[77]

In *Mapping Studio,* Bruce Neumann recorded seven sections of his own workshop during 42 nights and projected that video onto four semi-transparent walls, creating an enclosure. Surrounded by these static screens, spectators are faced with long periods of almost complete inaction. Mondloch observes that spectators feel a sense of autonomy in these installations as they can determine how much time they will spend with these works, influencing their overall cinematic experience.[78] They are free to walk in and out anytime, breaking the linearity that film often imposes.

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[76] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis: the University of Minnesota Press, 2010), 15.
[77] Micheal Rush, *Video Art* (London: Thames and Hudson, 2003), 172.
[78] Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis: the University of Minnesota Press, 2010), 40–59.

Françoise Parfait points out similar explorations of temporality in her discussion of Doug Aikten's installation *New Skin* (2001).[79] In this work of art, the video screen is composed of an oval board intersected by a 90-degree positioned panel. Each section presents the same video with a slight time delay. Viewers are required to move physically within the space to see each area of the screen, which implies an additional delay.

Objective, subjective, mnemonic, repetitive, closed circuit, and direct—artists create compositions using time in various ways, as Parfait discusses.[80] Media artists incorporate virtual dimensions conceptually such that a work's materiality expands the representational space, its physical space, and its temporal possibilities. This materiality is explored more fully in the next section.

1.2.3 Materiality

In order to draw attention to the particular materiality of a work, artists such as Magali Dezbazeille strategically choose particular surfaces for their video projections. In her work entitled *Table de Sable (2000*), Dezbazeille chose the medium of sand to serve as a skin to the moving images.[81] In her chapter on hybrid video displays, Parfait emphasizes that in this work, "the image is deformed, flows, falls off the rest of the body with the fluidity and plasticity of the sand."[82] Similarly, in the installation *Electronic Shadow* (2003) by Naziha Mestaoui and Yacine Ait Kaci, moving water receives the

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[79] Françoise Parfait, "Installation en collection," in *Collection Nouveaux Medias Installation*, Ed. Perez, Annie (Paris: Adagp, 2006), 50.
[80] Parfait, "Installation en collection," 41–47.
[81] Françoise Parfait, *Vidéo: un art contemporain*, (Paris: Editions du Regard, 2001), 31.
[82] Parfait, *Vidéo: un art contemporain*, 160–163.

animated images, which mingle together and appear to become one unit. Another example is Alan Rath's series of robotic sculptures, cathode ray tube monitors and more recently, liquid-crystal displays built into computerized structures. To explore society's intimate relationship with technology, Rath redefined these monitors by mounting them into anthropomorphic machines, generating digital video of moving human body parts, such as tapping fingers, a jutting tongue, or a blinking eye. In this case, Rath's machine-beings are "icons that represent both continuing human dilemmas and nascent cyberquestions,"[83] as curator Louis Grachos describes. Scientist Murray Gell-Mann comments that Rath's robotic sculptures invoke a plethora of thoughts and feelings. For example, in Rath's series of humanized machines, *Soar Eyes* (1994) presents the juxtaposition of a cold aluminum structure to images of warm, yellowish-green filtered eyes on two CRT monitors stripped of their original plastic frames. Leaving the cathode ray tube and the electron guns visible provides the sensation of seeing the optical nerves of a human's eyeball. The digital moving images are vastly textured yet flat, slightly blurred, and almost tangible.

In such works, Rath emphasizes the materiality of each element of his machine beings. He manipulates electronics, video images, structure, and space both as formal and metaphorical components while investigating the symbiotic relationship between humans and machines as well as the implications of this relationship in today's society. According to David Ebony, "The elements in these complex pieces dance together in sensuous rapture or duel without touching in intense mock battles, but they always act

[83] Louis Grachos. *Alan Rath, Robotics,* Ed. Sarah S. King, (New Mexico: SITE SantaFe, 1998), 5.

in accord with their own cyber-sensibilities."[84]

Another example of anthropomorphic robotic machines is the series of robots (1999–2009) realized by Zaven Paré. In contrast to the characters developed by Tony Oursler, the moving images are projected from inside a shape designed for the images. In his pieces entitled *O Observador* (1999) and *Der Jasager* (2002), a projected human's face anthropomorphized the machine. A series of dog's heads imprint the structure in the pieces named El Coloquio de los Perros (2002-2008). Mapping the developed surface, these robotic video sculptures promote a unique anthropomorphic effect and further explore sensory responses as they are confronted with another challenge: to "invent 'physiological' machines, which are endowed with an anatomical depth and why not, capable of showing physical or psychological dysfunctionality"[85] as anthropologist Emmanuel Grimaud observed. The qualitative aspect of this screen-reliant installation art has a different kind of complexity when the moving images and their display respond simultaneously to the changing input received in their environment. For instance, this event occurs when the screen physically modifies its materiality to reproduce a real-time moving image, such as Daniel Rozin's *Mechanical Mirrors* (1999–2008) or Jim Campbell's *Ambiguous Icon* (1999).[86] The video display is no longer passive. Rozin's robotic screens are composed of complex mechanisms, reproducing in real time the video captured by a tiny embedded camera; however, with Campbell's work of art, they are comprised of an LED grid that responds to the received data.

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[84] David Edony, *Alan Rath, Robotics,* Ed. Sarah S. King (New Mexico: SITE SantaFe, 1998), 46.
[85] Zaven Paré, *Cyber Art* (Brazil: Caixa Cultural, 2010), 100.
[86] Gregory Chatonsky, "La repetition des limites," in *Proliferation des Écrans*, eds. Poissant Louise and Tremblay Pierre, (Collection esthétique, Presses Université du Québec, 2006), 107.

Moving in a different artistic direction, Daniel Kupfer and Eyal Burstein developed the *Bubble Screen* (2005), a matrix of bubbles that move through a liquid at various speeds, reproducing programmed moving images. Kate Mondloch observed of interactive real-time screens that, "the spatial relationship between the viewing subject and the screen is redefined. The passivity of the virtual window cannot be taken for granted anymore."[87] This effect is observed in both the *TeleGarden* (1995–2004) by Ken Goldberg and the *Difference Engine #3 (*1995–98) by Lynn Hershman.[88] In *TeleGarden,* web users can view and care for a garden filled with living plants through the ease of their computer screens.[89] In contrast, the *Difference Engine #3* piece was described as an "interactive, multi-user, telerobotic sculpture,"[90] where the architecture of the ZKM Media Museum serves as the template and visitors roam in the museum as the artwork's interface.

Another example of real-time screen based installation art is the *Legible Cities* by Jeffrey Shaw (1988–91). This piece straddles the line between the artwork and the external world; viewers become active participants by navigating the virtual space in real time. Visitors are invited to physically ride a stationary bicycle in order to enter into a journey within a series of projected images of city views. In this case, the images respond to the direct actions of the visitor. Mondloch examines both the ethical issues and forms of interactivity related to these screens, which Manovich calls the *real-time screen*. Whether it is a feedback circuit or a system using surveillance, telepresence, or

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[87] Kate Mondloch, *Screens: Viewing Media Installation Art*
(Minneapolis: the University of Minnesota Press, 2010), 79–92.
[88] Idem.
[89] "Telegarden," Ken Goldberg, 2011, http://goldberg.berkeley.edu/garden/Ars/
[90] Lynn Hershman, "Difference Engine #3,"*Leonardo*, Volume 32, 4, MIT Press (August 1, 1999): 269–270.

telematic technologies, the spatial dynamic of spectatorship is transformed. Florence De Mèredieu wrote: "Spectators can become participants by making themselves part of the machine's workings by becoming an 'organ' of the machine."[91] In such a case, the spectators are essential components of any real-time screens. Artists integrated built-in sensors into their installations to obtain real-time changing data, which is sent to their systems, allowing them to process time, space, and imaging in various forms. For instance, De Mèredieu examines the interactive environment of the work entitled *A Volve (1993-94)* by Christa Sommerer and Laurent Mignonneau. The illusion of a deep pool appears on a touch screen, and virtual amorphous creatures evolve, mutate, and interact with the hand's movement on the screen. De Mèredieu points out that it is "through the real-time calculations of an SGI computer that the automatically animated beings in luminous water assume a physiognomy, and their enhanced plasticity makes them appear to be alive."[92] In this way, *A Volve* represents a classical real-time screen implying genetic art, where visitors interact actively with both worlds: the physical by touching the screen and the virtual by influencing the evolution. Since the 1990s, interactive art environments have proliferated, and the boundaries between virtuality and reality have become less clear. Lev Manovich wrote, "We may debate whether our society is a society of spectacle or of simulation, but, undoubtedly, it is a society of the screen."[93] With real-time screen installations, innovative interactivity is offered to the visitors; yet the screen's materiality is often not considered and is left as simply utilitarian surfaces

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[91] Florence De Mèredieu, *Digital and Video Art*, (Edinburgh: Chambers, 2005), 158.
[92] "Sommerer/Mignonneau «A-Volve»," Media Art Net, 1993-94, http://www.medienkunstnetz.de/works/a-volve/
[93] Lev Manovich, *The Language of New Media* (Cambridge: The MIT Press, 2002), 94.

that receive projected images and diffuse them.

Art historians have demonstrated, as discussed above, that in keeping with the fast pace of technological development, artists have created numerous sinuous paths of exploration and experimentation. Interactive art systems allow spectators to exit from the static two-dimensional rectangular frames while intensifying their relationship with moving images as seen in the next section.

1.3 Interactive Art Systems

The artist first creates the systems of the virtual world . . .
then becomes a gardener within this world he has created.[94]

—Todd and Latham

In digital art—from cyber art to interactive installation art—systems are often comprised of at least three main components: "a person (the participant), a device that can both display and respond to auditory and visual data (the medium), and a suitably-programming environment (the computer)."[95] In such systems, artists aim for the medium to capture visitors' attention and maintain their involvement. What should a medium do as soon as it detects a person? How could the system take into consideration the person's mood as soon as they enter the gallery's space? And what should happen when no visitor is perceived by the system? Such questions are essential when programming the system of any interactive video installation art. According to the programmed environment, when visitors enter an unknown physical or virtual space, they might have the option to become "users" by interacting voluntary with the

[94] Mitchell Whitelaw, *Metacreation: Art and Artificial life*
(Cambridge, Massachusetts: The MIT Press, Mitchell 2004), 56.
[95] Peter Grogono, *Computer Science comprehensive exam, question from Peter Grogono,* (2011).

environment—for example, by moving a mouse, or by turning a switch. Visitors might also automatically shift into "participants"—if they are taking part involuntarily into the alteration of the representation, such as the changing moving-images or the evolution of a noise. In this kind of situation, visitors are influencing the medium's state just by being within the confined environment, without knowing which kind of action triggering such system's behaviors. Lastly, visitors could stay in a passive observation mode being "spectator" if their presence does not affect the medium's current state. The "computer" (or, more precisely, the software component of a system) offers to artists programming environments such as Pure Data and Cycling 74 Max-Msp. With these real-time graphical dataflow programming environments, output messages can be sent to actuators, speakers, and video projectors and can also receive input signals, such as from sensors placed strategically in the room. Thus, the program can send output message for the "medium" to encode. For instance, if the "medium" is a responsive video membrane composed of a mechanical structure, it could change shape or position in response to the input signals received from sensors. Furthermore, the materiality of the "medium," such as an unexpected video surface, might influence the visitor's behaviors and the aesthetic understanding of the video itself, transforming audiovisual experiences by involving other senses, whether evoked by sensory imagination, sensory memory, and sensory accumulated knowledge. Thus, the medium's physicality might also modify the visitor's responses during any triggered mode. How can such medium

keep participants or users involved, and the programming environment, the computer, stimulating them continuously?

This section examines my past interactive video systems and questions how a responsive video membrane can potentially restructure itself in relation to changing signal inputs from both the virtual and physical worlds.

In order to explore these questions, this section analyzes my most recent systems based on literature from art historians and art critics Julie Bélisle, Sophie Bernard, Julie Bouchard, Lynn Crevier, Guillaume Evrard, Marilyse Hamelin, Michel Hellman, Marie-Claude Lacombe, Christine Redfern, Alison Syme, and Isa Tousignant.

1.3.1 Previous Interactive Video Systems (2000–2008)

Humans associate themselves with everything they resemble and respond to whatever mirrors their own reactions. From the Legends of Golem to Leonardo Da Vinci's mechanical man, the human form has long been used to facilitate communication. Modern society continues to create anthropomorphic machines that are flexible enough to do just about anything a human being does and more. In art, the human body often facilitates the expression of emotion, bringing viewers closer to their own perceptions of themselves.

Since 1999, I have developed a series of video systems that translate body language and behavioral patterns of their visitors and explore the intricate interactions between the physical and virtual worlds. These systems juxtapose virtual characters, mechanical structures, responsive membranes, abstract sounds, and digital interfaces to elicit multisensory experiences.

With a background in fine arts and music, I was introduced by the artist Bill Vorn to emerging interactive cinematographic tools during my first year of undergraduate studies in the class of electronic arts at the University of Concordia, Montreal. During my education, exposed to a variety of sensors, microcontrollers, and actuators, I began to develop a focus on forms of artistic expression at the intersections of digital imaging, performances, painting, sculpture, and music. By employing these sensory technologies, not only was my work programmed to mutate over time, but the visitors to an installation also became an integral and influential component of my research on the intricate interactivity between the virtual and physical worlds. I designed computer interfaces and multimedia exhibits, exploring how spatial environments affect people's perception and opening avenues to personal interpretations as the spectators shifted into participants being observed in unfamiliar environments.

Moreover, I created distinct video displays for each system that I designed, all of which responded to the projected moving images, as their format, shape, material, mechanism, and colors were chosen in relation to the properties of the moving-image's content such as tonalities, luminosity, format, and its subjects and thematic. For instance, if a virtual character presented in the video were suddenly to express aggressive behavior, the video membrane would reflect the physical tension and expand, as in my system, *Formica* (v1 2003). In this piece, a strong metallic frame houses a delicate video membrane consisting of a series of horizontal elastic slats. A projected virtual character seeks to create connections with visitors as soon as they enter the system's environment. Depending on the duration of the encounters, the membrane can

also contract with forceful affection or revulsion. The screen reacts directly to the video, similar to the way that visitors' bodies respond to their suddenly changing environment. Both the system's virtual character and the visitors respond to each other, triggering reflexes ranging from surprise to conflict and from uncertainty to curiosity. According to Isa Tousignant's description of her experience of this work:

> The screen suddenly extends out by two feet on each side, horizontally, thus splitting into banners that let strips of light project the lost image onto the wall behind the installation. The figure becomes so overwhelmed by them that she literally splits herself—overwhelmed by us, in fact, since we, the viewers, are responsible for unleashing the whole process.[96]

In each system, the proposed video display responds to the projected images, whether by changing shape, vibrating, physically expanding and contracting, or being designed to conceptually reply to the displayed images by its chosen materiality, which includes its format, shape, and texture etc. Furthermore, this series of interactive systems was not programmed so that specific actions by the visitors resulted in an automatic change of the medium's state. Instead, they offered a non-linear narrative with a palette of behavioral possibilities.

Much relevant brain research has revealed the influence of media on ways of thinking. Through a brain scan study at Carnegie Mellon University, researchers Erica Michael and Marcel Just confirmed that, "The medium is part of the message. Each medium creates a different sensory and somatic experience—and, we might add, develops different circuits in the brain."[97] In addition, psychiatrist Norman Doidge

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[96] Isa Tousignant, "Philomène Longpré rocks my world: Ooh mama," *Hour*, February 15, 2007.
[97] Norman Doidge, *The Brain That Changes Itself* (London: Penguin Books, 2007), 308.

demonstrated that, "Electronic media are extensions of our nervous systems."[98] Electronic media serve to rewire the brain since the human nervous system is plastic, and media can merge with it to produce a larger system.[99] According to art historian Julie Bélisle, the materiality of the screens of my pieces enhance visitors' experiences the moving images as they "overshadow us with their imposing scale and employ of unusual materials to play with our perceptual apparatus. Suspended structures hover over us with all their weight, while their movements sometimes create the illusion of evicting the characters that inhabit them."[100]

In this vein, I have introduced a continuous interplay between the subject and object in each of my past interactive systems. The initial systems began with *Plato's Cavern* (2000), followed by *Cycle* (2001), *Passage* (2002), and *Silence Inexistent* (2002), which present characters who translate their environments continuously. In my latest pieces, *Octopus* (2003), *Formica* (v1 2003, v2 2007), *Vita* (2005), *Illusio* (2006), *Underlayers* (2007), *Xol* (2008), *CEREUS -- Queen of the Night* (2009-2013), and *XIA* (2011), the virtual characters redefine themselves through their interactions with visitors who actively participate simply by being present in the environment. As visitors roam the exhibition space, the characters in the video respond, causing the membrane, the screen, to transform. In these systems, the resulting interplay between the character, the video membrane, and the audience elicited emotional responses that turned, for instance, an electronically controlled structure into a life force that confronts the frontiers of its own individuality. These hybrid displays influence the perception of the moving images and

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[98] Norman Doidge, *The Brain That Changes Itself* (London: Penguin Books, 2007), 310.
[99] Ibid., 311.
[100] Julie Bélisle, "Ce qui nous attaché," *Archée*, February 2007.

transform the audiovisual experience through the involvement of other senses.

In the installation *Cycle* (2001), the spinning action of a colossal steel gyroscope triggers different video sequences representing seven lives of a floating virtual character, projected on a large-scale white paper placed on the floor. A narration reveals itself as each visitor is physically engaged in the installation. Their presence activates the movement of the heavy gyroscope, and their distance from it affects its revolutions per minute. The faster the gyroscope spins, the faster the life of the character passes through its various stages, until the figure completely disappears and the gyroscope stops its movement. *Cycle,* which was first exhibited during the 2001 Promo 4.1 Festival at the Society of Art and Technology in Montreal, questions the relationship between time and space, as well as the coexistence of the wandering bodies, turning sculpture, and moving images. A disorientation effect is used as a key factor of this experience. As a consequence, it influences people's perceptions of the moving images, as they are part of the unfurling of the narrative.

Silence Inexistant (2002) is a large box covered with white elastane, "a synthetic fiber known for its exceptional elasticity," which serves as a screen. A complex aluminum mechanism composed of 36 pins is hidden inside. A virtual character is projected onto the elastane's surface, and microphones are placed around the room of the exhibit to capture the variations in noise levels, which influence the character's behavior. During the noisiest period, the mechanism inside the box is activated and forces the fabric outwards, creating a three-dimensional simulation of the character trying to push itself out of the confined space. Both the movement of the structure and

the video sequences visually and conceptually communicate a certain call to silence. Designed in Albuquerque, New Mexico, this system was exhibited in a tiny dark room at the Hardwood Center where visitors were invited to enter one by one in order to create a certain intimacy between them and the virtual character.

The *Octopus* (2003) system explores how people relate to space while being constrained by it and also having the opportunity to adapt to it. This installation consists of a virtual character projected onto a kinetic structure that hold a see-through membrane of narrow vertical strips. Visitors can experience up to three modes of communication. First, there is a period of "construction" when the virtual character is completely concentrated to the fabrication of this own environment. During that period, it is impossible to directly interact or communicate with the character. The second mode is the waiting period where the character is aware of what is happening in the gallery's space. A network of sensors is placed strategically within space and the data is received by the infra-red sensors and is sent to the programming environment, which triggers the third mode: the reaction. Related to the distance from the screen and position of the visitors in the room, the character can reacts in six different ways and the environment (its screen) responds to that sudden change. As the structure and character awaken, moving from a state of calm to agitation, the installation elicits reflections on the interrelationship between body, media, and space. "As its struggle to free itself reaches a climax, the screen starts to move, swaying like seaweed in a strong current; creature and environment dance together as the figure shakes itself free only to become tangled once

more,"[101] states art historian Alison Syme. Julie Bouchard comments on its interactivity: "In *Octopus*, the individual only takes shape within space by incorporating the presence of the other in his movements, always remaining an emerging form."[102] This system was recognized for its innovations with the 2005 FICFA Judith Hamel Award in digital art as well as with the 2003 Prize of Excellence in New Media Art by the Hexagram Institute for Research and Creation. Represented by Group Molior, this project was exhibited at the Hong Kong Art Center in Hong Kong (2007), at the 19e Festival International FICFA in Moncton (2005), at the FILE - Electronic Art Festival in Sao Paulo, Brazil (2004), in the Oboro Gallery in Montreal (2004) and at the Society of Art and Technology (SAT, 2003).

To further explore the interaction between screen and visitors, I designed the *Formica* system (V1-2003, V2-2007), which received the 2007 Octas Digital Art Award for the screen's innovativeness. The work presents a strong metallic frame that houses a delicate video membrane consisting of a series of horizontal elastic slats. The visitors transform and trigger links with the character as infrared sensors pick up their movements and ultrasonic sensors detect their locations. According to Michel Hellman, "As soon as we enter the dark chamber, we are automatically captivated."[103] He comments that the piece places the visitors in the position of being an important element of the system. In his review, he wrote: "Longpré was able to give life to a virtual character. In doing so, it reversed the codes. Visitors find themselves in an ambiguous position, as they are not only spectator but also participant to the final outcome of the

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[101] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.
[102] Julie Bouchard, "Octopus: Une installation vidéo interactive de Philomène Longpré," *Archée*, revue Cybermensuel Art, section critique, November, 2004.
[103] Michel Hellman, "Culture: Interaction virtuelle," *Le Devoir*, Montreal, February 12, 2007.

work."[104] Marilyse Hamelin described that this system "succeeded because the visitors are first completely assailed by emotions when encountering *Formica*."[105] This robotic structure explores the thematic of tension, and the red character expresses a series of emotions in relation to the selected subject. These interactions are visually expressed on the membrane as the projected video shown series of lines that like firing neurons are weaving a tapestry of connections. *Formica* seems to notice, feel, and learn as it adjusts to the shifting strata of social interactions. Isa Tousignant described *Formica* as follows: "The figure becomes so overwhelmed by them that she literally splits herself – overwhelmed by us, in fact, since we, the viewers, are responsible for unleashing the whole process."[106] This system was presented during the BIAN International Digital Art Biennale of Montreal, at C-2 MTL (2012), at the Collider Electronic Arts Festival in Akron, Ohio, United States of America (USA, 2011), at the Nouveaux Monstres at Life Museum in Saint-Nazaire, France (2010), and during the LILLE 3000 Festival in Lille, France (2010). It was also exhibited at the Parisian Laundry Gallery in Montreal (2007) and during the Digifest Art Festival at the DX Center in Toronto (2004).

In the case of the installation called *Vita* (2005), the virtual character is represented both by a blue light and a blue human form, which functions as an energy field rather than an actual identifiable individual. When Vita recognizes a visitor's presence, its mechanical environment changes, and its bodily consciousness begins to realize its limitations. The shift manifests as altering imagery and an outpouring of

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[104] Michel Hellman, "Culture: Interaction virtuelle," *Le Devoir*, Montreal, February 12, 2007.
[105] Marilyse Hamelin, "Formica vous observe! Ou est-ce l'inverse?," *La Voix Pop*., Montreal, Feb., 2007.
[106] Isa Tousignant,"Philomène Longpré rocks my world: Ooh mama,"*Hour*, Montreal, February 15, 2007.

multi-influenced sounds in the designated space. The installation, which was presented at the GL2 Gallery in Chicago (2006), collapses the separation of body and mind as the structure transforms from a video screen to a membrane of polyethylene tubing. This metamorphosis occurs when infrared sensors locate the participants and temperature sensors in the tubing detect touch. Vita triggers a visceral experience through its physical architecture as well as the actions of the visitors.

In *Illusio* (2006) installation, the participants trigger different emotional stages of a virtual character represented by distinct colors that infuse a perforated acrylic structure. Trapped inside a transparent shell, the character gazes at the world. The physical world witnesses a simple reflection of the virtual world where illusory boundaries are drawn between people and their surroundings, all of which establish and reinforce its limitations. This installation was designed in Chicago: as Guillaume Evrard wrote, "It originates from the environment of the Midwest capital city and its perpendicular grid characteristic of modern urbanism. Between Lake Michigan and the Chicago River, the passer-by appropriates the space of the street, the avenue and the park."[107] The relationship between the moving images and visitors is shown in the transforming colors diffused on the suspended structure. Evrard observed: "The visitor prompts various atmospheres in which the virtual character develops amidst a multicoloured infusion."[108] The interactivity is based on the location and motion of the visitors within the space of the exhibit, and the character responds to the predicament of being trapped by the shadow of its own environment. Christine Refern wrote in a

[107] Guillaume Evrard, "Power of Illusion – Illusion of Power?,"*Isomorphism, Art Interdisciplinary Field*, March, 2012, 63-65.
[108] Idem.

review that "Longpré's installation *Illusion* is so convincing that it is hard to believe the movement of the hanging screen is an illusion created by the projected video."[109] This system was presented at the Dancing Machines Exhibition during the EXIT Festival in Créteil, France (2010), and at the VIA Festival in Mauberge, France (2010). It was also exhibited at the Galerie UQAM, in Montreal (2007) and GL2 in Chicago, USA (2006).

Later, after a summer in New York, I designed *Underlayers* (2007), which presented a virtual character that occupies the space between walls. A performance filmed in the subway of New York gives voice to the memory of a public space and captures the deep incertitude of the unexpected. The character appears on two small liquid crystal display (LCD) screens installed within the walls of a narrow corridor. The character observes the viewer and performs, challenging the visitor to confront the desire to return the gaze and observe the character's evolution. Who is watching whom? This interaction in which viewers are being watched elicits reflections on the significance of contemporary issues revolving around auto-surveillance and total vigilance. It was exhibited during the international festival Interactive Playground: Sight Unseen at the Beverly Art Center in Chicago, Illinois, USA (2006).

Also in 2007, I created the *East/West Telematic Exchange System* during the AIR artist in residency in Hong Kong. It is a live-networked system, which was shown simultaneously at the Hong Kong Art Center and the Art Institute of Chicago during the international Festival Looptopia. Passers-by in Hong Kong were invited to peep through the hole of a customized box and gaze far beyond their reach. The eye of the observer was visually captured and instantly transmitted via the Internet to Chicago. In Chicago,

[109] Christine Refern, "All shook up,"*Mirror*, Montreal, Vol. 22 No. 36, 2007.

there was a similar peeping box inviting viewers to look beyond the familiar. Each "eye" from East and West was then featured on a large projection, and the collage of the two "eyes" displayed came from two different faces, one from each city on opposite sides of the world and separated by a 13-hour time difference.

According to Françoise Parfait, video installations can be defined by the particular relationships between the artistic act and the space of representation, the artist and actors of the exhibit, the visual art and theatrical scene, the exhibit and reception, as well as art and life. The screen-reliant installation art is an unique fusion of space and time.[110] It ventures to ask: How might the overall experience triggered by such interactive video systems become even more effective? How could the video display offer an extension of all the senses, an embodied experience of the presented moving images?

1.4 Design Research

The whole is more than the sum of its parts.[111]

—Aristotle

In order to develop and fabricate innovative responsive video membranes, as well as to design programs for their interactive systems, this section focuses on the classification and identification of dynamic systems as well as their wide-ranging capabilities. What would be the advantage of creating a continuous system that is conservative rather than dissipative? For which types of behaviors should the video

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[110] Françoise Parfait, *Vidéo: Un Art Contemporain, (*Paris: Editions du Regard, 2001), 160–63.
[111] Axel Ritter, *Smart Materials in Architecture, Interior Architecture and Design*
(Boston: Birkhauser-Publishers, 2007), 7.

membrane aim: stationary, oscillating or chaotic?

In addition, the section investigates series of smart materials and technologies used for design research purposes. It questions their intelligence, identify their sensory characteristics, and trace their uses in the fields of architecture, fashion, and robotics.

To fulfill these aims, this literature review examines theories by mathematician John A. Pelesko; civil engineer Farhad Asani; theorist Per Bak; electrical engineer Eric Klavin; mechanical engineers Riccardo Manzotti and Vincenzo Tagliasco; biomedical engineer Moshen Shahinpoor; computer scientist Christopher Langton; anthropologist Nina G. Jablonski; and architect Alex Ritter. In addition, it discusses architecture design by Ruiz-Geli and James Clar as well as a few fashion designs by Hussein Chalayan, Joanna Berzowska, and Adam Whiton and Yolita Nusentn and artificial skin design by Mo Koo.

1.4.1 Dynamic Systems

Dynamic systems can evolve and converge to stationary states (regular), behave chaotically when their movements through states have no visible organization (chaotic), and oscillate if their cycles are established through a fixed set of states (cyclical).[112] To classify systems, it is important to observe their behaviors. Computer scientist Peter Grogono compared the differences between deterministic and nondeterministic systems as well as among conservative and open or closed dissipative systems. For instance, a simple pendulum is described as a continuous system that can be conservative if there is no friction or dissipative when friction is encountered, whereas a Boolean network,

[112] Peter Grogono, *Dynamic Systems* (Montreal: Concordia, 2005), 8.

which is the simplest realistic model for biological systems, is categorized as a discrete system.[113]

Additionally, systems can be categorized in terms of different types of equilibrium states: stable, unstable, and metastable. Of course, systems can become quite complex when they are of an abstract, statistical, or probabilistic nature, as demonstrated by Per Bak.[114] He posits that chaotic systems can be defined as stable equilibrium systems without any critical state in time; hence, they cannot explain complexity.[115] Furthermore, Per Bak defines self-organized criticality as a way of viewing nature as well as the "only known mechanism to generate complexity."[116] From fractal patterns to catastrophic events, he argues that complex systems operate only during the critical points between order and chaos.[117] As Bak contends, in a pile of sand, any falling grain could create a series of avalanches, causing the entire pile to fall apart.[118] For instance, rapid changes can be observed in nature, yet they are difficult to predict. What are the causes of such rapid changes? The comparison between the flat, stable sand beach and the fragile sand pile explains the complexity of nature. Comprised of numerous simple elements, together they form an intricate system with a self-organized critical state.[119]

Another concept similar to self-organization is self-assembly. The main difference is that self-organization is often used to describe systems that present "patterns driven

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[113] Peter Grogono, *Dynamic Systems* (Montreal: Concordia, 2005), 2-24.
[114] Per Bak, *How Nature Works: the Science of Self-Organized Criticality* (Copernicus Springer, 1996), 5.
[115] Per Bak, *How Nature Works,* 31.
[116] Ibid., 5.
[117] Ibid., 117.
[118] Idem.
[119] Ibid., 59–62.

by a constant input of energy"[120] whereas self-assembly could be determined by, for example, "the tendency of the system."[121] According to John A. Pelesko, the science of self-assembly systems is the key to understanding not only biology and physical phenomena but also the origin of life itself.[122] Composed of particles and environments, as well as blinding and driving forces, self-assembly systems can be considered static, dynamic, or even programmable. The science of self-assembly systems pose a range of problems: forward problems (when all components of a system are already determined, but the structure needs to be defined) and backward problems (when the structure needed is identified, but its elements have yet to be found).[123] Pelesko has demonstrated that from a spiral galaxy made of billions of stars to the diamond-shaped pineapple pattern to the structure of protein, we live in a world of self-assembly.

Artists developing interactive experiential environments face similar forward and backward problems. For instance, when a visitor chooses to do nothing but continue to observe, the medium could be programmed to remain in a state of equilibrium, presenting no visible change in its representation; oscillate in a regular manner by offering visible loops or cycle of actions; or continue its chaotic behavior if there is no visible form of organization. Thus, in these three scenarios, visitors could easily lose interest and leave the exhibition room. However, if the medium unexpectedly changes its current state in a non-foreseeable, chaotic manner, (say, from cyclical to regular

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[120] Bernadette Bensaude-Vincent, "Self-Assembly, Self-Organization: A Philosophical Perspective on Converging Technologies "(paper presented at the annual France/Stanford Meeting Avignon, France, December 2006), 11.
[121] "Self-assembly," Wikipedia, last modified on September 3, 2013, http://en.wikipedia.org/wiki/Self-assembly
[122] John A. Pelesko, *Self Assembly: The Science of Things That Put Themselves Together*, (City, FL: Chapman & Hall/CRC, 2007), vii.
[123] Pelesko, *Self Assembly,* 83.

state), it may capture the visitor's attention and encourage him or her to change their observation state— which I name "the spectator state"—into a "user state" for a visitors who voluntarily interact with the system. In another possible scenario, the visitor knows that the medium is interactive. In this case, they may be curious to experience it during a quiescent state. How, then, can a program enhance the medium's ability to capture visitor's attention?

In my interactive video system entitled *Formica*, for instance, I observed that visitors seem to be active when the virtual character is in a relaxed state. They try to trigger another state of the system as they move around the space. Visitors stop moving as soon as the transitional state is triggered and the "medium" changes its behavior.

Moreover, a system can be "predictable when the viewer can learn how to interact with it or unpredictable when the viewer never knows what to expect in response."[124] To balance a system from those two extremes, the medium mutate over time with the use of *evolutionary programming*.[125] Visitors would need to adapt themselves continuously to the changing medium without precisely knowing the direction of its evolution. Another way to program the medium would be to offer unpredictable alterations created by specific user's actions such as in the artwork "Genetic Images" (1993) by Karl Sims. In this piece, the user makes a selection by touching a pressure-sensitive mat, and this action causes images to form the basis of the next iteration without the user knowing the result of the graphic variations.[126] For this

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[124] Peter Grogono, *Computer Science comprehensive exam, question from Peter Grogono,* (2011).
[125] Peter Grogono, "Laws and Life" (Montreal: Concordia University, 2005), 1.
[126] Mitchell Whitelaw, *Metacreation: Art and Artificial life*
(Cambridge, Massachusetts: The MIT Press, 2004), 28–32.

artwork, Sims uses a genetic algorithm to offer an image formed from variations on a selection of images.

In a different approach, the electrical engineer Eric Klavins presents a series of robotic self-assembling machines that sense their own activated state and collectively make decisions about how to bind together to create various possible shapes. In this situation, the pieces interact with each other without requiring any intervention from participants. According to Pelesko, "Klavin has shown how different graph grammars can achieve different assembly goals."[127] In this project, a series of triangular parts are programmed to assemble into responsive unity similar to how certain smart materials are structured. Klavin has demonstrated that through studies on self-assembly systems, these principles could be transposed to any scale, which opens door to multiple explorations in various fields. From self-cleaning fabric to self-forming structures, many smart materials have recently emerged using similar principles as those shown in Klavins's piece. These new technologies stimulate questions about how they are applied in modern society, and how such dynamic systems could be integrated into the artistic development of responsive video membranes. In order to answer these questions, it is essential to investigate their properties as well as their level of responsiveness. These properties will be discussed in the next section.

1.4.2 Smart Materials

Surfaces that absorb energy, change color or shape, or fully use the power of the sun, rain, and wind are becoming an object of study and increased interest in various

[127] John A. Pelesko, *Self Assembly: The Science of Things That Put Themselves Together*, (City, FL: Chapman & Hall/CRC, 2007), 83.

fields. Through functional approaches and a desire for aesthetics, architects and designers have explored ways to develop such surfaces—often called interactive skins—and composed of both *smart materials* and *intelligent technologies*. This section will attempt to answer how the level of intelligence and sensory characteristics of smart materials be defined.

According to architect Axel Ritter, smart materials have "changeable properties and are able to reversibly change their shape or color in response to physical and/or chemical influences: light, temperature or the application of an electric field."[128] For civil engineers Debashis Satpathi and Arup Kmaji, smart materials are recognized because of their "unique marriage of material and structural engineering with sensing and actuation control technology."[129] Moshen Shahinpoor, a biomedical engineer, believes that the main difference between smart and intelligent materials is that intelligent material should "possess or show a survival strategy that appropriates actions or actuations initiated in response to environmental changes sensed or detected and must preserve the sustainability of the state of material under consideration."[130] However, interactive skin often refers to a surface made of smart materials whose system is able to sense the environment, process the data received, and respond physically by changing its properties. An example could be a surface built with light-emitting or energy-absorbing materials, such as solar panels. They could also be of photochromic,

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[128] Axel Ritter, *Smart Materials in Architecture, Interior Architecture and Design* (Berlin: Birkhauser, 2007), 8.
[129] Debashis Satpathi and Arup Kmaji, *Intelligent Civil Engineering Materials and Structures: A Collection of State-Of-The-Art Papers in the Applications of Emerging Technologies to Civil Structures and Materials, Eds.* Farhad Ansari, Arup Maji and Christopher Leung, (Amer Society of Civil Engineers June 1997), 29.
[130] Moshen Shahinpoor, *Intelligent Civil Engeneering Materials and Structure*.
(Amer Society of Civil Engineers June 1997), 45.

thermochromic, or electrochromic aspect. In this case, such materials would change color in response to variations in temperature, light, or electrical current.

With the same influential factors, surfaces constructed from thermostrictive, electroactive, or thermobimetal materials could change their shape. Often used as actuators, shape memory alloys, such as Nitinol, will form themselves into different shapes in response to varying electric current. Studies have been done on the changing shapes of metal under electrostimulation as far back as the 1880s. Other surfaces integrate potentiometers, featuring pressure microsensors embedded within a tactile array that convert touch into electrical signals. A few adaptive materials have also entered the market. These types of materials are able to adjust themselves and reversibly change their color, states, and shapes in response to physical, electrical, and chemical influences,[131] just as leaves on a tree do. For example, as nights get longer and cooler in the fall, biochemical processes in the leaves start to coat the landscape from green to yellow and then orange to red, mirroring the perpetual changes occurring in the environment. Chlorophyll, tannin, and carotene are a few of the pigments that make these membranes evolve, producing their flamboyant colors. Plants are not the only organisms to reveal elaborate physical transformations in response to their environment. The cyanea octopus, for example, can quickly camouflage itself, blending into its surroundings by contracting its muscles, which reduces the size of the pigment cells.[132] Intricate dynamic systems allow physical transformations such as these to occur in response to a variety of data received by sensors.

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[131] Axel Ritter, *Smart Materials in Architecture, Interior Architecture and Design* (Berlin: Birkhauser, 2007), 9.
[132] "Octopus changing color - Great Barrier Reef," National Geography, January 27, 2007, http://www.youtube.com/watch?v=IAGxTsEmGek

Another example could be artificial skin. Through touch, rich communicative information is simultaneously translated into sensations, emotions, and feelings. Simply by shaking the hands of strangers, vast quantities of data can be accumulated. The human skin is an interface, and through mechanical, thermal, chemical, and electrical processes, one can identify pressure, vibration, humidity, temperature, and pain. As demonstrated by Nina G. Jablonski, understanding such mechanisms and processes, from light absorption to energy transfer, creates important alternatives for both structural design and technological solutions.

Today, artificial skin that changes color from green to blue to pink in response to the seasons and the energetic conditions of its environment are concept designed by the architect Ruiz-Geli in collaboration with media artist James Clar. When wrapped onto the Habitat Hotel in Barcelona, this unique electronic membrane portrays an artificial forest of leaves, as described by Axel Ritter in his book, *Smart Materials*. Composed of 5000 leaves with embedded solar cells and tri-color light-emitting diodes connected to a network of microcontrollers, the matrix grid reflects the sun's energy levels every day. The leaves read the brightness of light via built-in photo sensors; later at night, they release colors corresponding to the energy accumulated during the day.[133]

Another development in this area is the use of smart materials with electrochromic properties, such as polymer-dispersed liquid crystals (PDLC), can now be laminated on window panels. The PDLC membrane changes states between opacity and transparency. Keen Projection Media LTD has been a pioneer in the use of PDLC as

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[133] Axel Ritter, *Smart Materials in Architecture, Interior Architecture and Design* (Berlin: Birkhauser, 2007), 128.

a flat surface for projected images. PDLCs are mainly used in architecture and in advertising.

From adaptive envelopes to self-healing coatings, can their levels of intelligence or smartness be measured? In fashion, for example, many clothes have been developed to act like interactive skins that physically react to external factors. With a system of nano-actuators, shape memory wires, and sensors incorporated into the fabric, designer Hussein Chalayan re-defined the meaning of clothing.[134] In his S/S One Hundred Eleven Collection, his garments metamorphose like dragonflies in their final molting stage. During the automated transformation, dress, hat, and veil shape the body poetically, appearing alive as they do so. Even with the use of smart materials and intelligent technologies, his interactive designs evoke intricate and sublime phenomena in nature, such as the way a snake changes its skin.

Using the same technologies in different ways, Cute Circuit in Italy has designed responsive shirts that create bridges between the virtual and material worlds. The shirts actually allow you to feel virtual hugs, as well as the strength and temperature of a touch and the heartbeat of a loved one who could be overseas. Named the Hug Shirt™, the garment receives information from a mobile phone that transmits the arrival of new virtual hugs via Bluetooth™. Cute Circuit also presented a Kinetic Dress where electroluminescent patterns respond to the intensity of body movements by varying the colors and amplitude of the emitted lights.[135] In this case, the wearer and clothes achieve a state of complicity with one another.

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[134] Suzanne Lee, *Fashioning the Future: Tomorrow Wardrobe,* (Thames & Hudson, 2005), 180.
[135] Axel Ritter, *Smart Materials in Architecture, Interior Architecture and Design (*Berlin: Birkhauser, 2007), 18.

At XS Labs in Montreal, one can find garments that preserve the memory of a touch. Recollections come to mind with changing color patterns, animations of meticulously positioned LEDs, and automated moving decorative elements. Unlike the Hug Shirt™, the Memory Rich Clothing Collection by Joanna Berzowska "encourages physical touch and contributes to creating embodied experiences as opposed to simply measuring virtual proximity."[136]

Some clothing and materials have been designed to mimic the defensive or offensive strategies of numerous animals that surprisingly mutate. Some change colors, others change shape or produce a sudden light, hissing sounds, and even electric shocks. The No-Contact Jacket, invented by Adam Whiton and Yolita Nugent, offers some form of these strategies to its wearers and can guard its owner. Powered by a 9-volt battery, the jacket activates visible and audible electric arcs when someone approaches. It can then discharge electrical pulses when touched.

In robotics, humanoids have been covered with electronic membranes that are capable of sensing temperature, pressure, vibration, and texture. Scientists have developed flexible array of transducers with pressure sensitivity that respond in a similar timeframe as human skin.[137] In 2008, researcher Mo Koo presented a small flexible tactile display made of electro active polymer, which can be wrapped around fingers.[138] With such technology, various applications could be developed, such as a

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[136]Joanna Berzowska, "Memory Rich Clothing: Second Skins that Communicate Physical Memory," (paper, The MIT, 2006).
[137] John J. Boland, "Flexible electronics: Within touch of artificial skin, "*Nature Materials,* published online September 12, 2010, http://www.nature.com/nmat/journal/v9/n10/full/nmat2861.html
[138] Lisa Zyga, "Researchers Design Band-Aid-Size Tactile Display," *PhysOrg,* published online June 06, 2008, http://phys.org/news131968663.html

tele-feeling transferring system and glove-type tactile display device.[139] Moreover, multilayer tactile surfaces are being fabricated that allow for different sensory characteristics in each successive layer.[140] Using sensors integrated within the membrane and positional sensors in the joints, robots receive the information needed to know how to handle objects in the environment.

In spite of these technological attempts, the complexity and subtle responsiveness of a human's touch are extremely difficult to duplicate. The human skin is more than just an organ of the body; it is an evolving membrane that guides people in the world. How could a synthetic membrane be designed to reproduce human skin, at least conceptually? How would its shape, surface, format, be selected to evokes such manifestation? And what if the approach to its design was based on the designer's sensory responses? These questions are addressed in the next section on Multisensory Methodology.

1.5 Multisensory Methodology

Over the past 25 years, interactive skin has often been used in architecture, in fashion design, or in robotics. Designers search for innovative applications to integrate such sensory technology and amplify people's relationships with their surrounding environment. In addition to the growing accessibilities to these technologies as well as their continuous development, there are also a few innovative approaches to designing that have been theorized and discussed. However, could these methods be useful in the

[139] Lisa Zyga, "Researchers Design Band-Aid-Size Tactile Display,"*PhysOrg,* published online June 06, 2008, http://phys.org/news131968663.html
[140] Idem.

design of responsive video membranes? Can they intensify the result for people's experiences of the presented moving images?

This section discusses the studies of various established multisensory approaches to design, based on theories by designer Rick Schifferstein; philosophers Henri Bergson and Robert Persig; acoustics specialist Micheal Haverkamp; psychologist Fiona Newell; computer scientist Keith V. Nesbitt; and neurologist Francis McGlone. It also discusses approaches on how to analyze multisensory manifestations including therories by anthropologist David Howes; visual anthropologist Sarah Pink and David MacDougall; phenomenological philosopher Maurice Merleau Ponty; art historian Patrizia Di Bello; and psychologists James Gibson and Jacques Lacan.

1.5.1 Multi Sensory Design Approaches

A few theorists have proposed multisensory models for teaching, design and research. One of the pioneers of this type of approach is Rick Schifferstein, who proposed a method for multisensory design that investigated the attributes of experiences where target stimuli trigger various sensory systems.[141] For Schifferstein, "differences in the information activated by each sense are important in understanding their role in object perception, identification, experience, and evaluation."[142] His work explored the way in which sensory input is included in the experience of any physical object. He also assessed the importance of sensory memories, sensory imagination, sensory associations, and accumulated sensory experiences in any creative process.

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[141] Rick Schifferstein, H.N.J. "Multi Sensory Design." (paper presented at the ACM Proceedings of the DESIRE'11 conference – Creativity and Innovation in Design, Technical University, Eindhoven, the Netherlands, 19-21 October 2011), Eds. C.J. Hooper, J.B. Martens, P. Markopoulos, 361-362.
[142] "Delft Design Guide, for Industrial Design," *TU Delft*, June 30, 2010, http://ocw.tudelft.nl

Schifferstein suggests that all factors and contexts that could affect the user's experience of an object's design first must be identified and considered.

The Design Delft Design Guide on Emerging Design Methods pursues this aim in a section on Multi-Sensory Design approach, based on Schifferstein's theory and developed by Marieke Sonneveld and Geke Ludden. This method comprises the following eight steps: "The selection of a target expression; conceptual exploration; sensory exploration; sensory analysis; mind map; user-interaction scenario; model making; and multisensory presentation."[143]

The first step involves the selection of a word that evokes series of emotions and feelings, for example, innocence, or captivity. Then, the desired effects, the reactions that such expressions could trigger need to be identified. That could be, for example, fragility, wonderment in the case of innocence or anxiety, fear in the case of captivity. Then, this process is followed by a conceptual and sensory exploration in which the designer's research involves collecting samples that could be associated with the target expression. In this guide, they suggest that samples are in all sensory modalities. For instance, they could be from particular odors that recall the target expression and desired effect, or specific taste, sound, color, etc. They also recommend continuing this creative process with a sensory analysis to understand the relationships between the different sensory properties of the object design as well as the design's final expression. In that step, a layout of a sensory map with the target expression placed in the center is recommended. Then, the designer has to identify the users and explores the possible scenarios in which the object could be experienced, including a description of its setting

[143] "Delft Design Guide, for Industrial Design," *TU Delft*, June 30, 2010, http://ocw.tudelft.nl

and contexts. Finally, the designer will create a model of the object and finally, a multisensory presentation, which involved all the senses.

The challenging aspect of such a method is that different users will have distinctive responses. Thus, it is important to consider people's adaptive approaches to perception, which can also be altered by other factors, such as the user's personal emotional context: the mood of the day. According to Francis McGlone, the perceptual emotional properties of a design are certainly key influential factors, since the combinations of all the data that have been received fuse together and inform the user's actions.[144] Therefore, as David Howes has demonstrated the importance of recognizing that an individual's multisensory perception is an on-going development. It is also a continuous process that draws references from memories formed in time.[145]

Cultural and social history also has the ability to influence people's sensory responses to any design, as well as to influence the associations they make to their materiality.[146] For Keith V. Nesbitt, objects can evoke various metaphors, and categorizing them can be useful for the approach to multisensory design. According to Nesbitt's theory, the metaphors are divided into five distinct categories, all of which must be looked at carefully during the process of design. This examination includes considering the spatial (scale, location, and structure), temporal (how data change over time, movement, rhythms, and cycles), sight (color, light, shape, surfaces, and texture), sound (pitch, amplitude, timbre, and musical), and touch metaphors (force, inertia,

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[144] "*Multisensory Product Design,*" Francis McGlone, Neurotechnology, published April 20th, 2010, http://neurosci.co.uk/portfolio/multisensory-product-design/.
[145] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003).
[146] Idem.

vibration, hardness, softness).[147] Nesbitt demonstrated that sensory feedback is vital for understanding any sensory response. He discussed how, for example, haptization is the combination of tactile and kinesthetic feedback, which are related to both spatial and temporal metaphors because of the displacement on the skin.[148] In contrast, the Multi-Sensory Design Research Group at the National College of Art and Design in Ireland emphasizes the consequences of both the sensory information stored in memory and the resulting messages that such information can trigger during an experience.[149] According to this group, "all the senses are permanently active as the user approaches an object in the search of sensory information."[150]

As Henri Bergson demonstrates in his book, *Matter and Memory*, the user associates an experience with countless details coming in from memories, and that generated information influences the user's perception. Thus, sensory memory is a dynamic tool of perception in many multisensory approaches to design. As Fiona Newell explains, shape, color, and texture automatically trigger distinctive sensory responses, and a series of associations are elicited in relation to similar past observations that have been experienced by the user.[151] Therefore, the object's physicality must be chosen with meticulous care because it will be an important aspect of the final sensory message that is transmitted to the user. According to Schifferstein, the main challenge in design is to have all the sensory impressions support the selected target expression of

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[147] Keith V. Nesbitt, "*Modeling the Multi-Sensory Design Space*, " (paper presented at APVis '01 Proceedings of the 2001 Asia-Pacific symposium on Information visualisation, Basser Department of Computer Science, University of Sydney, Australia, 2001), 27-36
[148] Idem.
[149] Adrian Kenny Cearbhall O'Meadhar, *Sensory Modal Switching* (National College of Art and Design, Dublin Ireland, 2012), 2.
[150] Cearbhall O'Meadhar, *Sensory Modal Switching*, 3.
[151] Ibid., 4.

the product. He suggests that, therefore, designers need first to outline the desired user's sensorial involvement while also being aware of the message that it may convey as well as its contribution to the overall experience.

Another well-known method for design that involves a multisensory approach is the Zen design by Robert Persig.[152] This process focuses mainly on an object's rituals and emphasizes concentrating on bodily experiences first and then on the object's design. This method was initially presented in 1976 and is still used in the development of innovative objects today. In the case of responsive video membrane, this method would mean that the focus would be made on the desired effect (the overall experience of the visitors) rather than the physical object itself.

Michael Haverkamp, too, proposes a multisensory approach model for sound design. According to Haverkamp, sounds always elicit multisensory responses and should be designed and analyzed as such.[153] He examined the context of sensations as well as aspects of temporal, spectral, and spatial alignment and also discussed synesthetic perception as an approach to design. In his paper entitled *Visual Representation of Sound and Emotion,* Haverkamp stated that, "synesthetic perception is often connected to emotional content."[154] For Haverkamp, "numerous stimuli are presented through various sensory channels and are used by the perceptual system to build a continuous flow of multi-modal models of the surrounding world."[155] According

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[152] Robert Persig, "Delft Design Guide, for Industrial Design," *TU Delft*, June 30, 2010, http://ocw.tudelft.nl

[153] Michael Haverkamp, "Application of synesthetic design as multisensory approach on sound quality"(Ford Werke : GmbH Koln, 2010).

[154] Michael Haverkamp, "Visual representations of sound and emotion," *IV International Conference Synesthesia: Science and Art*, Almeria, 16–19th February 2012, 10.

[155] Idem.

to the MSD Research Group, the brain utilizes all sensory modalities during perception: "When one sense is chosen as the dominant means of perception, the other senses initiate a new sequence to supply additional supporting information."[156] This group argued that perception results essentially in "multisensory processing, layering in memory and sensory modal switching."[157] All these perceptual mechanisms are activated during both the creative process of a design and the user's experience of the final product.

Another distinct strategy for a multisensory approach to design would be a method that focuses on surprising the senses. According to Schifferstein, there are different possible types of surprises that a product can transmit, and these surprises often occur in relation to the way the material is used.[158] Its novelty can be visible or hidden, either in proximity or at a certain distance. The material can also look familiar but contain veiled characteristics or visual illusions. In addition, the composition of the material can be surprising, while its properties are not unusual.[159] For this strategy, surprises can be categorized as having visual olfactory, visual auditory, and visual tactual incongruities.[160] An example of object design that uses such methods could be, for instance, a very soft seat in the shape of a heavy hard stone, which would surprise the user. However, with any type of surprise, designers need to take into account the possible quick loss of interest that can be triggered by the repetition of a stimulus. The

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[156] Adrian Kenny Cearbhall O'Meadhar, *Sensory Modal Switching* (National College of Art and Design, Dublin Ireland, 2012), 3.
[157] Cearbhall O'Meadhar, *Sensory Modal Switching,* 6.
[158] Geke D.S. Ludden, Henrick NJ Schifferstein, Paul Hekkert, "Surprising the Senses," in *Senses & Society*, Volume 2, Issue 3, BERG, 2007, 353–360.
[159] Idem.
[160] Idem.

unexpected always carries surprises, and these can be modified in relation to the received sensorial data. However, the experience should not always be pleasant and memorable. This design strategy allows the focus to be on unexpected contrasts, mixing styles, multiple functions, and feelings of uncertainty. The designer must ask how this type of information or these kinds of sensory experiences might not be apprehended.

All these methods lead to two key questions: how many senses can be evoked during an experience, and how can they be classified? There is constant debate over the answers to these questions. A few scientists have proposed expansion of the traditional classification of the five senses, which were originally defined by Aristotle, by identifying a total of 28 senses. These include 20 internal senses that are stimulated from within the body and eight external senses that receive information from the outside world. These external senses have been identified as sight (ophthalmoception), hearing (audioception), touch (tactioception), smell (olfacoception), taste (gustaoception), balance (equilibrioception), body awareness (proprioception, nociception, kinesthesioception), and temperature (thermoception).[161] However, among neurologists, there is still no final agreement on the number of senses and on the definition of what each one is because so many different parameters have been attributed to them and various other systems of analysis.

In Western culture, the senses are often examined separately from each other.[162] Yet Howes demonstrates that, "When the senses are ignored or when they are studied in

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[161] Geke D.S. Ludden, Henrick NJ Schifferstein, Paul Hekkert, "Surprising the Senses," in *Senses & Society*, Volume 2, Issue 3, BERG, 2007, 353–360.
[162] Caroline A. Jones, ed., *Sensorium: Embodied Experience, Technology and Contemporary Art* (Cambridge: The MIT Press, 2006), 14.

isolation, all the interplay of sensory meaning—the association between touch and taste, or hearing and smell—and all the ways in which sensory relations express social relations are lost."[163] Maurice Merleau-Ponty emphasizes the interrelationship of the senses as follows*:* "My perception is not a sum of visual, tactile, and audible givens: I perceive in a total way with my whole being: I grasp a unique structure of the thing, a unique way of being, which speaks to all my senses at once."[164] Here, Merleau-Ponty suggests that a multisensory practice is a bodily experience.

In contrast, Di Bello frames each sensory modality individually as a method of analysis of artworks. She demonstrates how photographs and sculptures are related to the sense of touch, since sculpture contains the delicate or harsh traces of the artist, while light in its varying degrees imprints the surfaces of photographs. While for David MacDougall the senses of seeing and touching are different, yet overlapping, all sharing one experiential field.[165] To be aware of these different line of thoughts (on both approaches to multisensory design and to the analysis of such sensory manifestations) permit to designers, users, and observers to consciously be aware of the importance of nuances into a presentation. As Sarah Pink points out, the principle key is to emphasis on the individual's experiential role, as well as his or her physical engagement with both materiality and sensoriality.[166]

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[163] Howes, David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003), 17.
[164] Maurice Merleau-Ponty, *Sense and Non-Sense* (Northwestern University Press, Evanston., 1964), 18.
[165] Sarah Pink, *Doing Sensory Ethnography* (Thousand Oaks, CA: Sage Publications, 2009), 26.
[166] Sarah Pink, *Home Truths: Gender, Domestic Objects and Everyday Life* (Location: Berg Publishers, 2004),137-148.

1.6 Summary

To acquire an extensive understanding of the different forms of interaction with video screens, this literature review first outlined how video screen has been defined through history, and traced its technological development. It also examined theories made on how framed moving-images are perceived. This section questioned sensory responses triggered by the screen as being solely audiovisual manifestions as stated by Howes,[167] Lopes[168] or multisensory by Verrips,[169] McLuhan,[170] Meigh-Andrews.[171]

At the same time, diffused or projected, the moving image takes form, dot by dot, within a defined matrix no manner the kind of display. They mingle together, becoming one unit. Yet that passive fusion can obtains another level of complexity when the screens respond to the projected moving images by its chosen materiality, as shown in a series of examples in the section on screen-reliant installations arts. That section explored how artists have been transforming the video screens in order to offer embodied experiences, redefining the relationship between the media, bodies, and space. For instance, this manifestation occurs when the screen physically modifies its materiality to reproduce a real-time moving image, such as in *Mechanical Mirrors* (1999–2008) by Daniel Rozin. These robotic screens mechanically repeat simultaneously the video captured of the visitors passing in front of these artworks in the gallery's space.

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[167] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[168] Dominic M. Lopes, "Art Media and the Sense Modalities: Tactile Pictures", *The Philosophical Quarterly* Wiley-Blackwell. Vol. 47, No. 189 (Oct., 1997): 7.
[169] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 14.
[170] Marshall McLuhan, *Understanding Media: The Extensions of Man*, (MIT Press, 1994), 1-392.
[171] Chris Meigh-Andrews, *A History of Video Art: The Development of Form and Function,* (New York: Berg, 2006), 1-320.

Another presented example is *Bit Fall* (2006) by Julius Popp, a screen that physically duplicated programmed moving images of words, yet this time via a matrix structured by water jet. Whereas in the installations by Alan Rath, Tony Oursler, and Mona Hatoum, parts of the human body are shown within the video screen portion of their pieces. Whether diffused on monitors integrated in a robotic sculpture, projected on a crafted puppet's head, or included as part of a minimalist architectural structure, these hybrid video displays presents unconventional context that humanize the technological aspect of their installations. In these chosen examples, the displays respond conceptually to the content of the moving-images by adding conscious layers of meanings framed by the chosen surface, texture, shape, or specific setting.

This section was followed by a segment on interactive art systems, which focused on the experiential issues of my past developed video systems. In contrast to the previous section, each of the discussed systems are composed of specially elaborated displays that responds mechanically to the changing projected moving-mages such as by moving, stretching, pushing, etc. Furthermore, in these systems, moving-images are also altered by the presence of the visitors in the exhibition's space. Each of these displays represented the environment of the projected virtual characters. For instance, the displays represents a tense environment made of elastic bands in the case of *Formica* or a fragile environment with vertical moving laths in the system entitled *Octopus*. Their display's materiality, spatiality and interactivity were selected to respond to the chosen thematic of the piece. It was essential to review my work made since 2000 in order to

identify their uniqueness, and suggest new venues of explorations for the proposed responsive video membranes of this research.

Lastly, in order to elaborate such sensible membranes, a section on design research followed. This section served as an inspirational ground that addresses the technical needs for the design of both the proposed responsive video membranes as well as the interactive systems in which they are integrated. It first discussed the characteristics of dynamic systems in order to explore various possible manners in which the systems could be programmed in regard to the principal aim, which is to augment the visitor's experiences of the moving images. Moreover, this section also presented a review on smart materials, which included investigation on their level of responsiveness as well as their applications in modern society. This section defined and pointed out examples of interactive surfaces already used in different fields. Being aware of such smart materials elicited reflections on how they could be modified or integrated into the proposed video membranes in order to reach an even greater level of sensibility in their responses to moving images.

Finally, different multisensory approaches to design as well as theories on the analysis of such sensory manifestations were examined. This section, which identified the issues that need to be addressed in this exploratory research on the artistic development of responsive video membranes, brought knowledge that reinforced my hypothesis regarding the problem statement, as proposed in the next chapter.

Chapter 2: Responsive Video Membranes

Digital culture has saturated our lives so thoroughly that it has become almost impossible to determine where the virtual world ends and reality begins.[172]

—Gwyneth Cliver

2.1 Problem Statement

For many years, people have debated media consumption and its impact on society. In 2009, the Council for Research Excellence released a study showing that adults in Western societies stare at screens (televisions, mobile devices, and computers) for an average of eight hours a day.[173] A few years later, researchers at Northwestern University concluded that children in North America spend about ten hours daily in front of luminous screens.[174] These statistical projections have risen every year, indicating that people have less time to directly interact with the tangible world without experiencing it through a screen. One reason why this is important is because screens change people's perceptions. Anne Friedberg suggested that the screen has become an organ of perception, as images are already framed for the viewers.[175] If this is true, then one could ask, are the senses stimulated differently through screens? Or is the experience of video screens solely an audiovisual manifestation, while the other senses become secondary?

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[172] Gwyneth Cliver, *[Grid<>Matrix],* (Screen Arts and New Media Aesthetics. Washington: Mildred Lane Kemper Art Museum, 2006), 43.
[173] "Zero to Eight: Children's Media Use in America," Common Sense Media, published the October 25, 2011, http://www.commonsensemedia.org/research/zero-eight-childrens-media-use-america
[174] Idem.
[175] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 1.

Theorists such as Marshall McLuhan,[176] Chris Meigh-Andrews,[177] and Jojada Verrips,[178]among others, have discussed video screens as a vehicle for both emotional and physical experiences that automatically involves all of the senses. According to these theories, the television transmits a maximum of embodiment wherein all the senses mingle together. Going further, Verrips believes that moving images physically touch the viewer.[179] Thus, for him, defining the video screen as being an audiovisual device is a culturally biased description, since light touches people's pupils the way sound may caress an eardrum.[180] McLuhan also claims that screens trigger much more than just vision, as the whole body is involved.[181] Yet what happens when the screen is of small format, such as the one provided an iPod? Would multisensory manifestations still occur? Moreover, in regards to these theories, neither the content of the images nor the context in which they are presented is taken into consideration as a potentially influential factor of such multisensory manifestations. However, for Mark[182] and Classen,[183] only certain types of representations imply the sense of touch, triggering a unique intimacy with the spectators. According to Classen, both the subject matter and the way in which some images are captured produce rich textural information, which evokes tactibility.

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[176] Marshall McLuhan, *Understanding Media: The Extensions of Man*, (MIT Press, 1994), 1-392.
[177] Chris Meigh-Andrews, *A History of Video Art: The Development of Form and Function,* (New York: Berg, 2006), 1-320.
[178] Jojada Verrips, "Offending art and the senses of touch," in *Material Religion*, Vol. 4, Issue 2, (Academic Journal, 2008), 6.
[179] Idem.
[180] Idem.
[181] McLuhan, *Understanding Media: The Extensions of Man*.
[182] Laura U. Marks, *The Skin of the Film: Intercultural Cinema Embodiment and the Senses*, (London: Duke University, 2000).
[183] Constance Classen, *The Deepest Sense: A Cultural History of Touch,* (University of Illinois Press: 2012).

For Vivian Sobchack, the images on a screen are not the only elements that affect viewers' overall experiences. Sobchack argues that the screen's setting is also a key factor that influences perception.[184] She claims that the screens of electronic devices cannot be compared to those in movie theaters. The experience of sitting in the darkness, surrounded by a group of strangers, sharing their laughs and feeling their collective fear, anger, or sadness, cannot be experienced the same way if one is alone in front of an electronic screen, such as a computer. For Friedberg, the main difference between cinematic projection and electronic display is that in the theater, the borders between the virtual and physical space are blurred because of the depth and darkness, which reinforces the immersive experience.[185] However, others are of the opinion that, whether moving images are presented in a theater or on a television set at home, there is no such thing as a tactile image. In order for the eye to be "touched," as described by Verrips,[186] it needs physical contact, according to Howes[187] and Lopes.[188] Nevertheless, could sensory memory be enough to balance the audiovisual experience that video screens trigger? Perhaps the framed rectangular vision provided by video screens has indeed revolutionized people's senses.

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[184] Vivian Sobchack, ''The Scene of the Screen: Envisioning Cinematic and Electronic 'Presence,''' in *Materialities of Communication*, Ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Stanford: Stanford University Press, 1994), 83–106.
[185] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006).
[186] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 14.
[187] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[188] Dominic M. Lopes, "Art Media and the Sense Modalities: Tactile Pictures", *The Philosophical Quarterly* Wiley-Blackwell. Vol. 47, No. 189 (Oct., 1997).

Spectators had experienced moving images for more than 50 years within the realm of cinema when artists brought the moving image into museums at the end of the 1960s. In the context of art exhibitions, the propagation of video installations has evolved considerably every year since that decade. Whether sculptural, architectural, or robotic, the video screen has been redefined, and its interactions with bodies, media, and space have been explored in numerous manners. Screen-reliant installation art has changed people's relationship with the notion of materiality, given that the "disembodied image of the new media—fluid, immaterial, weightless—is its own support," as stated by Florence De Mèredieu.[189] Incontestably attractive, the illuminated surface acts as a sensorial magnet to the spectator's gaze and always captures people's attention, Françoise Parfait observed.[190] Video artists have transformed the once-immobile viewers into active participants, redefined film's notion of time and space, and reshaped the perceptions of the world through their video installations.

Whether miniature or monumental, enveloping or distant, or within a dark or bright environment, artists have been experimenting with moving images in numerous ways. De Mèredieu discusses how Wolf Vostell, Fabrizio Plessi, and Nam June Paik first appropriated the television set as a tool of expression, varying in format, quantity, position, and space. She recounted Nam June Paik's prediction that "the cathode ray tube will replace the canvas."[191] For De Mèredieu, the supremacy of technology also offers a "world of synthetic sensations,"[192] which artists often place at the heart of their

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[189] Florence De Mèredieu, *Digital and Video Art* (Edinburgh: Chambers, 2005), 217.
[190] Françoise Parfait, *Vidéo: Un Art Contemporain (*Paris: Editions du Regard, 2001), 160–163.
[191] De Mèredieu, *Digital and Video Art*, 27.
[192] Ibid., 9.

creative works. Visitors are corporeally, mentally, and sensorially mesmerized. Thus, video installations are in a certain way always performative, according to Parfait.[193] Like performances, they are meant to unfold in time and space. However, the primary focus of a video installation is often on the relationship between the visitors' bodies and the selected moving images rather than on the materiality of the surface that receives the images. Habitually, in the context of art, screens serve as passive surfaces for moving images, as do canvases for painting.

The development of technologies such as holography films, fiber optics, biofeedback-generated imagery, computer graphics, interactive electronic media, and spectral video projections has presented artists with a plethora of tools to search for innovative forms of interaction between moving images and spectators, as well as between the virtual and physical worlds. However, through the ongoing technological progress of video displays, artists and manufacturers have placed an emphasis on the enhancement of visual and audio stimuli rather than on the overall bodily experience. Sensory anthropologist David Howes has pointed to the primacy of audiovisual technology and its impact. According to Howes, the screen is best seen as a "sensory deprivation device"[194] rather than a screen of sensations of taste, smell, temperature, and so forth, as Verrips believes.[195] However, as we enter an era of materials with built-in sensing, processing, and actuating systems, as in tactile displays, we need to analyze whether responsiveness could or has reached another level of complexity.

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[193] Françoise Parfait, *Vidéo: Un Art Contemporain (*Paris: Editions du Regard, 2001), 160–163.
[194] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[195] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002).

Rethinking the approach to the design of video screens could also result in an intensification of the experience of moving images. With a multisensory method, video screens could evolve into a sensible video membrane if their materiality (format, size, shape, resolution, texture, colors), spatiality (setting, context, and environment), and interactivity (the interplay between each element of the system) were chosen to respond to the content of the moving images as well as to their continuous changes, such as tonality, luminosity, texture, and resolution. This leads to the main question of this transdisciplinary research: how can a multisensory approach to the artistic development of responsive video membranes result in the enhancement of people's experiences of moving images? How might a screen get even closer to its subject? It bear that video screens can fuse actively to moving images only by their chosen materiality, as seen in my past interactive video system. This generates the following sub-question: how can the membrane's materiality, spatiality, and interactivity influence people's perceptions, appreciation, and understanding of the moving images?

2.2 Hypotheses

Since the first movie projection occurred in the 1890s, artists have explored the intricate dichotomy between the virtual space provided on-screen and the physical space off-screen. As a result of ongoing technological development, the boundary between these two realities has become even more blurred. Studies have demonstrated that people have less time to interact directly within the physical world. Thus, people's sensory memories of lived experiences in the physical world are slowly being (re) defined through the screen itself. For Ron Burnett, through the use of new media,

people are gradually losing their senses.[196] In contrast, Verrips,[197] McLuhan,[198] and Meigh-Andrews[199] believe that any type of video screen always presents multisensory responses, implying a continuous interplay of all the senses. The nuances created by the screen's materiality, such as its format, resolution, shape, and setting, as well as the content of the images, have not been considered as factors of this embodied experience in these theories. Others, such as Mark[200] and Classen,[201] have explored the tactility aspect of certain kind of moving images, although other factors, such as the size of the screen and the setting in which the images are presented, are not taken into consideration. However, in the context of art, the screen's materiality and its spatiality are defined as influential facets of creative exploration and artistic expression found in numerous screen-reliant installations art, as discussed by Martin,[202] Mondloch,[203] and De Mèredieu.[204] Displacement is required in such installations, and many spheres of exploration are involved simultaneously. The occurrence of moving images in installation art, such as in *Corps étranger* (2004) by Mona Hatoum, proposes corporeality, as visitors are required to move and walk on moving images within a confined structure. Here, a physical action is automatically implied. When the visitors move

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[196] Ron Burnett, *Cultures of Vision: Images, Media, and the Imaginary*, (Indiana University Press, 1995).
[197] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002).
[198] Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA:MIT Press, 1994).
[199] Chris Meigh-Andrews, *A History of Video Art: The Development of Form and Function* (New York: Berg, 2006).
[200] Laura U. Marks, *The Skin of the Film: Intercultural Cinema Embodiment, and the* Senses (London: Duke University, 2000), 127-193.
[201] Constance Classen, *The deepest Sense, A cultural history of Touch,* (University of Illinois Press: 2012).
[202] Sylvia Martin, *Art Vidéo (*City: Taschen, 2006).
[203] Kate Mondloch, *Screens: Viewing Media Installation Art. (*Minneapolis: The University of Minnesota Press, 2010).
[204] Florence De Mèredieu, *Digital and Video Art* (Edinburgh: Chambers, 2005).

around in the space, the reflection of the video projection is imprinted on their bodies. However, no examples of video display have been found that both react physically to the moving images and to the visitors by changing shape, format, position, and resolution, and at the same time respond conceptually via the chosen materiality, spatiality, and interactivity. During the process of designing responsive video membranes, if an emphasis is placed on the receiving sensory signals (whether they are coming from sensory memory, imagination, or association), I hypothesize that the screen will get much closer to its subject. I also consider that many other factors can influence the perception of the moving images. Based on all the details of the presentation, I believe that as a result, the final experience of the presented moving images will certainly be intensified.

Furthermore, brain studies by Erica Michael and Marcel Just have confirmed that each medium creates a different sensory and somatic response.[205] I may hypothesize that the screen's materiality can also alter the perception of the presented images. As demonstrated, "experiencing" a film specially designed for a cinema screen on an iPod could be found to change the overall experience. However, if the film were specifically made for mobile devices, it would need to be conceived differently to take advantage of the screen's properties. Therefore, to get the subject closer to the object, I purport that all aspects of the screen as well as other influential factors must be carefully considered. Artists such as Oursler, Rist, and Hatoum have demonstrated the importance of spatiality in the understanding and appreciation of their video installations.

[205] Norman Doidge, *The Brain That Changes Itself*, (London: Penguin Books, 2007), 308.

Consequently, the chosen setting and environment of a responsive membrane would need to reflect the content both conceptually and physically in order to reinforce the experience; if the communication between the on- and off-screen realities is nonexistent, the bodily experience of the selected images cannot be fortified. Therefore, I believe that the interactions between each chosen element of the membrane's systems, such as its texture, shape, format, setting, and environment, can trigger different types of sensory input, which could result in diverse overall responses. For instance, if some of the elements of the systems, such as the color of the membrane and the colors of the wall in which it is presented, are not considered in regard to the moving images, then the result may lead the person far from the artist's desired outcome. This is why I believe that in a multisensory approach to the design of a responsive video membrane, where each detail of the system is consciously selected, the display will fuse to the moving image in an active manner, offering the visitors layers of information for them to consider during the experience. The passive screen's surface will then become an active shell that will envelope the moving images, offering a video space that is the idea behind the proposed responsive membrane in this doctoral research. The design of video screens suitable to the presented images will result, offering continuous nuances in the registers of their spatial, temporal, and qualitative aspects, consequently enhancing an individual's sensory, affective, and cognitive experience of a moving image.

This desire to fuse both on and off screen's realities together and to literally enter inside the space it offers or to escape from it has been explored since the 1920s by writers such as Vladimir Mayakovsky and decades later by filmmaker Woody Allen in

his classic *Purple Rose of Cairo*. Only with the development of new technologies have audiences been able to physically navigate a video's virtual space. Most recently, because of the increasing accessibility to a plethora of sensors, surfaces can be designed to respond to the images, thus changing shape, format, and material properties. In the dimension of virtual reality, countless researchers and artists are exploring the sensation of the "screen-less" environment, where viewers can find themselves in two locations simultaneously, both physically and virtually. However, I propose, with this research, not to take away the screen, but to consider the possibility that it could evolve into something different, such as a sensible surface that serves as membrane able to receive and respond to moving images. My hypotheses are based on the idea that in order to have an augmented sensory experience in which the body is physically touched by the images, as described by Verrips,[206] people would need more than just a video screen, such as a television set. Many details and factors must be considered. Sensory memories, sensory imagination, and sensory knowledge also influence the responses to moving images; however, along with Mondloach,[207] I believe that the screen's materiality, interactivity, and spatiality also alter the individual's perception. In consequences, the nuances and details of the screen's physicality and environment of presentation are all facets that could offer different experiences. Therefore, I posit that it is extremely important to value all of these influential factors in both realizing the design of the responsive video membrane and analyzing such sensory manifestations.

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[206] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 18.
[207] Kate Mondloch, *Screens: Viewing Media Installation Art.* (Minneapolis: The University of Minnesota Press, 2010).

Chapter 3: Methodology

The spectator makes the picture.

—Marcel Duchamp

This exploratory research is divided into two main sections. The first is generated by the artistic development of two responsive video membranes (specially constructed surfaces that respond both physically and conceptually to the projected moving images) as well as their interactive systems in which it will be integrated. This production is carried out under a defined multisensory approach inspired by methods proposed by Schifferstein,[208] Persig,[209] and Nesbitt.[210] The second segment consists of a case study for each elaborated system. Through a stage of direct observations using a grounded-theory approach within a sensory examination framework, target participants are invited to interact with responsive video membranes in the context of an art exhibition within a gallery's space. Survey research methods include the design and implementation of an interview and questionnaire. Participants (a sample from a population of gallery visitors in Montreal) are requested to describe their sensory responses in relation to the materiality, spatiality, and interactivity of each format of representation. Through both reflexive and experimental processes, people's sensory responses are observed and

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[208] Rick Schifferstein, H.N.J. "Multi Sensory Design." (paper presented at the ACM Proceedings of the DESIRE'11 conference – Creativity and Innovation in Design, Technical University, Eindhoven, the Netherlands, 19-21 October 2011), Eds. C.J. Hooper, J.B. Martens, P. Markopoulos, 361-362.
[209] Robert Persig, "Delft Design Guide, for Industrial Design," *TU Delft*, June 30, 2010, http://ocw.tudelft.nl
[210] Keith V. Nesbitt, "*Modeling the Multi-Sensory Design Space*, " (paper presented at APVis '01 Proceedings of the 2001 Asia-Pacific symposium on Information visualisation, Basser Department of Computer Science, University of Sydney, Australia, 2001), 27-36

analyzed based on the method of sensory ethnography proposed by David Howes[211] and later codified by Sarah Pink.[212]

3.1 Part 1 - Artistic Production

From conceptualization to design and fabrication of the responsive video membranes, I propose a multisensory approach comprised of the seven following steps.

First a target expression, which is a word that states a manifestation of emotions (e.g., captivity), is selected as being a fixed objective as well as an inspirational ground for the elaboration of both the responsive video membrane and its interactive system.

Then, inspired by the Multi Sensory Design Method (MSD) in the Delft Guide,[213] the second step consists of the identification of the desired effects, such as feelings, sensations, and responses (e.g., fear, wonder, anger, compassion, and curiosity), that the chosen expression could evoke in participants.

Next, an extensive understanding of the selected expression and desired effects are developed by gathering the experiences elicited by the selected expression. While recalling these encounters, emphasis is placed on the interplay between sensory modalities (i.e., visual, auditory, tactile, olfactory, gustatory, and kinesthetic), sensory memories (the impression of a sensory stimulus after the stimulus itself has ended),[214] and sensory imagination (a quasi-perceptual experience in the absence of appropriate

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[211] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003).
[212] Sarah Pink, *Doing Sensory Ethnography* (Thousand Oaks, CA: Sage Publications, 2009), 27.
[213] "Delft Design Guide, for Industrial Design," *TU Delft*, June 30, 2010, http://ocw.tudelft.nl
[214] "5. Cognitive Processes: Sensory Memories," ThinkQuest, 2013, http://library.thinkquest.org/

stimuli).[215] Moreover, as outlined in the MSD method, the sketching process takes the form of a collection of various components (e.g., objects, sound files, smells, textures, etc.), which are chosen to represent the interplay of feel, smell, sound, or taste that evoked the main target expression. These encounters also represent the inspirational ground for the decisions made in the following steps.

The fourth step explores the ideal space in which the responsive video membrane should be presented. In relation to the identified effects as well as the sensory memories recalled in the selected encounters, the setting of the responsive video membrane (e.g., suspended, on the ground, or on a wall) and its environment (e.g., dark, bright, with or without curtains, color of the walls, height of ceilings, or dimension of the room) are carefully chosen.

Then, the fifth step is divided into three sections: the elaboration of the responsive video membrane, the production of moving images, and the recording of the sound. The design and fabrication of the responsive video membrane involve a sensory exploration of the possible visual metaphors (e.g., the structure, dimensions, shape, surface, texture, and colors) as well as the tactile metaphors (e.g., force, inertia, vibration, hardness, and softness) that its materiality could trigger, as inspired by the method proposed by Nesbitt.[216] The selection of each detail of the membrane's physicality is made while keeping in mind the target expression. Then, the moving images include the realization of a performance as well as the editing of the captured moving images. In this case, the

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[215] "Sensory Imagination," Stanford Encyclopedia of Philosophy, published Mon Mar 14, 2011, http://plato.stanford.edu/entries/imagination/

[216] "Delft Design Guide, for Industrial Design, Emerging Methods, The Zen Design Method " *TU Delft*, June 30, 2010, http://ocw.tudelft.nl

visual metaphors (e.g. the body's movements, the clothes, the lighting, the environment in which it is filmed, and the camera's position), the tactile metaphors (e.g., force, inertia, vibration, hardness, and softness), and the emotional associations that these selections could stimulate (e.g. fear, surprise, or happiness) are considered beforehand. Then, the relation between the sensations and the selected audile metaphors (e.g., source, pitch, amplitude, timbre, and musical) are investigated. The desired textural effects are also explored inside the tactile register (e.g., the sound of paper crumbling, or the sound of an insect eating). This examination is made in light of the relationship between the sensory signals and the desired effect. Schifferstein noted, "It is important to find out why certain samples seem related to a specific expression and try to determine the physical properties that evoke the target expression."[217] Although the actions in this step are described in a certain order, they can be executed in any order. For instance, the sound could be captured and edited before the realization of the moving images, or the fabrication of the membrane as everything will eventually fuse together and become only one entity.

Next, after the setting, environment, membrane design, moving images, and sound are identified, different scenarios of the possible interactions between each element of the system are elaborated. As suggested in the MSD approach, the setup is used to identify "all the sensory touch points during the experience."[218] This step comprises the design of the interfaces (e.g., electronic circuits, sensors) and software

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[217] Geke D.S. Ludden, Henrick NJ Schifferstein, Paul Hekkert, "Surprising the Senses," in *Senses & Society*, Volume 2, Issue 3, BERG, 2007, 353–360.
[218] "Delft Design Guide, for Industrial Design, Emerging Methods, The Zen Design Method " *TU Delft*, June 30, 2010, http://ocw.tudelft.nl

(i.e., the program). Inspired by the Persig's Zen method, all decisions, such as the kind of sensors used, are made based on the desired ritual, which is the intended individual's experience within the system. To complete this step, a series of question are posed. First, how can the medium (the responsive video membrane) maintain the visitor's involvement? How could it continuously mutate its physicality in the eye of the observer while simultaneously responding to both internal and external input of the program? Also, which strategies could the program take in order to stimulate the direct interactivity between the images, the membrane, and the visitors? Moreover, how could the software component enhance the medium's ability to capture the visitor's attention? How could the system sense the visitor's mood? Finally, how can the screen's materiality, interactivity, and spatiality intensify the experience of the moving images directly? As soon as the desired behaviors of the dynamic system are identified (e.g., regular, cyclical, chaotic), the interplay between the sensations and the temporal metaphor (e.g., how data change over time, movement, rhythms) are investigated. For instance, if the program changes the regular state of the medium in a chaotic manner, the visitor could feel an effect of "surprise" or "fear." By answering the questions posed here, the interactivity of the system can be predicted and the visitor's experience enhanced.

Finally, the last step is the exhibition of the realized system in public spaces in the context of art exhibitions. Once the systems are installed, they are examined within case studies as proposed in the next section.

3.2 Part 2 - Case Studies

A case study is conducted for each realized system. The first one examines *XIA System* (2011) and explores how the materiality of video display can alter one's perception of moving images in the context of a gallery art exhibition. Participants are invited to experience a video sequence projected on its "specially constructed membrane." Then, they are asked to view the same sequence within three formats of representation: a 1980s television, a 2011 iPad, and a 2011 iPod. This television was selected to represent an old device that could trigger various memories from participants, while the iPod and iPad were chosen to portray recent technology and a common mobile display. During this process, direct observation is carried out to collect data, such as the behaviors of the participants as they experience each format of representation within the darkened art gallery. Then, they are invited to answer a series of structured questions as described in the following section

Next, the case study on the *CEREUS -- Queen of the Night* (2008–2013) examines how influential the screen's spatiality and interactivity are for the overall experience of the presented moving images. First, participants are asked to experience the *CEREUS* system. Direct observation sessions occur where data are recorded in the exhibition room to trace participants' movements in the space and also to note the duration of their visits. This step takes place in two different locations where the space's dimensions and configurations vary. Once the participants finished experiencing the system, they are asked to advise the researcher. At that moment, the researcher silently brings the participants to a closed room near the gallery and gives each a questionnaire to

complete. Participants are asked to reply spontaneously to a sequence of structured questions. Open-ended interviews are also conducted.

In both case studies, participants are asked to allocate a minimum of 60 minutes for this study and are required to sign a written consent form prior to visiting the gallery.

3.2.1 Sample – Participants

The population of interest in these two case studies is selected using the stratified random-frame sampling method.[219] The randomization of the sub-samples is based on the different selected strata: a group of professors and researchers from Concordia University, a group of students, and a group of gallery visitors (volunteer passersby). Participant recruitment occurred primarily through e-mail invitations via selected mailing lists for researchers and professors. Students from various universities and Cégeps within different fields of study are invited to participate. In addition, passersby are invited to take part in this study to ensure the inclusion of random volunteers. The generalization from the sample to the sampling frame is considered representative of a population of individuals who visit galleries in Montreal, including representation from various fields of specialization and professional occupations.

3.2.2 Evaluation of the data

The approach to the design of the questionnaires and the manner in which the collected data is analyzed are based on sensory ethnography methods. This provides

[219] William M.K. Trochim, "Probability Sampling, Simple Random Sampling, "(Research Method Knowledge Base, 2006).

reflexive and experimental processes that include participatory research techniques, such as the participants' observations and interviews. Sarah Pink's studies have examined this methodology's potential to represent multisensory manifestations. She demonstrates that the sensory reflexivity, subjectivity, and inter-subjectivity is understood, practiced, and simulated in this approach.[220] Ethnography is "a qualitative research design aimed at exploring cultural phenomena."[221] In contrast, sensory ethnography suggests a process through reflexive attention to sensory experience, practice, and knowledge of both the researcher/designer and the target subjects who participate in the study. For this research, inspired by sensory ethnography, I propose an approach, which comprises of the five following steps.

First, the researcher must consider each detail of the system from the type of screws (e.g., colors, size, and material) that are used to the color of the cables and electric wires. During the installation period, it is important to examine the details of the gallery's space to determine each factor that could affect the participants' experience (e.g., exit signs, doors, windows, and light). During that period, the researcher/designer must eliminate influential factors that could harm the overall experience (e.g., by blocking the window or hiding exit signs). This step is in line with the multisensory approach to design suggested in Part 1 - Artistic Production.

The second step consists of the construction of the questionnaire, which is divided into two sections: the participants' sensory profile and their sensory responses. As David Howes demonstrated, it is necessary to create a sensory profile of the

[220] Sarah Pink, *Doing Sensory Ethnography* (Thousand Oaks, CA: Sage Publications, 2009), 27.
[221] "Ethnography," Wikipedia, last modified on 6 October 2013, http://en.wikipedia.org/wiki/Ethnography

participants prior to making any observation or analysis of their sensory manifestations.[222] In order to create a sensory profile, this section of the survey asks the participants questions about their daily relationship with video screens. Specifically, they are asked to describe in their words a screen for moving images and to calculate how many hours a week they spend in front of a screen. Next, they are asked to explain whether they consider those screens to be only audio-visual or multisensory. Finally, they are instructed to discuss whether they consider the onscreen world more attractive than the one in which they live and to enumerate the reasons for their answers. After providing answers to develop their sensory profile, participants move on to the second section, which focuses on their sensory responses to their experiences of the system. Specific questions are created for each system. In the case of *XIA*, the participants are asked to identify the representation that best captures their attention, and to explain how different the experience was for each format. Next, they need to state whether the display's materiality altered their perception of the moving image and whether any other influential factors affected their perception during the experience. Finally, they are also required to identify the emotions and sensations evoked during their experience of the system and describe what they think the system was trying to convey. For the experience within the *CEREUS* system, participants are asked to identify the first word that comes to mind after the experience, to enumerate the emotions evoked, to describe the space of the system, and to describe what they think *CEREUS* was trying to convey. Finally, they are asked whether they feel that the spatiality altered their perception of

[222] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003).

the image and, if so, to explain the reasons. For these questionnaires, respondents have the option of writing their answers directly on the questionnaire or recording their replies using an audio recorder. This process allows the participants to select the most comfortable method, which ensures detailed answers. Also, if a respondent does not understand the meaning of a question, he or she could ask the researcher for clarification.

In the third step, the collected results of both the direct observation and surveys are analyzed. Each word choice is considered. For the *XIA* case study, the direct observation is made for each format of representation. The participant's position, such as static or mobile, their proximity to each screen, and the manner in which they hold the devices are noted on a table for analysis. The categories for the distance differ based on the suggested viewing distance for each format of representation. For example, the 26-inch TV requires from 3 to 6 feet, as proposed by the Viewing Distance Calculator,[223] whereas the iPod and iPad require 3 feet or less. For the *CEREUS* case study, the participants' movements are traced on a floor plan. The speed of their displacement as well as position and duration of the visit are marked using color-coded lines. The observations are made in two distinct locations in order to examine how the spatiality influences the experience of the system.

Next, the fourth step for the replies to the questions, each word is studied before being placed into the tables for analysis. The tables present groups, which are identified by one word. Different groups are formed depending on each question. In the profile

[223] "Viewing Distance Calculator," C. M. Collins, 2001, http://myhometheater.homestead.com/Index.html.

section, the groups are based on suggested theories presented in Chapter 1 – Literature Review. For example, the groups *window*, *space*, *surface*, and *interface*, are chosen for the question on how the participant describes a video screen. These words directly reference studies on video screens that were examined during the first stage of this research. As seen in the literature review, a screen can be described as an opening to another world, or it can be associated with an area or a 3D expanse, marked only by its outer boundary or reference to a physical object. For the section on participants' sensory responses, the categories are chosen in relation to the chosen target expression and the desired effects selected during the artistic production for each system as discussed in the next chapters on the artistic production of *XIA* and *CEREUS*. All the collected data, in both French and English, is placed in the table as raw data. In regard to sensory ethnography, Howes proposed the examination of multiple areas, such as the language used, in relation to the senses evoked during the experience and the relationship between the senses, the constructed setting, and the proposed environment to understand the position of the sensorial modalities within a culture.[224] In the evaluation of the data of these case studies, the words used for the categories are chosen in direct relation to the principal aim of this research. Finally, every reply is taken into account and is presented inside tables in the annexes of this research, in order to present the nuances that they can evoke.

Finally, the methods used to interpret both the tables of analysis and the interviews are based principally on the emotions evoked during these experiences.

[224] David Howes, *Sensual Relations. Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan, 2003).

Maurice Merleau Ponty wrote, "All human experiences are based in the human body, which explains the unity of the senses."[225] Thus, in order to analyze such experiences, it is important to emphasize the individual's experiential role as well as his or her physical engagement with each element of the presented systems. As proposed by sensory ethnography, it involves an evaluation of the accumulated data both in great detail as well as in a wide overview of all participants' sensory responses.

3.3 Summary

For the purpose of this research, the artistic production and the case study are based on an approach that focuses on sensory responses to the screen's materiality (i.e., its format, shape, color, and material used), spatiality (i.e., the on- and off-screen spaces, its settings, and environment), and interactivity (i.e., between the screens, the media, and participants).

First, the proposed multisensory approach to the design of the responsive video membrane principally questions the proprieties of the space in which it will be presented as well as the material aspect of each element of the presented systems. This includes the physical aspects of the moving images, sound, and membrane in regard to the chosen target expression. The approach also focuses on the intricate interactivity among these elements of the installation with the visitors and the relationship between bodies, media, and video membranes, which include shifts between time and space as well as among the different sensorial modalities elicited.

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[225] Cretien Van Campen, *The Hidden Sense: Synesthesia in Art and Science* (Leonardo Books, 2006), 155.

For the case studies, in order to ensure that the data collected can provide meaningful information for the proposed guidelines, the experience is maintained in a specific context, which is inside an art gallery. Also, the results are analyzed in great detail in order to place each reply inside tables of analysis. The interpretation suggests a particular focus on the nuances in order to provide information that could be used in various ways. The direct observation permits the researcher to examine different approaches to spectatorship. For instance, do the proposed responsive video membranes trigger feelings of embodiment? Do they call for an uncontrollable gaze, an immersive physical experience, and psychological effects? What is the role given to visitors in these pieces of artwork? Are they visitors, users, participants, actors—or all of these? These questions will be examined in greater detail in Chapter 6.

Inspired by the writings of Jorges Luis Borges, the *XIA* and *CEREUS* systems were designed to offer an endless labyrinth where each participant could experience a different story simultaneously. With these two systems, the goal is to provide a membrane that is ever closer to its subject. As such, the worst scenario would be if participants had no reaction at all during the experiences. For example, in the case study on *XIA*, the worst would be if participants thought that a display other than the one specially designed in the artwork best captured their attention. These systems were designed to avoid such a scenario and evoke strong responses from the participants. In the next two chapters, each step of the design of these systems are defined and scrutinized in great detail.

Chapter 4: *XIA*

In a darkened gallery space, on a luscious, luminous carnation ground, a velvety black charcoal bloom – like the dusky, polleny heart of a poppy – is both the setting and the trace of a captive's struggle.[226]

— Alison Syme

Philomène Longpré, "XIA" 2011. Montreal, FOFA Gallery. Photo by: Guy L'Heureux

[226] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.

4.1 Part 1 - Artistic Production

From the conceptualization to the design, realization, and presentation of the system entitled *XIA,* all details were accounted for, and each element of the system was meticulously selected in direct relationship to the chosen target expression "captivity."

During the creative process, the sensory exploration of the selected expression resulted in the identification of a wide range of desired effects, which is represented by a series of contrasting emotions, such as sublime moments filled with fear juxtaposed with periods of wonder. For instance, captivity was portrayed by both dark and anxious flashes, as well as luminous scenes filled with hope and curiosity. The "state of being imprisoned, confined"[227] was studied along a variety of avenues, such as being a captive of a space, a body, a dream, or a story. I also studied concepts that included imprisonment on a canvas or in an image, in the same way that the artist's delicate or harsh traces are held captive in a sculpture, or in the way that light imprints the surfaces of photographs, as discussed by Di Bello.[228]

This exploratory step was followed by an investigation of the immediate associations, as well as by the gathering of experiences in relation to the chosen expression and intended effects of this artistic production. To do so, I first went through a collection of sound files that I had recorded during previous travels in China.

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[227] "Captivity," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/captivity
[228] Patrizia Di Bello, ed., *Art, History and the Senses* (Farnham: Ashgate, 2009), 1-14.

For this piece, I selected the vibrant sound produced by the ancient 龍洗 "Golden Water Bowl", or the "Dragon Bowl," which I recorded in Ping Yao old city, located in the Shanxi province of China.

"Golden Water Bowl," Ping Yao, China

Enclosed in this decorated bowl made of brass, the water seems to be serene and immobile. As soon as someone rubs its handles, the water reacts and moves in all directions, like a powerful, frightening storm in the middle of the ocean. If the person rubbing the handles is sufficiently patient, the aggressive movement will slow down until the water's gesture harmoniously organizes itself, and creates distinct drops that leap into the air, trying to escape from the confined space. According to the number of drops and the light flittering on the surface, the owner of the bowl predicts one's future and interprets the energy from the water's response. This action proposes a sound of metallic reverberation juxtaposed with the whistling water.

While keeping that sensory experience in mind, I then recalled a visit to a calligraphy studio in Dunhung, a city situated at the door of the old Silk Road in Gansu Province. In that studio, paper scrolls of all sizes were preserved in a tiny, dark room.

As soon as the heavy bells attached to the wooden door announced my arrival, an old man emerged from the darkness, bringing with him some long-hidden scrolls. He started to unroll the largest of them, and, like the pollen of a bloom, dust was scattered through the air, fertilizing my imagination. Filled with details, the deep black ink gestures on the unrolled yellowish paper came alive, as if responding to my gaze.

Finally, the last experience that I recollected regarding the selected expression was my unforgettable visit to the Mogao Caves. Located in the middle of the Gobi Desert, thousands of little carved doors opened into spaces showcasing the millenary history captured on magnificent murals. Only a few guardians owned the keys. Inside the grotto, in total darkness, with a scarf covering my mouth to shut out the deep smell of dust, a guardian asked if I was ready. It was at that moment, thanks to a tiny flashlight, that a world was revealed in front of me. Vivid colors made from natural pigments, from lapis lazuli to jasper, staged a luminous canvas filled with Feitians; flying characters that lacked wings or feathers. Dancing freely in the sky, with ribbons fluttering elegantly, they were referred to as the "fragrant goddess with a sweet voice."[229] Imprisoned in the cliff, the murals had many stories to tell. I was mesmerized, yet also frightened, by this embodied experience, in which my imagination was simultaneously triggering different cycles of time in history.

From these particular encounters, I delved into the realm of the sensible, exploring how the body reacts to the coexistence of a thousand years of history. Under the proposed approach, the realization of *XIA* consisted of the sensory exploration of the spatiality (environment and setting), the materiality (the responsive video membrane,

[229] "Feitian," Online Dictionary, China Culture, 2003.

moving images, and sound), and the interactivity (the program and electronics circuits, as well as the relationship between each element). With regard to both the desired effects, as well as the sensory memories recalled from the selected encounters, the creative process also implies the search for possible sensory metaphors. For example, the high pitch of the metallic reverberation could evoke fear and anxiousness among visitors, as the darkness of the space could trigger curiosity relating to the unexpected. This system is designed with the aim of optimizing the experience of the moving images with each chosen detail, as discussed in the following section.

4.1.1 Spatiality

The carnation ground unfurls onto the gallery floor,
tempting the viewer to step into the floral trap.[230]

– Alison Syme

XIA's interactive video system requires installation inside a space measuring a minimum of 20 feet long by 15 feet wide and 12 feet high. It is also surrounded by heavy black velvet curtains to darken the space, producing an aesthetic similar to the one created inside movie theaters. Visitors are invited to walk along the outside of these black velvet curtains until they find a tiny entrance, as if they are entering a mysterious cave. Facing the opening, an unexpected luminous canvas briefly dazzles the spectator. A virtual, immobile character is projected on carnation paper of 9 feet wide by 11.4 feet high, which continues on the floor for 8.3 feet and rolls up at the end, like a giant scroll.

[230] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.

Two suspended black speakers are placed in the corners near the entrance and point toward the middle of the paper mounted on the wall, surrounding the visitors with sound as soon as they enter the confined space. In addition, a network of Ping ultrasonic and Phidgets infrared motion sensors is hidden in strategic locations on the ceiling. One motion sensor is placed at the entrance in order to detect visitors' arrival and departure, while six ultrasonic sensors create a grid to determine their actual position in space. Recalling my experience in the Mogao Caves, the projected virtual character comes alive as soon as visitors enter the space, as if responding to their gaze.

Between light and dark, the virtual world captured on the giant scroll, and the obscured space in which the visitors stand, are fused together, offering an immersive environment to explore. According to Jeanine Parkinson:

> *XIA* formed a virtual pocket of time and space that is annexed onto our own. The space is shallow with no foreground or background; the depth is more like a relief. The camera's point of view does not move, forming a seal between this pocket of virtual space and our own. Dark footprints lead along the pink canvas lying on the floor, like traces of someone having left this reality and leapt into the alternate sanguine atmosphere. There is a doubling of real charcoal handprints beneath their projected counterparts, in a way that produces a hint of depth. Gravity behaves differently in this other realm. The woman is suspended in space, floating as if she is in a liquid environment.[231]

4.1.2 Materiality

On the basis of the proposed multisensory approach, the mediums and techniques used for the design of each element of the *XIA* system were chosen in direct relation to the three encounters that I associated with the selected target expression for this piece.

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[231] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*," *Driving Creativity, Artengine blog: Art and Technological Experimentation*, August 5th, 2011.

The system consists of a responsive video membrane, a virtual character, sounds, and digital interfaces; these components are described in the following sections.

4.1.2.1 Responsive Video Membrane

A large, flesh-pink, carnation-colored paper serves as a responsive video membrane for the projected moving images. It offers a flat surface mounted on a wall and curves at the bottom, as it gently unrolls on the ground toward the entrance, inviting the visitors to come in. As Parkinson's review of this piece explained, "The canvas rolls off the wall and along the floor into the space, and the woman appears pinned to it, like a butterfly in a shadow box, trapped and on display as an allegory of beauty and mortality."[232] This canvas is also marked with dark gray charcoal powder. The gestural abstract, yet expressive, captures the projected virtual character's body movement and freezes its passage while leaving its traces. Like a score, these marks witness the figure's unfolding actions, triggered by the visitors. The texture created by the charcoal powder of the surface, the heavy black imprints, and the strong contrast with the pink paper produce a certain three-dimensional (3D) illusion that the moving images are floating. The traces on the surface are made especially for the moving images. Every detail, such as color, format, texture, and shape, was selected to intensify the experience of the moving images. The static surface shifts into a responsive video membrane at the moment where the marks on it actively fuse with the character's movement. As Rebecca Hiscott mentioned in her review, "The figure seems to protrude from the backdrop due to layered HD video, which creates a shockingly three-

[232] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*," *Driving Creativity, Artengine blog: Art and Technological Experimentation*, August 5th, 2011.

dimensional holographic effect."[233]

Philomène Longpré, "XIA", 2011. Montreal, FOFA Gallery, Sept. 2011. Photo by: Guy L'Heureux

[233] Rebecca Hiscott, "Between Darkness and Light, Anima Shares the Vision of Ana Mendieta," *The Link*. Montreal, Sept.13, 2011.

On the flesh-pink paper chosen to portray undying love, fragility, and delicacy, like the pollen of a bloom, traces of charcoal fuse with that made in the projected moving images. Thus, the responsive video membrane, especially elaborated for these particular images, all together creates a volume, a space for the image to float. Art historian Alison Syme described the membrane as follows: "A luscious, luminous carnation ground, a velvety black charcoal bloom like the dusky, polleny heart of a poppy—is both the setting and the trace of a captive's struggle."[234]

4.1.2.2 Virtual Character

Inspired by Michel Serre's fantasy of a non-verbal paradise, as well as the book entitled *Sensuous Man*, by Henry David Thoreau, the performance was drawn from research into the sensory responses to my experiences that I associated with "captivity". I began by collecting various types of fabric and paper for the dress, different pigments for the skin, and gestures for *XIA*'s performance.

Over a six-month period, I filmed sequences of each movement numerous times. I edited them separately and directly on the designed video membrane until I found the specific lighting and body movement that projected the desired effects, which combines a sublime moment filled with fear and torment, with periods of calm and total serenity.

For this performance, I studied both dramatic and delicate body gestures. As Alison Syme described, "Legs scrabble; head and arms jerk mechanically; hands reach out to either side as if to ward off something or someone sensed but unseen. But even as she writhes, slowly turns, or curls up into a fetal position, the near-weightless being

[234] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.

remains trapped in her flowery prison."[235]

Philomène Longpré, "XIA", 2011. Video Still.

[235] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.

The projected character is floating, yet imprisoned inside the scroll. This character is named *XIA*, "a term used mainly in Eastern philosophy which is used to describe a righteous and honorable, chivalrous warrior."[236] The concept behind the term *XIA* came from ancient Chinese culture and referred to a talented warrior who had the skills "to protect the innocent and fight injustice."[237]

Held captive, the character disputes its own reality. The saturation of colors, as well as the kinetically exciting body movement, adds to the dramatic scene. Further, the character's juxtaposition with the pink background elicits a series of emotions and sensations, while simultaneously questioning the idea of disembodiment. For Parkinson, the character is as follows:

> Twisting, tossing, turning, resting and stretching, often with glitching, frantic movements, she gives off a nervous desperation. It is as if she is caught in a nightmare, running but getting nowhere. Her frantically flailing limbs spread heavy charcoal marks across the rich, rosy-pink backdrop. The drama of the piece is heightened by the lighting—an extreme chiaroscuro, which could easily be described as Caravaggesque tenebrism. The strong shadows and highlights sculpt the rumpled fabric loosely wrapped around her figure, exaggerating the contours of her face and body to haunting effect.[238]

In addition, the dress is also an important aspect of this chilling 3D effect. It was designed with rumpled paper and marked with ink and charcoal, which emphasizes the illusion of fusion with the materiality of the responsive video membrane, the display on which the image is projected. As Isa Tousignant stated in an article in *Canadian Art Magazine*, "It features a woman wrapped in a long sheath of heavy paper and lying on

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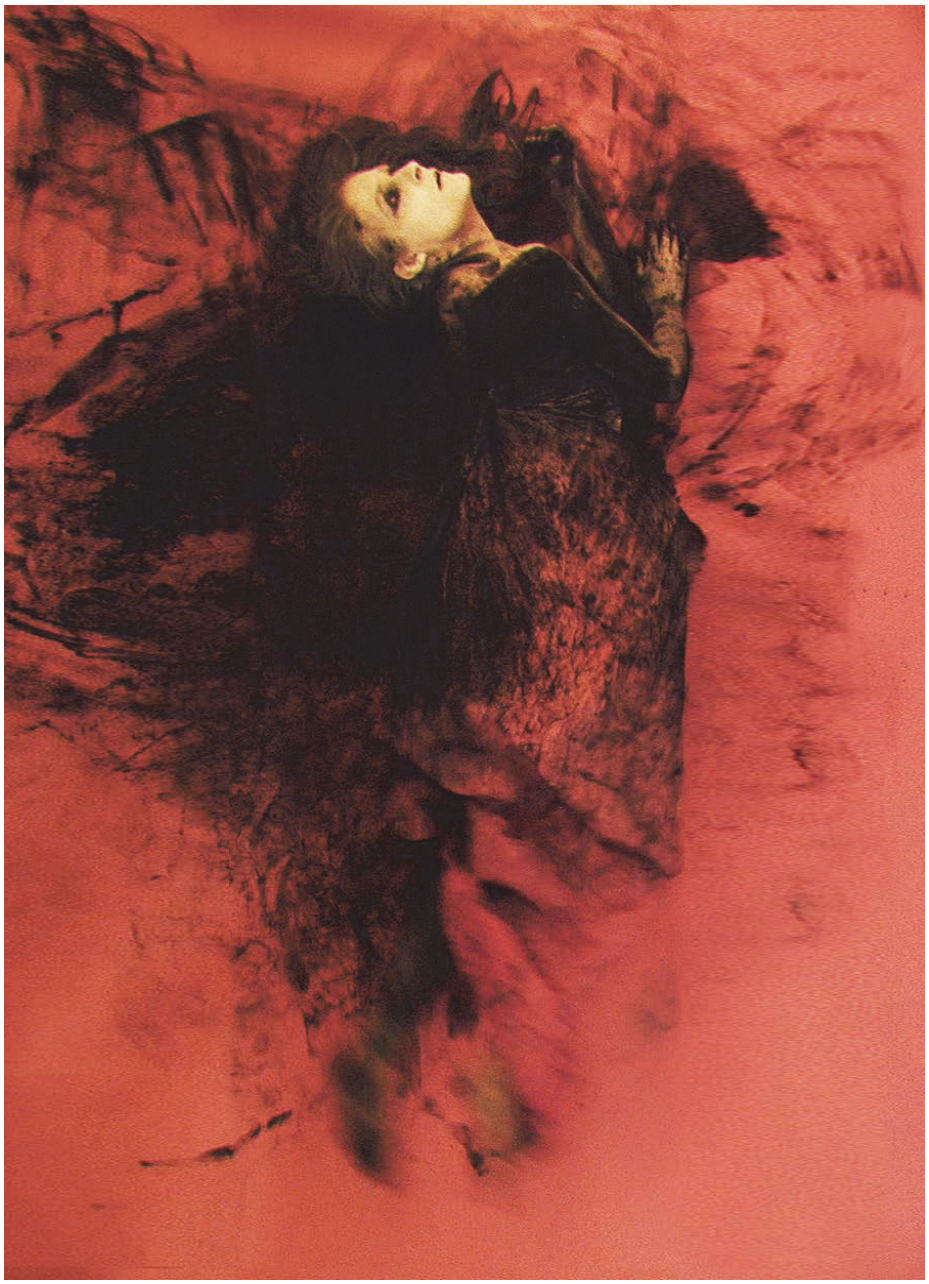
[236] "*XIA*," S.E. Smith, Ed. Bronwyn Harris, Conjecture Corporation 2003-2013.
[237] Idem.
[238] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*," *Driving Creativity, Artengine blog: Art and Technological Experimentation*, August 5th, 2011.

another sheet of paper. Her extremities are covered in what seems like charcoal—a substance, at any rate, that leaves traces of her contortions."[239] From flesh pink to dark vermilion, the colors change so that one can witness time and duration, such as the nuance between day and night.



Philomène Longpré, "XIA", 2011. Video Still.

[239] Isa Tousignant, "Top 3: Into the Deeps," Canadian Art Magazine, Dec. 2011.

Finally, perturbing yet intriguing, the movements of this enigmatic female figure, with continuous flashback and flash forward, freeze-framing slow motion and fast motion, which the moving images explore in a non-linear manner, portray a series of emotions that only visitors can reveal through their presence.

4.1.2.3 Sound

The metallic reverberation, contrasted with the whistling water from the recorded sound of the "Golden Water Bowl" is the primary audio source of this piece. A computer modifies this soundtrack in real time, via a program made using Supercollider and MAX/MSP software. The continuous information received from the sensors' network triggers the intensity of the volume and the variation of the frequencies.

Additionally, two other soundtracks exist. The first is directly linked to the video sequences and, more precisely, to the movement of the character. Heartbeats and loud respiration can be heard in the first of these, while the second soundtrack represents the imaginary environment of *XIA*. It is composed of the sounds of hissing crickets, fluttering birds, creaking wood, and urban noises, such as those of car traffic and machines, all of which were recorded in the center of Beijing, Shanghai, and Xi'an in China. They fuse together, and the visitors trigger their transformation as soon as they enter the room. Hiscott underlined the fact that "the sounds of heartbeats, cicadas and birds emanate, morphing seamlessly into ambiguous industrial noise. It's primal."[240] Meanwhile, Parkinson reinforced this viewpoint, saying that the "sounds of cicadas,

[240] Rebecca Hiscott, "Between Darkness and Light, Anima Shares the Vision of Ana Mendieta," *The Link*. Montreal, Sept.13, 2011.

beating insect wings, pouring water, and metallic scratching reinforce the feeling that we have opened up a gate to a parallel existence."[241]

In this system, the noises are amplified as soon as visitors enter *XIA*'s space, and they fade slowly as people leave. Tousignant discussed the impact of this interactivity. She wrote, "When she 'senses' you, she shifts positions—the paper against paper makes a dramatic rustling sound, a noise joined by that of her breathing as she gets going."[242] The interactivity is happening between each detail of this piece, as examined in the following section.

4.1.3 Interactivity

XIA is an interactive video system where visitor's presence triggers different emotional stages of the projected virtual character. Feeling a sense of being observed, the visitor is confronted with the desire to return the gaze and to witness the system's evolution. The character responds to the transformations that occur in the exhibition room, while a network of sensors captures the visitor's presence, movement, and position. The data are sent to a program I created with MAX/MSP Jitter software on a computer, triggering a transformation in the sound, as well as in the video influencing the projected virtual character's behavior. I also used this software in order to create a 3D virtual space for the images to float, as it allows for the superimposition of multiple layers of high-definition video sequences together, in a method similar to a stereoscopic technique.

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[241] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*," *Driving Creativity, Artengine blog: Art and Technological Experimentation*, August 5th, 2011.
[242] Isa Tousignant, "Top 3: Into the Deeps," Canadian Art Magazine, Dec. 2011.

Philomène Longpré, "XIA", 2011. FOFA Gallery, Montreal. Photo by: Guy L'Heureux

Philomène Longpré, "XIA", 2011. Ottawa, 101 Gallery. Photo by: Bruce Barbour

Further, I used a mapping technology to coordinate the movement of the character in the moving images with the dark traces of the physical drawing on the actual paper. The lighting is also an important factor in the process of creating such a volume. Moreover, the system comprises a series of rules, with the aim of intensifying the visitor's embodied experience. For instance, when no one is in the exhibition room, the character is in a state of rest, and the noises fade and eventually disappear. The character's behavior will mutate as soon as the system detects changes in the environment. In an innate manner, the character responds emotionally with its body gestures.

In Parkinson's review, she mentioned that she had observed subtly different periods in the piece. She wrote, "At some point, the woman appears to be wearing a grotesque mask, and the color projected onto the background turns it more coral than rose."[243] This is a great example of the details that can be activated by the visitor's presence. Hiscott discussed her experience as follows: "As the viewer approaches, the figure springs to life. She flails, kicks her legs, and jerks her head and arms, stares urgently outwards, seemingly in distress. At times she disappears completely, reappearing in a startling cacophony of sound and strobe lights."[244]

This dynamic system was designed with chaotic and cyclic behaviors. Inspired by the "Golden Water Bowl", it was programmed to reflect my experience of rubbing my hand on the handles. For example, in *XIA* System, when visitors get closer to the virtual

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[243] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*,"
Driving Creativity, Artengine blog: Art and Technological Experimentation, August 5th, 2011.
[244] Rebecca Hiscott, "Between Darkness and Light, Anima Shares the Vision of Ana Mendieta," *The Link*. Montreal, Sept.13, 2011.

character, it reacts chaotically, as does the water in the bowl, and if one were sufficiently patient, its behavior would harmonize, and reach a state of serenity in a similar manner to the water. However, the interactivity among the visitors, the character, the sound, and the membrane was designed to be very subtle. For instance, a red light on the figure's waist will appear when visitors get closer, portraying responses to the changes happening in its surroundings. *XIA* transforms under the influence of all of the alterations that take place in its environment. This nonlinear and nonverbal experience explores corporeal responses. The character does not seek to create links with the visitors, yet expresses reactions to their presence. The process of creating this system, and more precisely, this virtual character, was conceived by observing my own sensory responses to unfamiliar environment. It truly delves into the realm of body language, nuances, and detail as a route to the essence of the sensible itself. For instance, the composition of each detail of this system, such as the high pitch in the sound, the rough traces on the paper, and the velvet curtains in the gallery, was structured to optimize the visitor's experience of the moving images. This system also questions the membrane's materiality as an important factor in the perception of the moving image. This was the focus of exploration in the proposed case study.

4.2 Part 2 — Case Study

The case study on *XIA* took place during its presentation at the FOFA Gallery in Montreal, from September 6 to October 7, 2011. A total of 64 respondents participated in the study: the group ranged in age from 18 to 78 years, from various cultural and social backgrounds, representing a population of individuals who visit galleries in Montreal.

The experiment was conducted in the same context as the exhibition inside a darkened art gallery. Participants were invited to experience a selected video sequence within different formats of representation: on its specially constructed membrane, on a television, on an iPad, and on an iPod.

Finally, the evaluation of the data was executed by a combination of two methods of measurement: direct participant observation and survey research based on a group-administered questionnaire, as described in the following section.

4.2.1 Results

4.2.1.1 Direct Observations

During the observation, I first noted that all visitors were in both static and mobile positions while experiencing *XIA* with its specially constructed membrane. They were in a static status only with the television and were mostly static as well with the iPod and iPad. Furthermore, all participants experienced *XIA* with its specially constructed membrane both up close (less than three feet) and far away (at least six feet). With regard to the television, the visitors stayed an average of three feet away, while for the iPod and iPad they remained an average of one foot away.

Finally, the collected data of the observation demonstrated that the screen's format stages the visitor's behavior, and consequently how they experience the moving image. All data were entered in a repertory grid.[245] The distance ranges, that is, less than three feet, three to six feet, and over six feet, were chosen with regard to the viewing

[245] Appendix II: *XIA* – Results. *Table 1 – Case study: XIA. Repertory Grid, 227*

distances suggested by the Viewing Distance Calculator, in relation to each format of representation, as seen in the previous chapter.[246]

4.2.1.2 Interview: Questionnaire

Section 1 – Video Screens

1. *How would you describe a screen for moving images?*

To this question, the complete replies of all 64 participants were placed in a table of analysis composed of the following five color-coded categories: ***Window*** (blue), ***Space*** (purple), ***Surface*** (orange), ***Device*** (red), and ***Others***. Words in participants' replies were analyzed and ones that I considered as referring to any of these groups were marked with these color codes. These categories were chosen in relation to the suggested definitions for video screens as proposed in Chapter 1: Literature Review. The results were presented in the table[247] as follows:

First, I placed a total of five replies in the group entitled ***Window***, which I choose for definition of video screen as being an opening to another world. For instance, one wrote that it is "a window to a virtual or cinematic space that delights our perspective with a supposed reality."[248] This category was selected as a reference to Ann Friedberg's statement that windows are a metaphor for screens.[249]

The group that I named ***Space*** includes the replies of six individuals who described the video screen as being a "created space."[250] This was chosen in reference to

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[246] "Viewing Distance Calculator," C. M. Collins, 2001, http://myhometheater.homestead.com/Index.html.
[247] Appendix II: *XIA* – Results. *Table 2 – Case study: XIA. Answers to question 1, 228*
[248] Participant (36).
[249] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge: The MIT Press, 2006), 1.
[250] Participant (23).

Lev Manovich's discussion on video screen as a space of representation.[251] For instance, in this group, one wrote that it was "a space with variable dimensions that is influenced by the environment it inhabits."[252]

Next, nine participants responded that a screen is a surface that receives, reflects, diffuses, emits, or shows moving images. One participant stated, "A screen is any surface that renders a combination of light particles."[253] These replies were placed in the group that I named ***Surface,*** which is giving reference to the Gregory Chatonsky's proposition who wrote that the entire world is becoming a surface capable of receiving moving-images.[254]

Yet a total of ten respondents observed that video screens are not only a surface, but also a physical, 3D object: namely, an entertainment device, a communication tool, a thing, an interface, a support, or a material that contains images. These replies were all included in the group ***Device,*** which I chose to refer Kate Mondloch's discussion on the video's interface as the key factor in the embodied experience of any screen-reliant installation art.[255]

Finally, in the last category, ***Others***, I placed the distinct answers of ten respondents. For instance, one wrote that the screen is "a founding block of today's modern society,"[256] while another described it as "a frame for a floating dream."[257]

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[251] Lev Manovich, *The Language of New Media* (Cambridge: The MIT Press, 2002), 103.
[252] Participant (7).
[253] Participant (6).
[254] Gregory Chatonsky, "La repetition des limites" in *Proliferation des Écrans, Eds.* Poissant Louise and Tremblay Pierre (Collection esthétique. Presses Université du Québec, 2006), 95.
[255] Kate Mondloch, *Screens: Viewing Media Installation Art.*
(Minneapolis: The University of Minnesota Press, 2010), 15.
[256] Participant (9).
[257] Participant (16).

Additional responses defined screens as "a portal to project people in a virtual world"[258] and as "something that easily captures our attention."[259]

2. Approximately how many hours a week do you spend in front of screens (including the computer monitor, television, iPod, iPad, cell phone, cinema screen, video game devices, etc.)?

The collected data were analyzed with a statistical method in order to calculate the average amount of hours the participants spent in front of screens. The majority responded that they spent over 45 hours a week in front of luminous screens, which represents an average of six hours daily, while 26 disclosed that they log more than 60 hours weekly, which represents approximately eight hours daily. These data served in the creation of a profile of the group of participants.

3. Do you consider those screens to be only audio-visual, where sight and hearing dominate the other senses, or as multisensory devices?

To this question, six participants responded that video screens offer only ***audio-visual experiences.*** For example, one participant described screens as follows:

> The screens that I use are audio-visual. In fact, even if my body and my senses react to some film or television program, the sight and hearing dominate always. For example, I have never felt a pine forest or the smell of a bakery because I saw it on screen, [even] if I am extremely sensitive to smells.[260]

Three respondents wrote that ***sight*** dominates the other senses when using a video screen. One affirmed, "I tend to consider most screens I encounter as strictly visual. I tend to think of integrated speakers as discrete but related devices."[261]

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[258] Participant (34).
[259] Participant (45).
[260] Participant (23).
[261] Participant (5).

Finally, a total of 55 persons stated that video screens offer ***multisensory experiences***. For these replies, I created a table composed of the following four categories. First, for answers describing screens that evoke a "brief impression of a sensory stimulus after the stimulus itself has ended,"[262] I chose a group named ***Sensory Memory***; for replies mentioning that the subject matter is an important factor in the overall experience, a group entitled ***Content***; for all responses stating that the main factor is the object itself, ***Devices***; and finally, I chose the word ***Space*** to encompass answers discussing the importance of the screen's spatiality. All these categories were selected in order to represent the influential factors that I explored in my past interactive video systems as seen in Chapter 1. In this table,[263] the results are presented as follows:

First, a total of eight replies were placed in the group ***Sensory Memory*** from participants who thought that their memory played an important role in their sense reaction. As one claimed, "An image may recall a smell."[264] Another explained:

> The sight of a pizza tickles our nose and makes us, or at least can sometimes make us feel hungry: ditto for a feather on a body or the sight of a spider or other creature. Sensory memory is strong, and the senses, like the links of a gear, can react one after the other, likes a chain of reactions.[265]

Further, I noted 20 participants who mentioned that a video display can be multisensory, depending on the content being presented. A respondent claimed that "the screens themselves are audio-visual, whereas the content evokes multisensory

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[262] "5. Cognitive Processes: Sensory Memories," ThinkQuest, 2013, http://library.thinkquest.org/
[263] Appendix II: *XIA* – Results. *Table 4–Case study: XIA. Anwers to question 3.* 229
[264] Participant (28).
[265] Participant (40).

reactions."[266] The other respondents mentioned that the type of screen is also extremely important. These replies were placed in the group entitled ***Content***.

Next, the screen's materiality, including its size, format, luminosity, and resolution, were noted as crucial factors in the perception of the moving images. Of the respondents, ten described today's screens as even more multisensory, since many offer tactile devices. For example, one participant wrote:

> Five years ago, I would have said mostly audio-visual, but in 2011, things are increasingly multisensory. My iPhone is the first place where touch is directly connected to communication with friends, family, and even the act of typing things results either immediately or at least in some kind of multisensory response.[267]

Another noted: "My Blackberry is definitely multisensory as it is directly connected to friends and loved ones who can evoke all sorts of layered feelings and reactions. My personal laptop is the same; however, my work computer, not so much."[268] These replies were included in the group ***Devices.***

Finally, only one participant discussed the importance of the space surrounding the screen as follows: "It all depends on the space and not the surface. Physical places have a great impact on what the viewer feels. It decreases or increases the overall sensation."[269] I placed this reply in the group ***Space.***

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[266] Participant (9).
[267] Participant (21).
[268] Participant (36).
[269] Participant (7).

4. Do screens offer a world more attractive than the one in which viewers live?

For this question, all the replies from each participant were placed in one of two table of analysis. The first table was for replies of those who considered the virtual world to be more attractive than the world in which we live, whereas the second table was designed for those who disagreed on that statement. The result was presented as follows.

In the first table,[270] I placed 30 replies from participants who considered the virtual world that a screen can offer to be much more attractive than the one in which they actually live. In this table, five claimed that this is mainly due "to the fact that everything is calculated, pre-designed."[271] Another affirmed: "When I visit someone who watches television, I don't stare at my friend, but at the screen. I would say it is often more appealing because of its non-quietness, compared to our world." A different respondent agreed: "A screen doesn't talk back or throw punches at you and doesn't require any effort. It's lazy, which makes it more attractive to most people. The screen is also at our command."[272] Moreover, I also observed that many participants discussed the fact that a "virtual space offers possibilities that reality cannot."[273] Another example was this reply: "The virtual has exceeded our reality since there is partially no obstacle, no limit in that world. Everything seems possible."[274] A total of ten participants thought that the brightness and the colors offered by the screen were much better than those we experience in reality. In a similar vein, one respondent proposed: "The quality of the

[270] Appendix II: *XIA* – Results. Annexe 1. *Table 5–Case study: XIA. Answers to question 4,* 230.
[271] Participant (8).
[272] Participant (9).
[273] Participant (11).
[274] Participant (29).

image that we now have access to often gives a gray air to our reality."[275] Another said: "Yes, the light, the color, the intensity, the speed, the time are compressed; everything seems less gray and more alive on the screen."[276] Yet another participant provided an additional example: "I would agree that screens do often offer a world more attractive than our own. I would also say things that appear on screens are made to appear more attractive or perfect."[277] Finally, one respondent discussed the overtaking of the screen as follows: "Maybe we are observing the world, the reality, through these screens because they comment on reality; perhaps it is overtaking reality in that sense."[278]

Next, in the second table,[279] I placed a total of 21 replies, including five answers from participants who wrote that they preferred what is offered by the world outside, such as "the light coming from the sun rather than the light inside the screen."[280] Further, seven of them demonstrated that the virtual and physical worlds are distinct and respond to different needs. For example, one wrote, "I would not say is more attractive than our actual reality, but it gives an alternate reality that pairs with it. I think the virtual space is just expanding our existing reality."[281] Additionally, another seven individuals mentioned that the virtual world is not currently more attractive, but could become so soon. As one respondent affirmed:

> No. Not yet, as long as I am physically able to escape in our world and find beauty and a truly complete sensory experience, like a moonlit night or the powerful persistence of a river under my paddle, it will have some difficultly

[275] Participant (24).
[276] Participant (14).
[277] Participant (19).
[278] Participant (37).
[279] Appendix II: *XIA* – Results. *Table 6–Case study: XIA. Answers to question 4. 231.*
[280] Participant (2).
[281] Participant (2).

> competing. However, it is true that I feel the majority of the population is losing touch.[282]

Finally, I also noted that two people claimed that the borders between these two worlds are blurred, and that it can be difficult to identify which one is which. For instance, one wrote: "Everything depends on the screen and what is happening in there, as well as the reality of the person who is facing the screen. Our 'reality' could also be seen as a screen, where each displays its own vision, a projection of the world. "[283]

Section 2 - Experiments on Materiality

5. During the experience, which presentation best captured your attention?

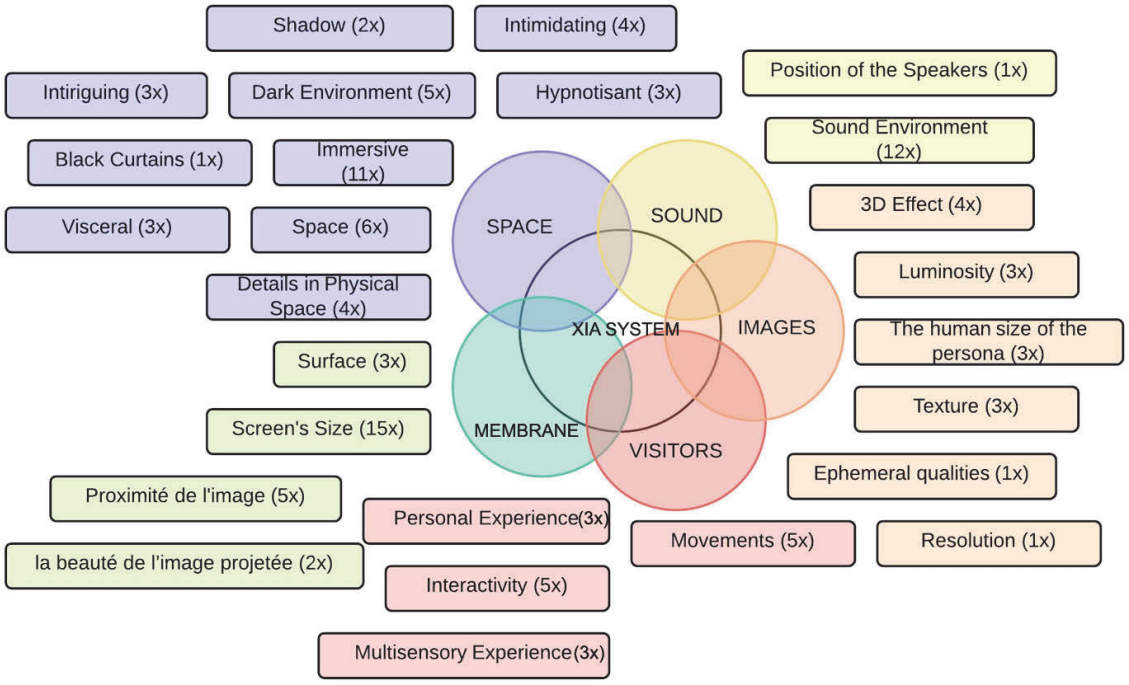
In answer to this question, a total of 63 on 64 participants wrote that the specially constructed membrane best captured their attention due to factors coming from the screen's materiality, interactivity, and spatiality. Analyses of these replies are presented in *Figure 1.*

First, I drew a large circle in black in the middle, to represent the *XIA* system. I then added a series of circles of different colors around the larger one, to represent the elements of the system that were explored during the creative process. These included the space, the membrane, the moving images, the sound, and the visitors. I presented all the circles as attached to the main circle and touching one another, in order to represent the interactivity that is thought to occur between them, such as between the high pitch of the sound to the movement of the virtual character in the moving images to the traces made on the membrane, as discussed in Part 1 – artistic production. Each group was

[282] Participant (45).
[283] Participant (22).

color-coded as follows: the **Space** in purple, the **Membrane** in green, the **Sound** in yellow, the **Moving Images** in orange, and the **Visitors** in red. I then went through the analysis of all the collected replies, selected words that I associated with one of these groups, and placed all these selected words around the system to portray the mentioned factors that influenced the visitors' overall experience. Alongside each word, I indicated the number of times that the word was mentioned. For instance, 13 replies used referring to sound as an important factor. In addition, 15 respondents mentionned the effect of the moving images on the specially elaborated display, such as the 3D effect, the luminosity, resolution, format, and texture of the moving images, as well as its ephemeral qualities. A total of 16 participants discussed the importance of aspects related to the other visitors who were in the room with them. For instance, they mention that others' movements and positions influenced their experience. Another group gave answers that mentioned the responsive video membrane; 25 individuals considered the display to be the reason why the projection representation best captured their attention, due to its surface, its dimensions and resulting projected images. Finally, 42 participants stated that they preferred projection because of the element of space. Many reasons were given, with regard to the space that *XIA* offered. For instance, a few mentioned its physicality and the shadows created, as well as the fact that it offered an intriguing, intimidating, immersive, mesmerizing, and visceral environment to explore.

Figure 1 – XIA experiment. Answers to question 5



6. How different were your experiences when watching the XIA *sequence in the three formats of presentation?*

To this question, all the replies were placed in three tables of analysis: one table for the experiment with the specially constructed membrane,[284] another one for the television experiment,[285] and the last table for that with the iPod/iPad.[286] I colored words that I associated with the categories entitled ***Space***, ***Moving Images***, ***Sound,*** ***Membrane,*** and ***Visitors***, using the codes as suggested in the figure made for Question 5.

First, the table for the experience with the projection's format demonstrated that the majority of participants found that this kind of representation offered them an immersive and visceral space. For example, one visitor wrote: "I felt that going inside

[284] Appendix II: *XIA* – Results. *Table 7- XIA experiment. Answers to question 6,* 232.
[285] Appendix II: *XIA* – Results. *Table 8- XIA experiment. Answers to question 6,* 233.
[286] Appendix II: *XIA* – Results. *Table 9- XIA experiment. Answers to question 6,* 234.

the projection, I was completely absorbed by the images."[287] Further, 23 participants mentioned the importance of the screen's materiality, such as its size, color, surface, and texture, as well as its setting in the space. One explained: "It was the most fascinating experience. The video was displayed in an ideal way, I guess. I imagine that the artist took really good care of the display and the environment. It makes the screening more controlled."[288] Another affirmed, "The video projection was intimidating, as the screen was a part of the space. My shadow could be cast on the projection."[289] A third visitor responded, "The format forces me to enter into its space."[290] In addition, several participants deliberated on the importance of the 3D effect that the display created in this format of representation. For example, one wrote that the experience was "fully engaging, captivating; the figure and myself seemed to be sharing a certain space between the three-dimensionality of the figure and the darkness of the room. There was no distinct barrier."[291] Fifteen participants discussed the moving images further. For instance, some noted the importance of communication with the virtual character: "I felt more absorbed by the work. Communication with the personage was stronger; a real dialogue was instilled."[292] A total of ten participants discussed their experience as visitors: "I had the impression that the personage was just next to me. I could almost interact with *XIA*. I was enveloped by the images and the sounds, as well as by the darkness of the room."[293] Another visitor observed: "One could move closer, sideways

[287] Participant, (14).
[288] Participant, (3).
[289] Participant, (35).
[290] Participant, (18).
[291] Participant, (22).
[292] Participant, (26).
[293] Participant, (25).

and back, offering an interactive participation beyond just viewing."[294] Finally, ten participants raised the importance of the quality of the sound as a major factor enhancing their sensory experience of the projection's format.

The second table of analysis was created for the experience where the selected video sequence was presented on a television. The majority of the participants noted that the quality of the images and the sound absolutely affected their overall experience. For example, one wrote, "The textures felt lost,"[295] while another "found that the light of TV washed out the piece,"[296] and a third felt, "The emotion was lost for me.[297] Participants described the television as being bland, dispassionate, mundane, passive, annoying, dated, impersonal, pixeled, conventional, trivialized, and cold. A few respondents also mentioned the fact that television is culturally constructed, and therefore represents many layers of information. For instance, one visitor argued that this representation was "largely influenced by the experiences of watching too much television as a child. It is difficult to separate what I'm seeing from the experience here."[298] Five participants wrote that the television offered a "sharp and clear image, good sound not quite visceral."[299] Another responded that with the television, he was "very aware of the frame, which flattened the image."[300] He described his experience as follows: "it made me feel more like an audience member than a participant; I lost focus on the content and drifted off to other concerns. Except thinking how made quote the

[294] Participant, (62).
[295] Participant, (16).
[296] Participant, (18).
[297] Participant, (40).
[298] Participant, (4).
[299] Participant, (19).
[300] Participant, (36).

television was for display."[301] One added that the 3D effect was completely absent with the television. The feeling was described as follows: "I found the experience cooler and detached (…). The appearance of a frame resulted in no evoked emotion."[302]

The third table represents the experiences with the iPod and iPad. The majority of the participants described their experiences with these devices as more personal and less intimidating than the television. They responded that the images in these formats were very clear, attractive, and vibrant. One participant defined the device as "luxurious, personal, futuristic."[303] However, another called it "heavy. I dislike the feeling: irritating."[304] In fact, half of the replies revealed that many factors distracted them from concentrating on the presented content. For instance, one respondent claimed: "I had a hard time focusing on the screen. The shape as well as its size and the cultural coding of this device encourage hyperactive viewing patterns."[305] Another was annoyed: "Seeing my reflection was distracting, although it made me think of power, violence, and history.[306] Still another responded that the screen was "just too small to be experienced."[307] I then noted that a few participants described their experiences as "holding a human."[308] One visitor said: "I felt like I was holding the figure's reality,"[309] and another wrote, "You could cradle the sleeping figure in the palm of your hand."[310] One participant explained the sensory responses to this experience as follows: "I felt the

[301] Participant, (36).
[302] Participant, (42).
[303] Participant, (1).
[304] Participant, (4).
[305] Participant, (5).
[306] Participant, (6).
[307] Participant, (20).
[308] Participant, (10).
[309] Participant, (22).
[310] Participant, (24).

vulnerability of the presented character because I was holding it in my hands, and it was vibrating when sounds were heard. It gave life to the character, and I felt more connected to it. A kind of intimacy was created, a privileged access to the character. In fact, I wanted to touch the character during the presentation of the iPod, in order to comfort it."[311] With this small format of representation, 20 participants reported that they were capable of seeing more details. For example, one reply mentioned, "The motion and image were pleasant to look at. The framing was overpowering, and I paid more attention to the face than the body's language."[312] Another affirmed that the device "definitely made me pay more attention to detail. The TV and the video projection made us look at the whole picture, but the smaller devices permitted us to look at the movement of the eyes (that I had not noticed previously) and the position (tension) of the feet."[313] Finally, I also observed that five respondents associated their experience with the mobile devices as recalling video games, according to their replies. One visitor remarked: "It felt like playing with a toy, a game. The control of the device sometimes became more important than what was being projected."[314] A second participant mused: "The iPod still feels like a novelty piece. I associate it with games and music videos and photographs. I could not lose myself in the content."[315]

[311] Participant, (23).
[312] Participant, (21).
[313] Participant, (34).
[314] Participant, (25).
[315] Participant, (36).

7. Do you think that the screen's materiality altered your perception of the visual presented within?

To this question, 58 participants answered "yes," and only one wrote "no." Principally, they all mentioned that the physicality of the screen affected their perception. For instance, one wrote: "Definitely: the video projection on a large paper roll made me more aware of the details presented."[316] Another claimed: "Of the projection, the roll of canvas drew me into the image, not knowing the limits of where it would appear."[317] The majority of the replies also discussed how materiality, such as the dimension, shape, and resolution, influenced their experience. Others mentioned "the cultural constructs that surround those devices"[318] as a factor that also affected their experience. One stated: "The textures that are more organic seem to be warmer and real, while the cathode ray tube screens are more cold."[319] A different respondent confirmed this by answering: "The screen's materiality did alter the perception, as textures were either made more or less visible. The projection creates a sense similar to being a part of the *XIA* environment; each divide facilitates a different attachment perception. Thus, the materiality alters the experience."[320] For one respondent, the materiality of the projection "evoked sensations of touch."[321] Finally, the only participant who answered that the materiality did not affect the perception of the presented images wrote: "No, not that much. My attention is focused on the content." [322]

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[316] Participant, (38).
[317] Participant, (35).
[318] Participant, (39).
[319] Participant, (40).
[320] Participant, (16).
[321] Participant, (18).
[322] Participant, (11).

8. Besides its materiality, did any other factors affect your perception during the experience?

For this last question of Section 3, the data were analyzed in a qualitative manner where answers where placed into the same groups created for the second questions, which were ***Space, Sound, Visitors, Moving Images, and Membrane.***

The accumulated data for this question revealed that 12 participants reported that the ***space***, such as the environment surrounding the screen, also affected their perception of the presented moving image. The following factors were mentioned in their replies: the ambient light, the size of the space, the general quietude of a gallery, and the context. Many stated how the darkness influenced their experience. One wrote: "watching *XIA* on the video projection in complete darkness adds to the experience; it makes it more exciting and really plunges us into the virtual world created."[323] Another argued that "the darkness that surrounds the screen also affects the experience; it gives us the feeling of penetrating a universe, and allows the images to have a greater impact."[324]

Next, I noted a total of nine individuals mentioned the importance of the quality of the ***sound***, the resonance in the space, and the position of the speakers as factors that influenced the immersion.

Then, eight visitors identified the presence of other ***Visitors,*** whereas only three mentioned the content or the subject matter, the ***Moving Images***.

Finally, 22 individuals mentioned the type of screen as being a major influential factor. They discussed its format, size, brightness, shape, texture, and framing, which

[323] Participant, (35).
[324] Participant, (58).

revealed more of the screen's materiality. All collected data were placed in a table of analysis where I colored words that I associated with the categories, using the codes as suggested in the figure made for Question 5.

Section 3- XIA Installation Art

9. Which emotions were evoked while experiencing the XIA Installation*?*

With this question, I was interested in discovering how many people associated their experience with the principal desired effects I choose for *XIA*: fear and wonder. All the replies were placed in a table composed of the following two groups: one for replies that evoked only one sensation, and the other for replies describing contrasting sensations. Additionally, words that I associated with fear (words that evoked "a feeling of disquiet or apprehension, agitation and anxiety,"[325] or any words associated with captivity or feeling captivated or enraptured), were marked in purple, and those associated with wonder (words that portrayed a state that might "cause [a person] to feel astonishment, or amazement, as at something unanticipated")[326] were marked in orange. The replies were placed in an table[327] and results are described below.

First, I paced 31 replies that mentioned only one emotion or sensation in the first table. This table comprises 17 replies with words that referred to ***Fear***, whereby participants described their experience with a sensation of fear, anxiety, sadness, or nostalgia. Five of them, compared their visit to feeling like a captive. For example, one wrote: "Captivity: a feeling of being observed by the viewers, and for the viewers, a

[325] "Fear," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/Fear
[326] "Surprise," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/surprise
[327] Appendix II: *XIA* – Results. *Table 11–Case study: XIA. Answers to question 9,* 235.

feeling of watching someone helpless."[328] In addition, 14 respondents described their experiences with words that I associate with ***Wonder***, calling the experience exquisite, emotive, magnificent, touching, intriguing, and inspiring.

Next, I placed a total of 22 replies in the table entitled ***Contrasting Emotions***, as they presented a combination of distinct sensations. Answers were contrasting, such as "relaxation and contraction, shock and reactions, inspiring"[329] ; "I love the soundtrack and opposition in the work. Nature vs. city, quiet vs. compulsions"[330]; "fear, terror, beauty"[331] ; and "beautiful piece, disturbing and stunning all in the same moment."[332] One respondent affirmed that *XIA* elicited "a certain tension and defined curiosity. I have empathy for *XIA*; I don't know why. I would not say happy, but I could not say sad. If I had to pick, it would be something toward the sad and not the happy, something more complex."[333] Other responses included the following: "I was repulsed, and yet intrigued all at once"[334], and "first thing that came to mind: this is beautiful! It was a pleasant experience at first and a bit more intense emotionally as I was drawn into it. "[335] For many visitors, the piece evoked a series of feelings: "Feelings and emotions are evoked to whatever degree of involvement one chooses to engage in with the projected activity; once one chooses to engage and not just watch, one is drawn into the activity; anxiety, fear, floating, drifting and moving are experienced, and even a sense of

[328] Participant, (3).
[329] Participant, (13).
[330] Participant, (18).
[331] Participant, (27).
[332] Participant, (28).
[333] Participant, (22).
[334] Participant, (52).
[335] Participant, (40).

physicality and non-physicality, which does not happen with the other devices."[336] One visitor defined the experience as being a mirror of his or her own mood at the moment. In this regard, *XIA* was "anthropomorphism, a projection of my own feelings over the character. I experienced a sensation of weightlessness in some cases."[337] Finally, one participant explained that the experience was "vaguely disturbing and liberating, as *XIA* comes to life in front of our eyes. It was very mysterious, and the mystery persists even after repeated examination. There is also a sensation of surprise, as *XIA* sometimes resembles a Chinese demon: very clever, as impressionable as wishes. We feel that under the calm water lies a live Abyss."[338]

10. For you, what was the XIA Installation *trying to convey?*

The collected data for this question were analyzed with the use of a table[339] divided into the following three categories: ***Experience*** (for replies focusing on "the apprehension of an object, thought, or emotion through the senses or mind"[340]), ***Message*** (for answers that expressed a specific statement), and ***History*** (for accounts that conveyed a story that unfolded or a narrative). These groups were selected in direct relation to the conceptualization of *XIA* system. With this question, I was interested in knowing how many people associated it primarily with an experience, a statement, or a story. The results are described below.

I first placed a total of 22 replies in the group ***Experience,*** including participants who referenced bodily responses, whether emotional or somatic in nature. For example,

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[336] Participant, (26).
[337] Participant, (11).
[338] Participant, (30).
[339] Appendix II: *XIA* – Results. *Table 12–Case study: XIA. Answers to question 10,* 236.
[340] "Experience," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/experience

one wrote that the *XIA* system tried to convey "different states of emotions"[341], while another described the experience as follows: "Each time I watched it, I thought of different interpretations, depending on my own mood for that day. Usually I thought of mark-making, of embodiedness, isolation, drowning, control vs. loss of control, franticness. Sometimes I felt a sense of guilt for being a voyeur or a powerful viewer who revels in *XIA*'s capture, but does nothing to help her."[342] A different visitor wrote: "While leaving the screen by the 3D effect, the character remains a prisoner (of his body, an invisible thread, prejudices, etc.). The impression of an opening created by the 3D is in fact a 'false' feeling, so the content calls for introspection. This duality reinforces the emotion and the anxiety."[343] In the same vein, one participant cited that the piece evoked a "resentment of struggle to achieve a certain freedom."[344] All these replies focused principally on "the apprehension of an object, thought, or emotion through the senses or mind."[345] Another explained his experience as "a possible relationship between the viewer and the video: a symbiotic of the unreal and real."[346]

Next, I placed seven participants who wrote that *XIA* tried to convey a specific statement in the ***Message*** group. As one wrote:

> It made us think about the vulnerability, the violation of privacy, and the position of the observer in relation to the observed subject, as well as the impact that the observer may have on the observed. Maybe it also wants to express discomfort, disorder caused by certain circumstances, and in a very physical way, via a character who does not speak, but simply manifests itself with its body's movement in a sort of semi-consciousness.[347]

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[341] Participant, (1).
[342] Participant, (36).
[343] Participant, (40).
[344] Participant, (41).
[345] "Experience," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/experience
[346] Participant, (7).
[347] Participant, (23).

Yet another participant stated that *XIA* examined "how contacts and external stimuli guide or influence our behavior (…).[348]

Finally, six replies were placed in the group entitled ***History***, as they gave answers that referred to a story or a narrative. One example is a reply that mentioned "a trapping, a desire to leave a mark, met with a tired and resistive feel. Also, it brings a strong context of womanhood and femininity. This is apparent in the video, but not necessarily in the overall approach."[349] Another participant saw "the transformation of a quiet character into some strange demon."[350] Two participants indicated that *XIA* tried to convey a history associated with captivity. One described *XIA* as "a definite darkness, running away, running toward. A body entrapped in the womb of our life. The drab chiaroscuro."[351] Another example was "an impression of canning, as if I were trying to obtain something that came from outside of the confined reality (the video), that wants to smash the border of the screen (for lack of a better word) to touch the viewer, outside, far away, at a non-existent point of view from *XIA*."[352]

4.3 Summary

From the conceptualization to the realization to the presentation, *XIA System* focused on one target expression, which is captivity. Using a multisensory approach, a series of desired emotions that reflect that expression were listed, ranging between the sensations of fear to wonder. In the creative process, I also recalled three encounters that

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[348] Participant, (12).
[349] Participant, (6).
[350] Participant, (11).
[351] Participant, (21).
[352] Participant, (29).

I associated with this defined effect and target expression. These steps of sensory exploration also served for the method of examining the data collected from the case study.

First, the observations showed that with the specially constructed membrane, all visitors naturally walked in the space, were both static and mobile in status, and went both close to and far from the membrane. However, with the television, iPod, and iPad, the majority of the participants remained in a static status and viewed the moving images at a fixed distance. These collected data demonstrated that format of representation does affect the behavior of the participants; thus, this influential factor must be considered by both designers and researcher. Next, the results from the first section of the questionnaire allowed me to create a profile of the 64 participants. This profile focused principally on participants' daily relationships with video screens. The results demonstrated that the majority of the respondents were spending an average of six hours in front of luminous screens every day. Further, 55 of the 64 participants defined the screen as multisensory. The majority of the replies stated that the content of the moving image was the primary reason for such a manifestation. The profile also demonstrated that the video screen had been defined in numerous ways such as a surface, an opening to another world, an object, or a space. The results showed no category was more predominant than another in relation to how the screen is perceived. Finally, it is important to note that the almost half of the participants considered the virtual world offered by the screen to be more attractive than the one in which they live.

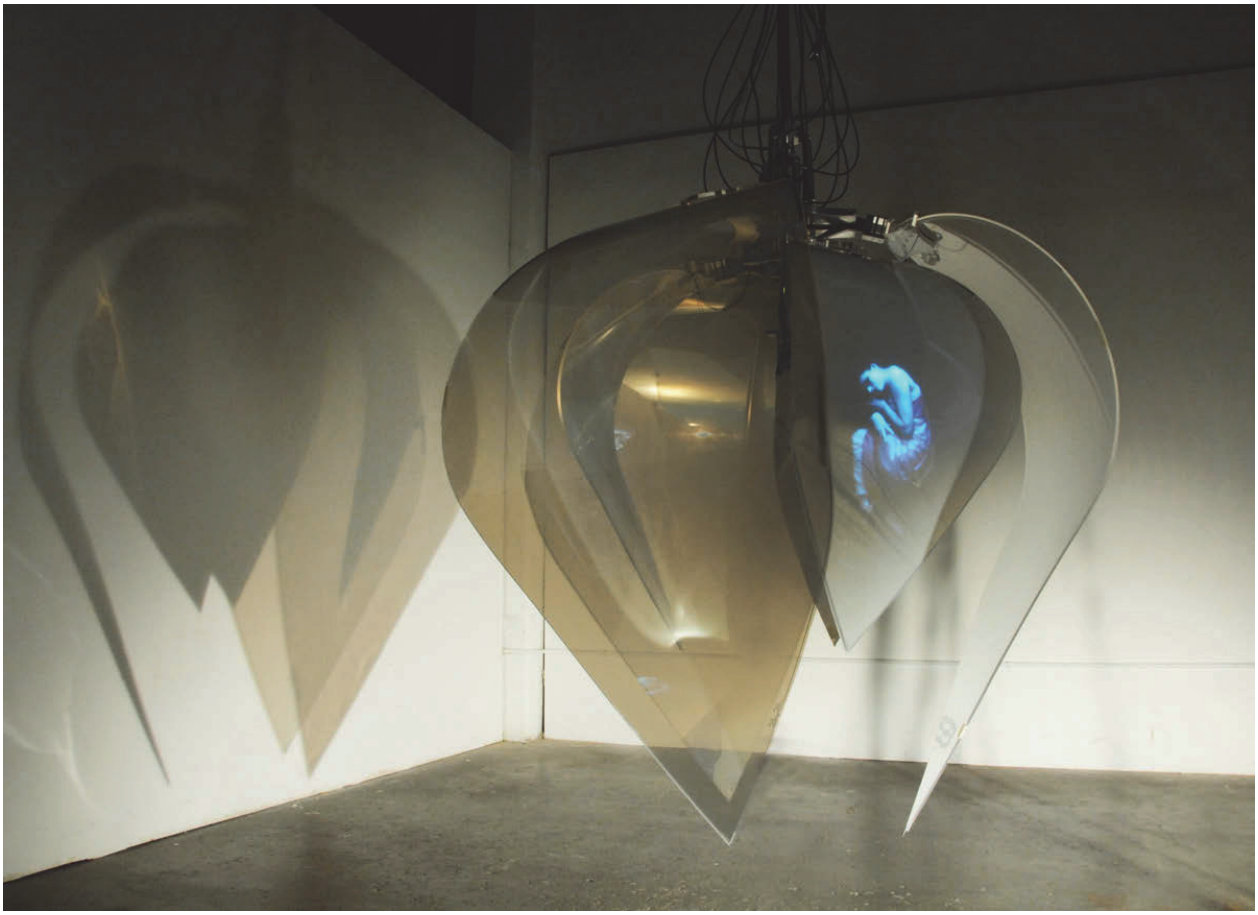
Next, the results of the experiment with the three different formats of representation suggested that 63 of the 64 participants found that the membrane best captured their attention. The principal reasons were related to both the materiality of the responsive video membrane and the environment in which it was presented. The sound, the moving images, and the visitors were also identified as influential factors; however, they represented a very low percentage of the responses. With regard to the television, all participants discussed the poor quality of the moving images. For the mobile devices, a large group discussed the precision of the details in the moving images, and how the experience of the selected video sequence in these devices reminded them of video games because of character's small size. These results confirmed that many factors affect the perception of the images, and watching one sequence in three different formats produced totally different responses to the same moving images. The answers show that the screen's materiality, such as its dimension, shape, resolution, and texture, affected the perception of the moving images in 99% of the respondents.

Finally, in the results collected from the section on the *XIA* System, 55 of the 64 participants used words that I associated with fear or wonder, which are the two principal desired effects for this piece. The last question was structured in order to ascertain what participants thought the *XIA* System was attempting to evoke. The results show that the majority considered that it offered primarily an experience. These results will be analyzed and interpreted in Chapter 6. In the following chapter, the second artistic production, *CEREUS—Queen of the Night*, is reviewed in detail, and the data collected from its second case study are presented.

Chapter 5: *CEREUS—Queen of the Night*

CEREUS defies the constraints of the gravitational pull between heaven and earth, life and death, light and darkness.[353]

- Guillaume Evrard



Philomène Longpré, "CEREUS, Queen of the Night", 2013.

5.1 Part 1 - Artistic Production

Inspired by a lived experience in the Chihuahua desert of New Mexico, the *CEREUS—Queen of the Night* system recreates a nocturnal world where stem-like machinery, cables, and tubes operate a responsive video membrane. While living in

[353] Guillaume Evrard, " *CEREUS – Queen of the Night* ", *Isomorphism, Art Interdisciplinary Field*, March, 2012, 62-63.

Albuquerque, I was told about the spectacular experience of the wild night-blooming Cereus. Many Native American legends describe this mysterious desert flower that—for one night only—reveals its unforgettable sweet smell. In the darkness, its perfume guides lost travelers, and once they find the flower, the water of the cactus plant may save their lives.

In the legends of the Papagos, the Cereus bloom represents the spirit of an aged woman, *aux chooh stoah mawh* (the old mother white head).[354] The story narrates how the Cereus embodies the memory of this old woman who "saved her grandson, [and] the most beautiful flower of the desert was born."[355]

After many years, I finally witnessed this magnificent blooming. As the vivid blue sky became darker, I waited—eagerly, serenely, and quietly—for the magical blossom in the middle of the vast desert. Far away from any cities, obscurity quickly took over as evening fell upon the dunes, creating disorientation and vulnerability. I can recall in great detail the series of emotions and sensations that were evoked that night. In the darkness, it was the elegant aroma that made me realize the flower was actually blooming. I felt astonished, enchanted, and ethereal. At that moment, the sound of stridulating, buzzing, and beating of wings came from all directions. I suddenly understood that I was not alone in this arid environment. Attracted by the flower's efflorescence, insects miraculously convened from everywhere, unforeseen, frightening, and anguished. Between heaven and earth, clouds of sphinx moths were dancing around that floating flower, which was suddenly illuminated by the moon and

[354] Harold Bell Wright, *Long Ago Told Legends of the Papago Indians, (*Appleton, 1929), 156.
[355] Idem.

seemingly weightless. At dawn, the flower, which had been pollinated during the night, was already closed and wilted, stimulating nostalgia and wistfulness. The closed Cereus blossom eventually mutates into a fruit that falls to the ground and procreates, completing the cycle of life.

This sensory experience aroused a rush of emotions in a very short period of time. With a multisensory approach, I investigated the influential factors that could elicit such an array of sensations for visitors inside a confined environment, and more precisely, within an art gallery. Exploring the target expressions "weightless and unforeseen," a series of desired effects were identified, including: fear and surprise as well as eager, serenity, disorientation, vulnerability, astonishment, enchantment, ethereality, unforeseen, frightening, anguished, nostalgia and wistfulness. The sketching process took form as a collection of various components such as the natural essence oil from the Cereus flower, files of sounds that I recorded from the insects during the blooming, and fagile petals that feel like silk.

For the purpose of this artistic production, emphasis was placed on the associations and interplay between sensory memories as imagination evoked by the selected encounter. Each element, which includes the responsive video membrane, moving-images, sound, program, digital interfaces, and space setting, were chosen in direct relation to the experience that I associated with the chosen target expressions and desired effects. My experience of the blossom in the desert became the core reference to all the immediate associations and to the gathering of sensory memories relevant within these three registers: spatiality, materiality, and interactivity.

5.1.1 Spatiality

The *CEREUS — Queen of the Night* system requires a large environment that is a minimum of 46 feet long, 23 feet wide, and 12 feet high—a space where visitors will not feel oppressed by the presence of the walls or ceiling. Being in a vast open area, and forgetting one's existence recalls my sensory nocturnal experience that I had in the desert. Additionally, the venue must be very dark in order to trigger disorientation and an awareness of the unforeseen, as a delay is needed for the audience's vision to adjust to the low light conditions upon entering the room. The system is also designed with only one entrance so that visitors are required to retrace their initial path to exit the environment. Triggering their memory on how they came into the space creates an similar experience to one present in a more natural environment.

The responsive video membranes, which are made of "smart" materials, are strategically positioned. Six are attached to the specially constructed robotic structure, which is suspended 26 feet from the entrance and one foot off the ground.[356] Due to the curved shape of the designed video membranes, the projected moving images reflect across the entire space. For example, at one precise moment, a circle of light can be observed on the floor along with large moving lines on all four walls and the ceiling.

Moreover, the images of the virtual characters also appear on the ground at certain periods, as if the video were escaping from its screen.

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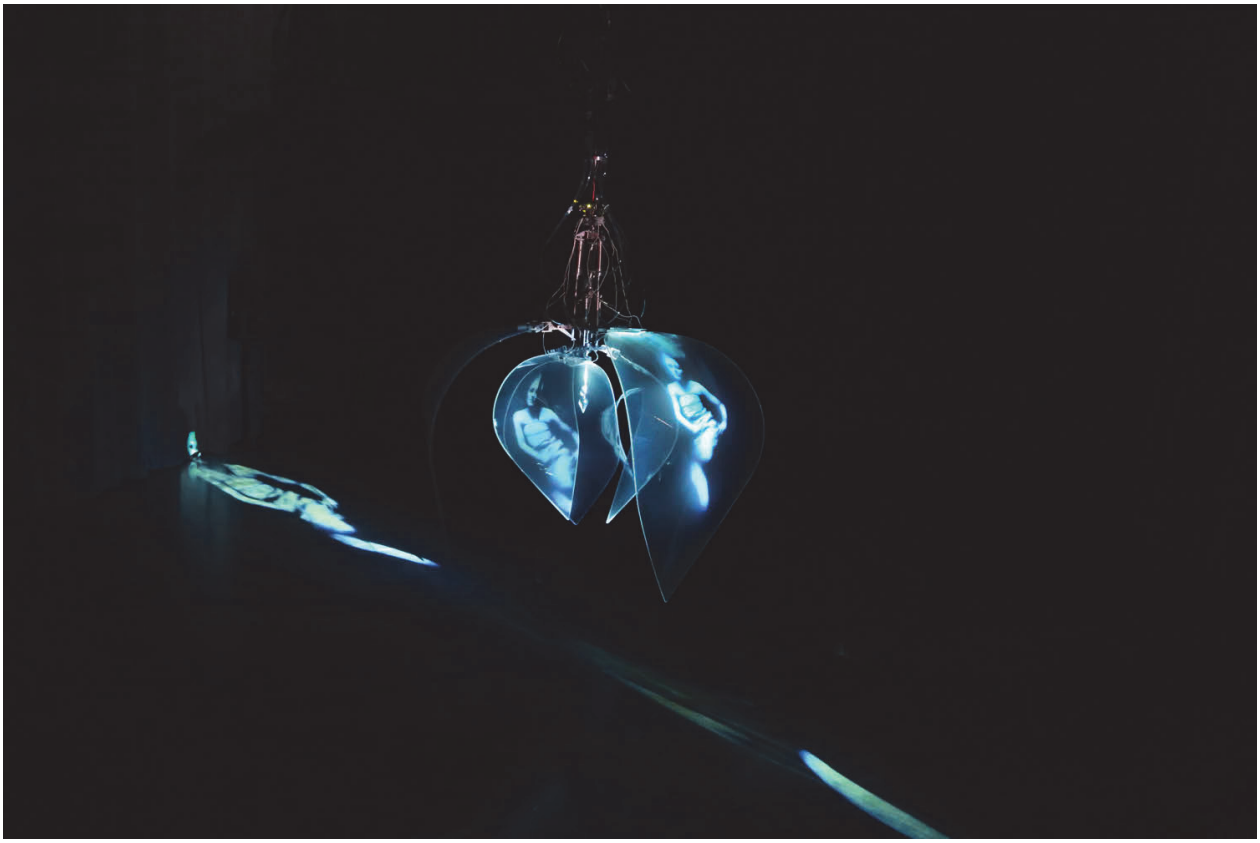
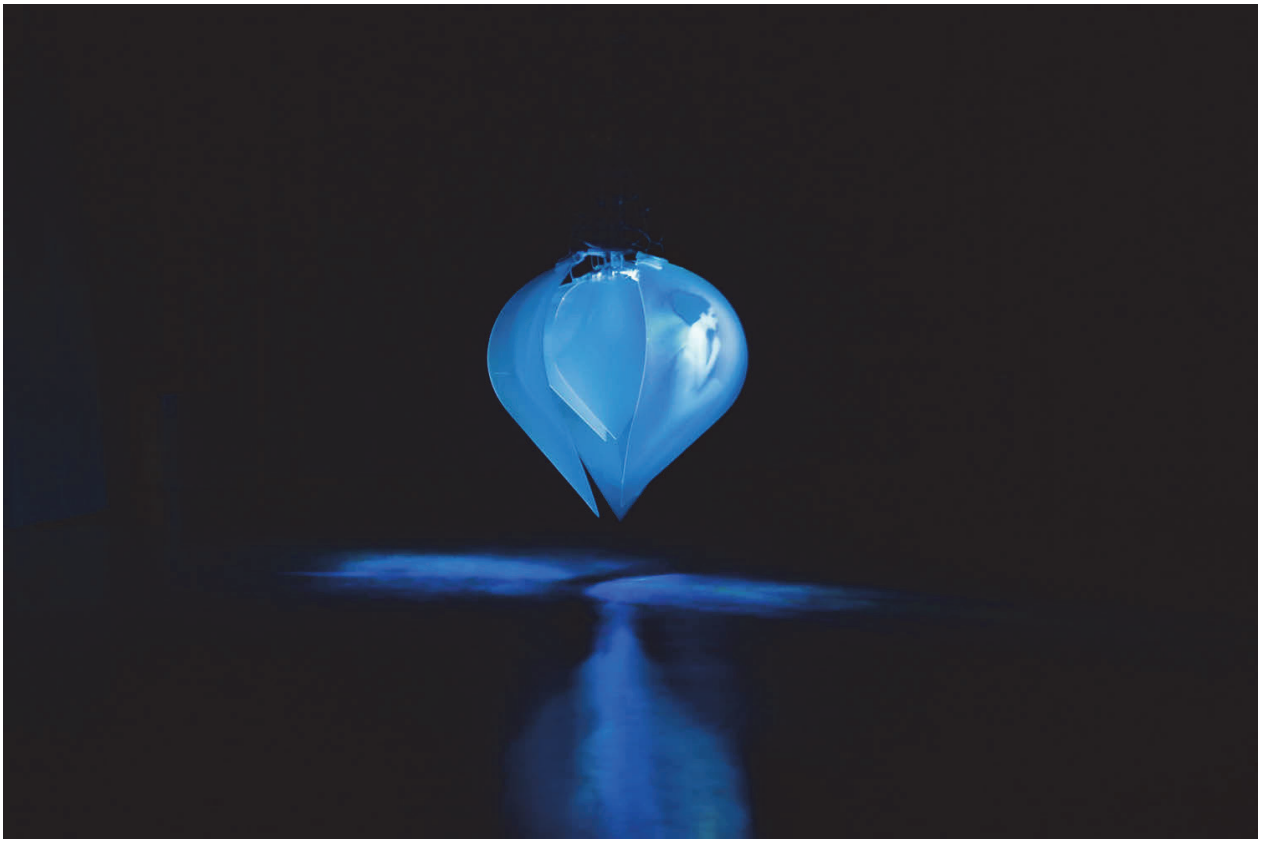
[356] Appendix III: *CEREUS* - Floor Plan, 237



Philomène Longpré, "CEREUS—Queen of the Night", 2013. Phi Centre, Montreal. Photo by Ianna Landry

In fact, for this system, the space in its totality was designed as a video display so that visitors, objects, and walls receive and diffuse the pulsing light from the main projection, which is on the suspended structure.

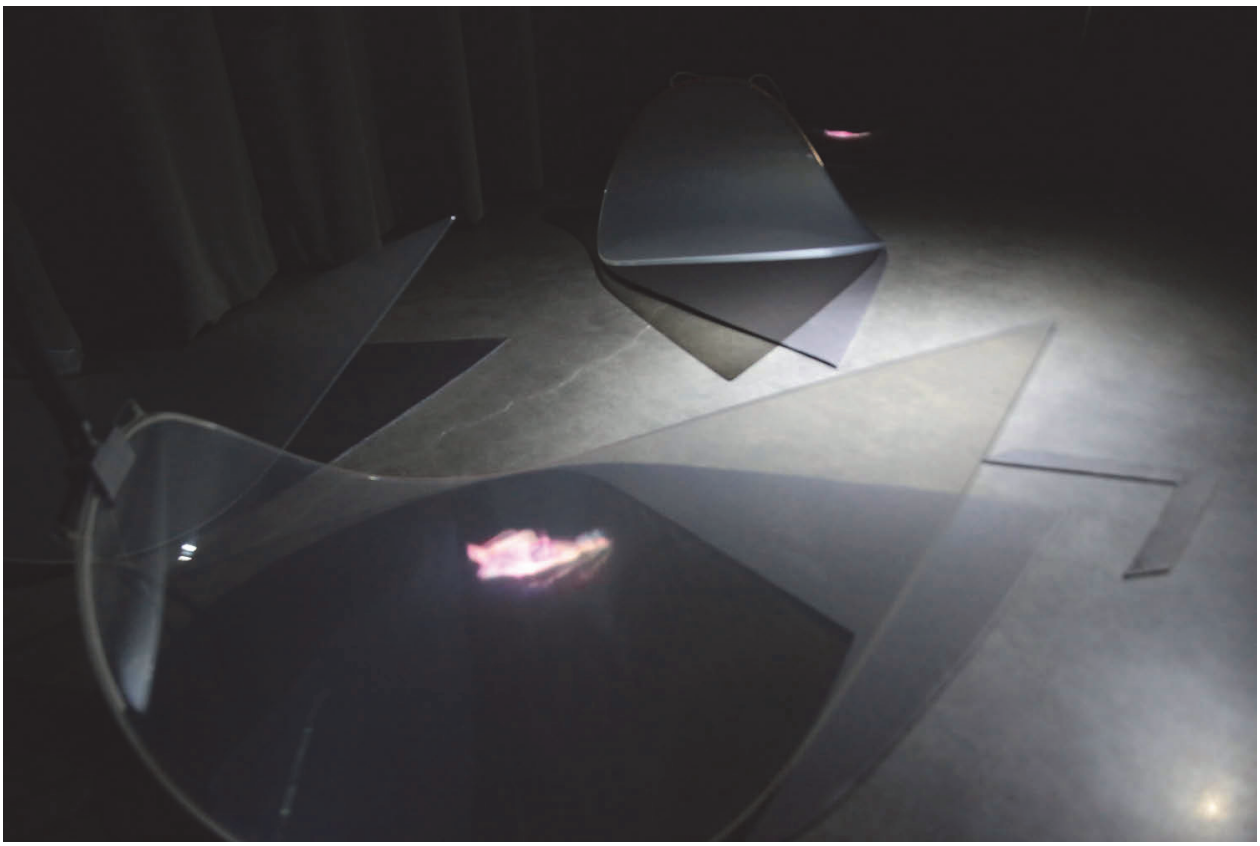


Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Centre, Montreal. Photo by Georges Fok

Six other petal-shaped video membranes are meticulously placed on the floor to the left of the entrance.[357] Microvision PicoP laser projectors transmit images on three of these petals. When these moving images appear, they are instantly reflected on the ceiling, invading that space completely for a short time. Near these petals, a set of speakers is placed on the ground and another set is near the suspended structure, and is

[357] Appendix III: *CEREUS* - Floor Plan, 231

supported on tripods.



Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Centre, Montreal. Photo by Georges Fok

Regarding the sound, this system uses three different types of tracks: one link to the video of the virtual characters, another to the membranes' movements, and one that mutates over time influenced by the location of the visitors in the exhibition room. Research was conducted on how field-recorded sounds could be modified using a computer to explore the "sensation of being weightless" thematically and how sound could navigate the space and capture the different actions, tensions, intensities, emotions and energy within a confined space. Inspired by musicians such as Todor Todoroff and Ken Weinstein, the system presents aural visions as a different type of sound spatialization that goes beyond the normal pattern of moving from point A to

point B. These soundtracks are both instinctual and surprising as fragments or cells of sound appear and disappear in different location in the exhibition room, resonating across the total spatial environment.

Finally, a network of ultrasonic, infrared, and proximity sensors are installed on the robotic structure and near the petals on the floor. In this sensitive system, the exhibition's space not only serves as a video display but also as its own tangible vessel, confined to the constraints of the gravitational pull.

5.1.2 Materiality

Humans perceive weight in relation to the force that attracts objects to the center of the Earth: namely, the force of gravity. In the 1990s, artists such as Kitsou Dubois, Frank Pietronigro, Dragan Zivadinov, and Mike Stubbs were among the first to present performances in a zero gravity environment during parabolic flights. Others explored this sensation in the virtual world, such as Martin Sjardijn with his weightless sculptures, or in the physical world, such as Tom Shannon, who created floating sculptures using strong magnets aligned with Earth's magnetic field.

In the case of the *CEREUS* System, as part of my artistic approach, each element was selected in direct relationship to the chosen target expressions: weightless and unforseen. Thus, in order to elicit a sensation of weightlessness, I sought to evoke a series of strong contrasts for visitors to experience in a short period, such as standing in a very dark environment and being attracted to a floating, bright, luminous structure, experiencing calm sequences of blue light with unexpected thunderbolt-like yellowish flashes, and simultaneously feeling the weight of a heavy suspended metallic structure

and the sensation that the transparent membranes, fragile and delicate, were levitating in space.

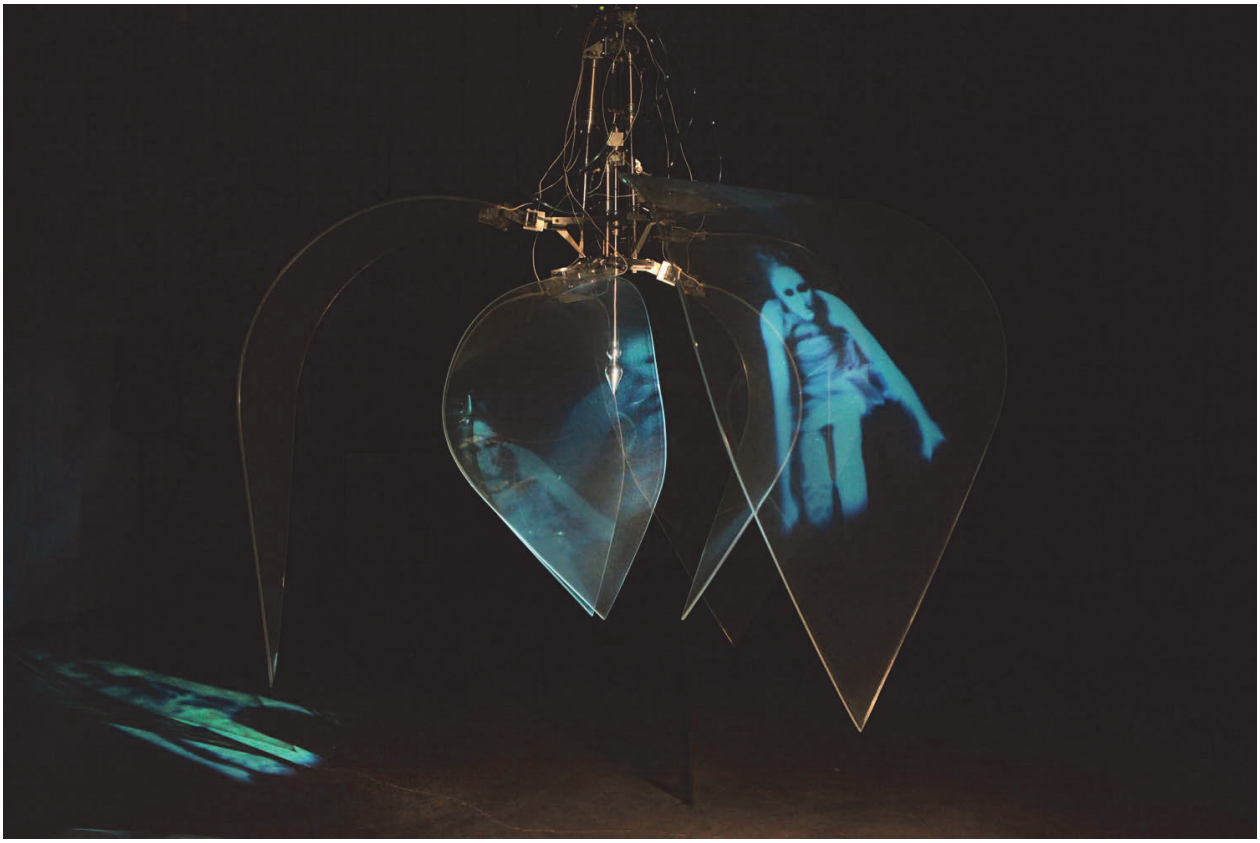
Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Centre, Montreal. Photo by Longpré

According to art historian Guillaume Evrard, the *CEREUS* system investigates "beyond the artistic and physical limits, the sensory limitations of our contemporary society in a subversive spirit related to the Lettrism movement. […] Message and media re-appropriated, *CEREUS* questions the role of the screen, its operation and its purpose."[358] In 1951, French lettrist Maurice Lemaître first transformed the cinema's theater into an immersive experience in which the virtual space represented within the

[358] Evrard, "*CEREUS – Queen of the Night," Isomorphism, Art Interdisciplinary Field*, March, 2012, 62-63.

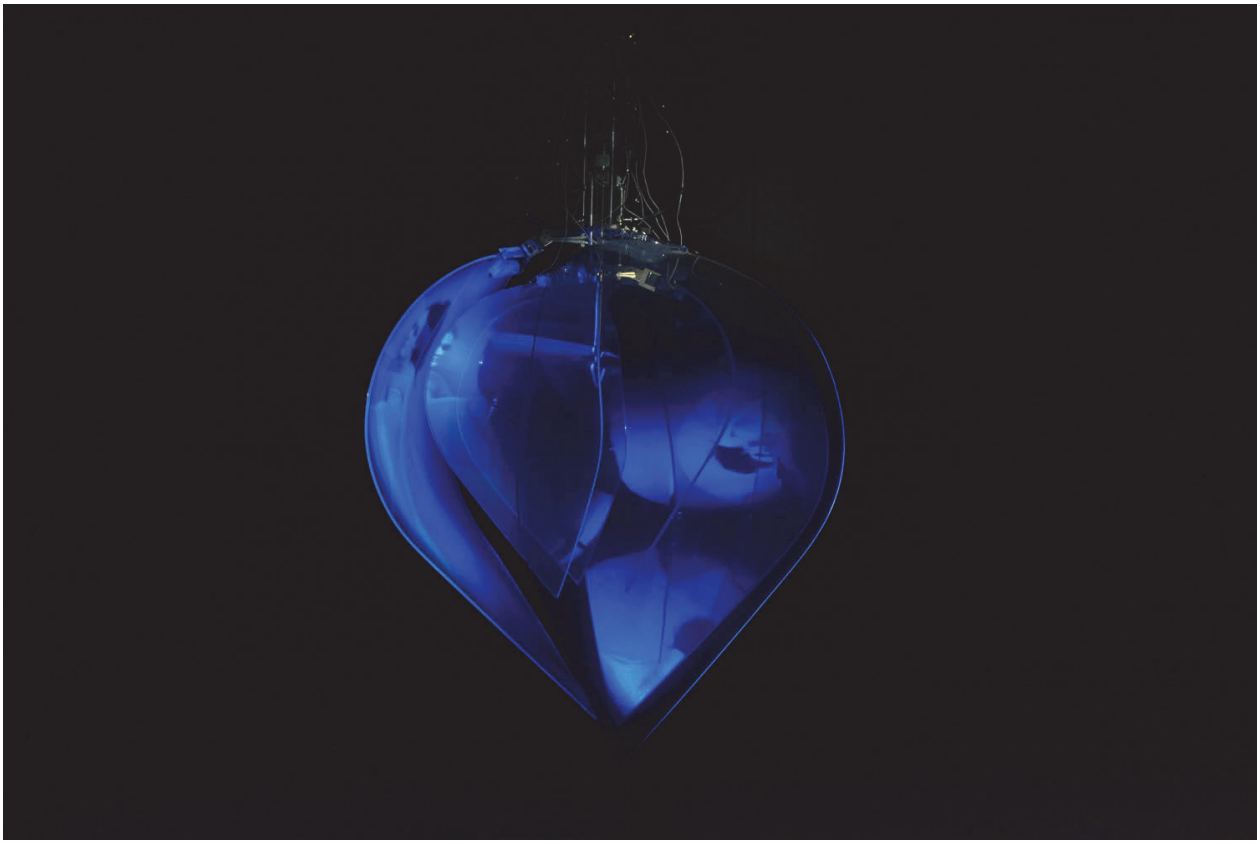
screen was simultaneously extended into the physical space of the spectators.

In the case of this system, both physical and virtual worlds are fused together. It presents a new medium for projected images: a display that actually responds physically and conceptually to the moving images behavior, such as its density of light and changing tonalities. The robotic aspect of this display is mechanically designed to move the responsive video membranes and mimic the dexterity of the fingers of a hand. Its shapes are inspired by the desert Cereus plant. When the structure is completely open, floating in the darkness, the petals create an almost flat surface that moves from abduction to adduction.



Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Center, Montreal. Photo by Longpré

When closed, the membranes reassembled to evoke the shape of a tight water drop.



Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Center, Montreal. Photo by Longpré

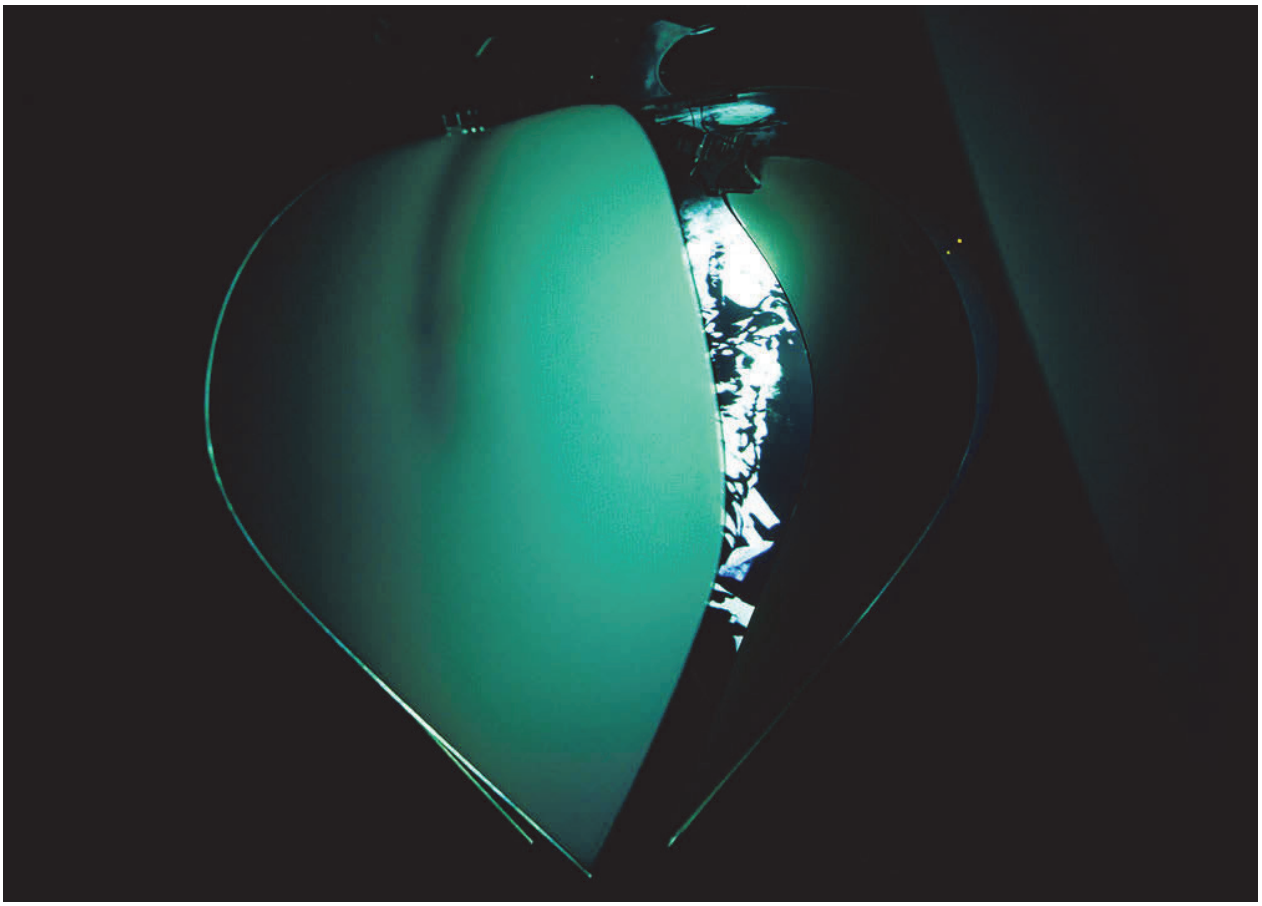
In between those two modes, the structure slowly opens as if it is blooming, expressing the delicacy of Cereus.

The process of designing such a system involved conceptualization to realization of the petals (responsive video membranes), the mechanism (robotic structure), the interfaces (electronic circuits and programs), the virtual character (moving images), and the soundtracks (noises). I developed each of these elements based on the proposed sensory methodology through which the chosen materials and construction techniques, as well as encountered challenges and solutions, continuously influenced the overall creative process while also keeping in mind the lived sensory experience that I

associated with the target expressions for these pieces.

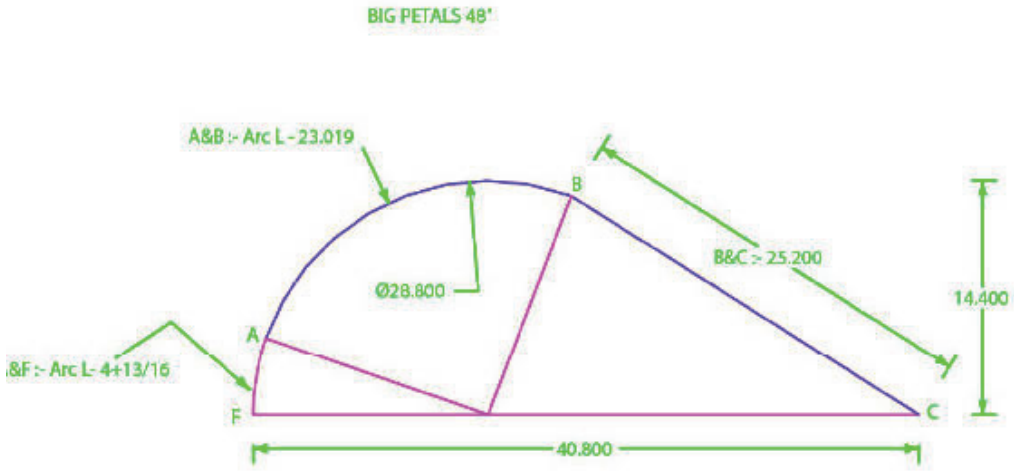
5.1.2.1 Petals

For the fabrication of the petals, I first investigated smart materials and revolutionary technologies used in the fields of architecture, fashion, and robotics. I proposed a membrane that would respond both conceptually and physically to the presented moving image: a medium whose materiality could change from opaque to transparent, that captures a projected image still in its optically clear state, and mutates by opening and closing.



Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Center, Montreal. Photo by PULP

In essence, the design of this video display is composed of 12 curved petals: nine large ones measuring 48 inches long by 32 inches wide and three small ones measuring 23 inches long by 32 inches wide. The prototypes for these petals were first made at the Solheim RP/RM Lab in the Mechanical Engineering Department at the University of Washington in Seattle. Their shapes and curves were created using Rhinoceros software, a modeling tool for designers. During this process, the two-dimensional (2D) shape of the petal (top view) was merged with its 2D curve (side view) by calculating the arc between points A to F.



Following that step, the curve was then printed in three dimensions (3D) on a Z-Corp machine.[359] Using Polyethylene terephthalate plastic (PETG), I vacuum-formed each petal directly on the printed 3D object.[360] When the curves were ideal for the inner and outer light reflection during the opening and closing states, I started the construction of the actual petals, which are made of a specially built responsive video membrane composed of four layers. This membrane includes a holographic film that

[359] Appendix IV: *CEREUS* – Prototypes, 238.
[360] Idem.

allows images to be captured when the petals are completely clear. Additionally, a layer of polymer-dispersed liquid crystal film (PDLC) smart material permits the petals' materiality to change between opacity and transparency because of its electro-chromic properties. Once all of the layers were created using an industrial vacuum forming machine and cut with a CNC laser cutter, I laminated and sealed them together, which was the most challenging step of this project. The difficulty was primarily the result of mounting the holographic film without leaving any discoloration or spots caused by humidity on the curved surface of the petal once laminated. To solve this issue, different adhesives were tested, as well as double-faced clear film such as Wrim film, bubble releasing film, 468MP optically clear, 300LSE, AR 90879, and self-wetting adhesive film.

The lamination of the petals required the development of a complex procedure that included the design of a wooden structure to form the plastic and to later support all of the layers when being assembled in a dust- and humidity-free environment. Then, the pieces were baked in an oven for 24 hours. Only one petal could be laminated at a time.

Furthermore, because 115 Volts AC is required to change the physicality of each petal, I had to ensure that the procedure was secure and that it complied with electrical safety norms. Thus, the copper power bar at the top of the petals had to be covered. I designed a Rhino shape and printed it on adhesive white vinyl to protect the power bar and hide the copper. This option did not work because the thin vinyl melted in the oven during the lamination procedure. I eventually used acrylic putty with electrical insulating properties to cover the copper.

Finally, the last step was to flame polish the edges to create a line that could reflect and diffuse the projected light and, lastly, to solder two electric wires to the power bar and install a connector on each of the 12 petals.

Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Center, Montreal. Photo by Longpré

To inspire the sensation of weightlessness, the petals were designed from a clear material. Thus, the petals seemed very light and fragile even though they each weigh 15 lbs. The tiny white electrical wires and connectors were left visible on the structure. Interweaved, these delicate wires are creating some natural curves in order add an organic feel to the visual presentation. In addition to the metamorphosis of their materiality, the kinetic aspect of the petals is also extremely important to the overall sensory experience of the presented moving images.

5.1.2.2. Mechanism

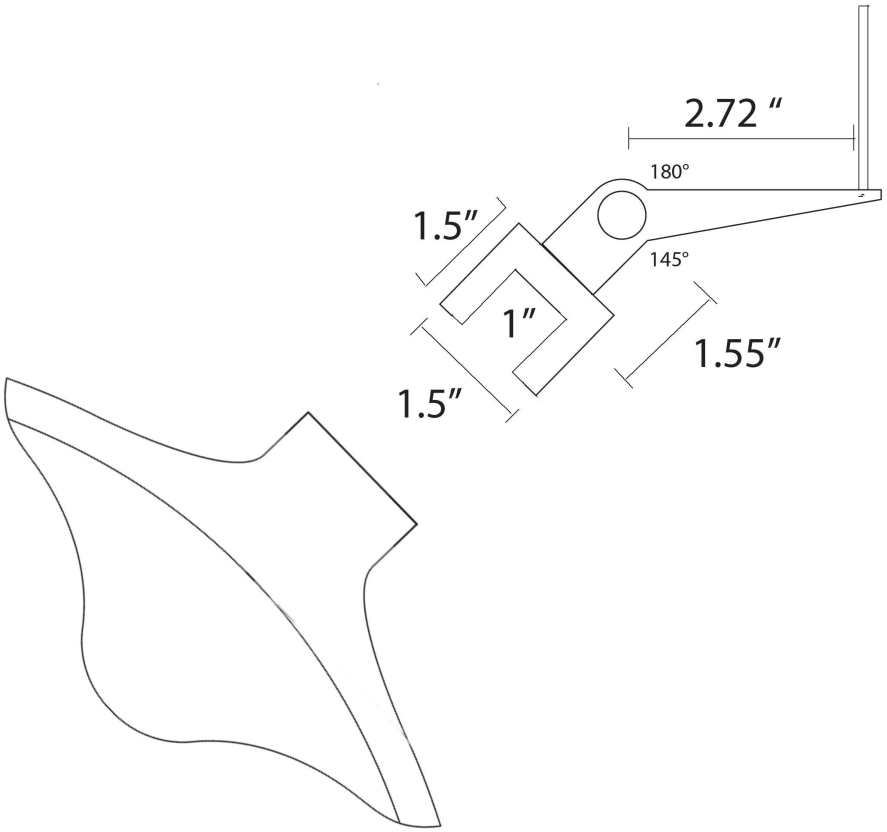
A robotic structure driven by a pneumatic system allows all of the six petals to move from abduction to adduction. All of the mechanical parts of this structure were drawn by hand and then transferred in AutoCAD.[361] They were first 3D printed on ABS plastic using the Dimension SST 3D printer at the Solheim RP/RM Lab.[362] A series of assembled prototypes of the structure were constructed before the resulting physicality of the object reflected the desired sensory effect. For example, the first printed structure was much too delicate and not heavy enough visually. I wanted to create a striking dichotomy between the metal's mechanism and the transparent luminous petals. Once the desired design was confirmed, the parts were then made from aluminum at the Mechanical Engineering Instructional Shop at the University of Washington in Seattle and at the Mechanical Engineering Machine Shop at Concordia University in Montreal. I cut the two central bases and six arms that hold the petals using a water jet cutter and then machined them on a vertical milling machine and metalworking lathe. To keep the moving arms well positioned on each shaft, I added some copper sliding bearings that I cut to act as spacers. The solution worked perfectly and did not affect the movement of the bearings mounted on the arms. I went over the machining and polished off parts A through H, including the extension for each cylinder and the top holder for the cables.

[361] Appendix V: *CEREUS* – Mechanism, 239.
[362] Idem.

Philomène Longpré, "CEREUS – Queen of the Night", Parts A-H

This process was followed by the design of the frames that hold the petals. I sought a part made from clear material that was strong enough to hold the 15 lbs petals during their movement. The first frames that I machined were visually elegant but much too fragile for the actual force required when moving. The final frame was made of one inch-thick clear acrylic cut using a Redsail Laser Cutter and the track inside with a CNC Vertical Mill five axis. The last step was to flame polish the edges to allow light to infuse the object. To avoid damage such as cracks or marks on the petals made by the pressure of the setscrews used to hold them in place inside the frames, I fabricated some frame-shaped cutouts with a heavy vinyl desk mat. In this case, the texture of the vinyl acted as an adhesive that allowed the petals to stick to the inside of the frames and protected them at the same time. Before arriving at this particular solution, I attempted different

options using layers of silicone and latex, but the setscrews passed right through them because of the softness. Moreover, to ensure that the frames fit with precision into their respective metal parts, a layer of thin vinyl was also applied, enabling the insertion of the frame into the mechanism without the risk of loosening the metal parts.



Philomène Longpré, “CEREUS – Queen of the Night”, Frames.

Finally, as soon as I assembled all of the machined parts with six pneumatic double-action cylinders, I was faced with an unexpected situation. The opening of the large petals was not equal to the full length of the cylinders’ rod, and the speed of the movement was too fast. To resolve the problem, I added some flow control, changed the size of the cylinders to 1-1/16″ bore with a 2″ stroke for the large petals and 3/4″ bore

with a 1/2″ stroke for the small petals and adjusted the six little arms and extensions. I aimed for a very slow and smooth motion to evoke the poetry of a blooming. Because of the weight and the force of gravity, the air pressure in the cylinders was inadequate to hold the petals wide open; however, the speed was now as I desired. A slight delay occurred before having the required pressure in the cylinders when it changed direction and the petals could not be held in place while closing. I attempted a few options before finding a solution. I first added a shock (coil/spring) to each petal and designed new parts for this addition. The movement was much smoother but the rebound of the petals could still be felt at the closing state. I also attempted to add more friction to the mechanism but this attempt was not the best solution.

The next option was to replace the muffler on the valve with a flow control and install only quick fittings on the cylinders. Then, the second attempt involved replacing all of the double-action cylinders by revising the acting cylinders. The third one was to add 12 valves to control both the internal and external pressure of each cylinder. With this option, the movement of the petals was no longer synchronized and the speed of the aperture was much too fast. None of these tests were successful.

Of course, such a problem could have been quickly solved using another type of actuator, such as oil cylinders or direct current (DC) motors. However, these solutions would not have fit with the desired artistic expression that I sought, both conceptually and physically. A pneumatic system is driven by compressed air, which brings something very organic to the piece. In a way, the structure seems to be breathing from the sound of the air going in and out of the robotic machine, adding an andromorphic

feel and aesthetic. Moreover, air tubings are very important visually as they recall bronchioles, or a nervous system.

Philomène Longpré, "CEREUS – Queen of the Night", 2013. Phi Center, Montreal. Photo by Longpré

After a few months of tests, I finally came up with a new option, which was to add utility gauges and 1/4 Wilkerson R03-02-000 relieving regulators on the input and output of each cylinder to control the pressure and to allow "more give" when the petals open up. With this solution, by slowly and manually turning the pressure regulators, the movement became perfectly smooth in both directions. To control the pressure in both directions, I first did some tests with a 1 to 10 V proportional valve, which worked well but made unacceptable noise for this art installation. After several more weeks, I

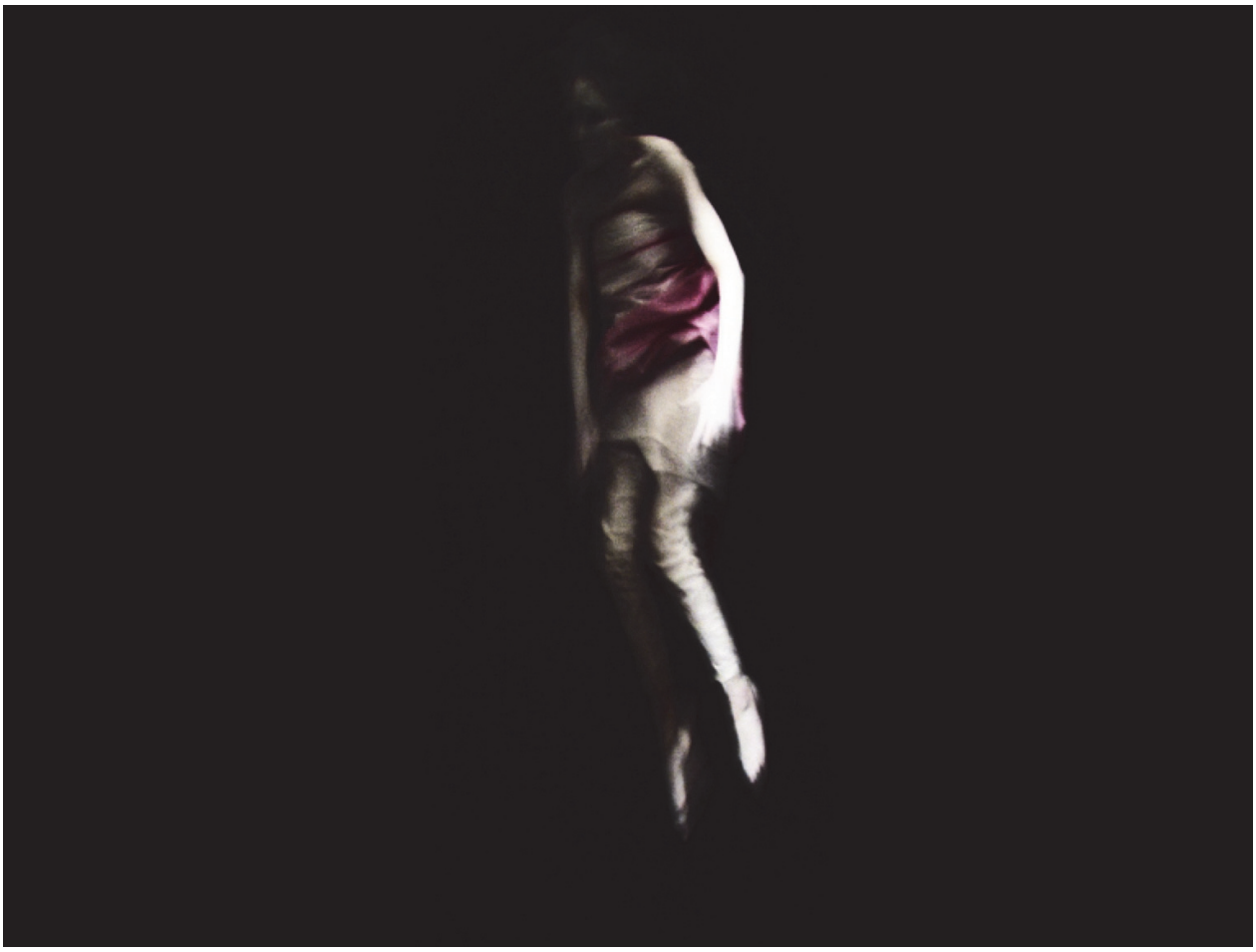
found a solution to the problem, which was to add 4 to 20 mA Control Air-I/P Transducers. Thus, a few more pieces were machined at Hexagram Mechanical Lab to install the new parts on the central shaft. That solution made it possible to open and close the petals smoothly and gracefully, resulting in the desired sensation of floating in the darkness, which was simultaneously enhanced by the gestures of the projected virtual character in the video.

5.1.2.3 Virtual Character

In this system, the moving images represent a female entity who unexpectedly mutates in a short period, and her diverse emotional states are triggered by the changes occurring inside the environment—in this case, the exhibition room.

Recalling the spirit of the Queen of the Night, such as in the legends of the night-blooming Cereus, this haunting spirit reacts with grace and delicacy and also with sudden and unpredictable manners. The character seems to be participating in an unremitting cycle of alterations through the continuous interplay of freeze framing, flashbacks, and flash forwards, as well as through the juxtaposition of both slow and fast motion. Thus, an emphasis is made on the image's physicality. For instance, the focus is on the luminosity and the textural quality of the images, which play an important role in its tangible insight.

At certain moments, the pixilation of the images also adds to its bodily virtue and enhances the sensation of the metamorphosis of the character, which is also strengthened by the design of the dress she wears and the chosen gestures of the performance.



Philomène Longpré, "CEREUS – Queen of the Night", Video Still.

In nature, plants reveal elaborate physical transformations in response to the environment they sense. As a defensive strategy, various animals completely change their physical appearance. Some inflate their bodies, radiating sharp spines such as the puffer fish or the porcupine. Other species modify the patterns and texture of their skin

or glow in the dark to evade enemies or stalk their prey.[363] Intricate dynamic systems allow physical transformations such as these to occur in response to a variety of data received by the senses. In the case of the virtual character of the *CEREUS* system, the metamorphosis was also used in a similar manner to transform both time and space in relation to the data received by the sensors. For instance, sequences can be superimposed and duplicated, and their duration can be expanded or contracted in real time within the program made in MAX-MSP/Jitter software. The saturation of the color as well as the kinetically jerky gestures can be reinforced by that transformation.

For a period of six months, I first studied how the body reacts in a zero gravity environment to create a sense of weightlessness by filming in high definition at a resolution of 1980 x 1082 / 30P using a Canon XH G1 camera. I also explored the factors that influenced me, such as sensations I experienced in the desert. Then, I performed a series of movements in different settings with a green screen background, while attached with a harness or jumping on a trampoline. All of these processes question the constraint of the gravitational pulls that occur on the body. Research also implies how visitors might themselves experience the feeling by interacting with the moving images of this character projected on the suspended structure.

Furthermore, to enhance the tactile quality of the filmed images, a study was done on the specifications of various video projectors. Both Micro Vision SHOWWX+™ Laser PicoP projectors and the 5000 lumens Sanyo PLC-ZM5000L were selected. No bigger than a quarter, Laser PicoP projectors can easily be integrated into any structure and always stay on focus, whereas the PLC-ZM5000L offers very bright and contrasted

[363] Denis Owen, *Camouflage and Mimicry*. (Chicago: The University of Chicago, 1982), 134.

images that allow the reflections to invade the environment at the precisely desired moment.

Finally, this system consists of 64 sequences of the virtual character's mutation, representing a total duration of 18 hours. Each sequence was edited directly on the responsive membranes, which were already mounted on the robotic structure to intensify the inner and the outer reflection as well as its interactivity with the visitors, the robotic structure, and the soundtracks.

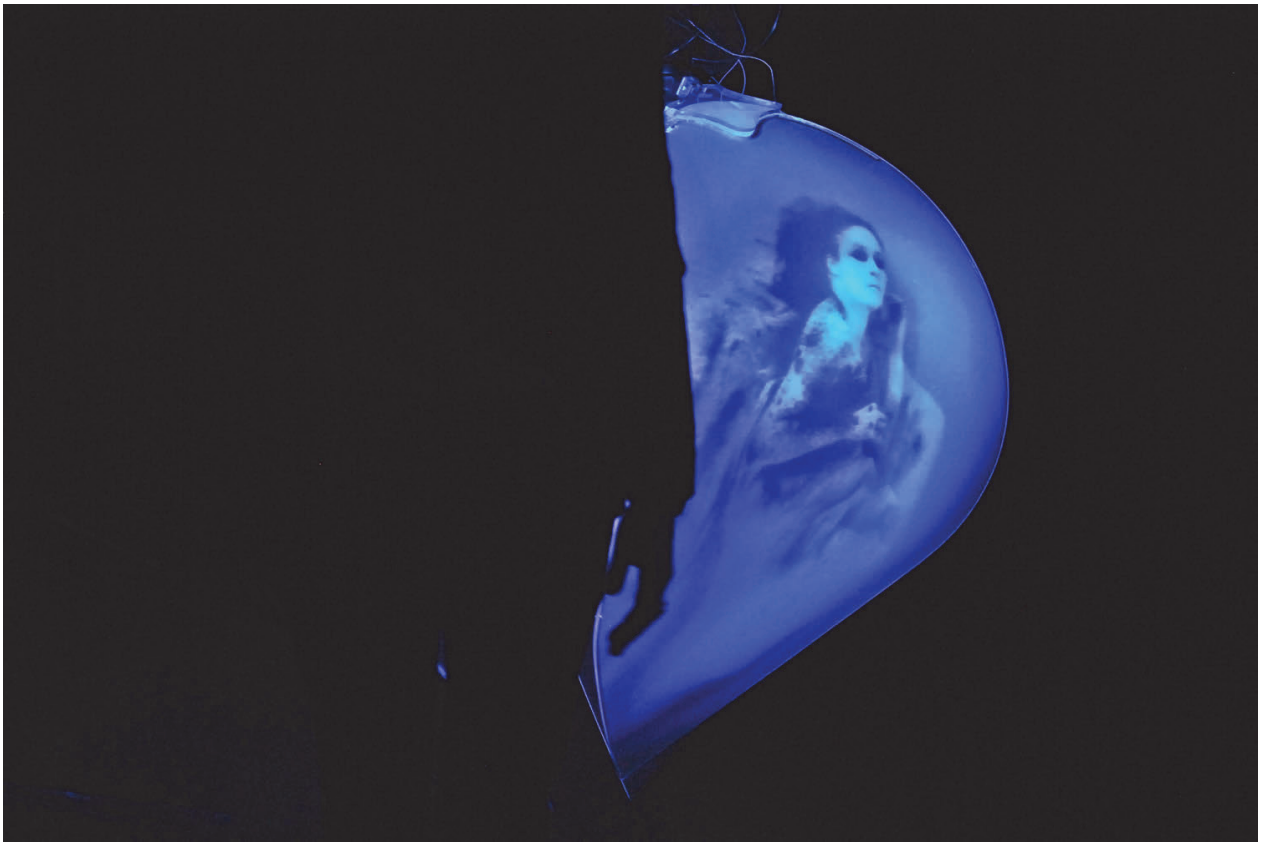
5.1.2.4 Sound

During my experience of the night-blooming Cereus in the desert, I did some onsite field sound recordings. The fluttering of hundreds of moth wings juxtaposed with high-pitched cricket chirps and the frighteningly sharp hissing noise of a tarantula were recorded during that night. To put each of these noises on a separate soundtrack, I also recorded at the Seattle Bug Safari. In that insectarium, I captured a series of noises made by male crickets and by cockroaches when eating and walking, as well as the hissing noises of spiders. The main challenge was removing the extraneous background noise during the recording session, which was exceedingly loud. To eliminate that noise—from downtown traffic to ventilation—the insects' tanks were covered with many layers of fabric and were inserted in Styrofoam thermo for isolation. Afterward, the sound was edited in Audacity and in real-time via Supercollider. The soundtracks were designed to thematically explore the "sensation of weightless," whereby the sounds do not fall in a predictable manner but surprise visitors as they move toward the membranes.

5.1.3 Interactivity

In its pellucid floral prison, this character is a mirror image of the viewer:
Longpré has compared visitors to the sphinx moths
that are drawn to the nocturnal blossom. [364]

-Alison Syme



Philomène Longpré, "CEREUS – Queen of the Night" 2013, Phi Centre, Montreal. Photo by: Héloïse P.

Digital interfaces, responsive video membranes, robotic structure, virtual character, and abstract sounds envelope each visitor, making them conspirators in the unfolding action. Suspended in space, the responsive video membranes react and transform by changing shape, expanding and contracting physically, under the influence of changes in the display's environment. Constituted by both the screen of the

[364] Alison Syme, "The Various Contrivances of Philomène Longpré," *Isomorphism, Art Interdisciplinary Field*, March, 2012, 60-61.

moving images and the heart of *CEREUS*, the display's transformation reverberates within the system.

Attracted by the luminous structure, visitors intuitively approach it, triggering its programmed mutation. The projected character moves like a ball, bouncing against the limits of its physical environment, the membranes. The ambient sounds also affect its behavior; loud and noisy sounds influence its state from calmness to utter unrest as people cautiously and curiously move closer. In the absence of any visitors, the character disconnects from its environment and eventually disappears. The membrane then closes completely, and the sound fades away.

This dynamic system is programmed to oscillate, presenting cycles established through a fixed set of states.[365] In fact, its own internal process is influenced by a built-in sensing system that responds to the presence of visitors as they themselves interact with the projected character. The distance between the visitors and the membranes is calculated with the data received from ultrasound sensors placed on the suspended structure. The closer visitors get, the more awake and receptive the character becomes. Simultaneously, visitors exert a range of attractive forces on the membranes according to their positions.

The video sequences are separated into five main groups. Each group of sequences consists of four sub-categories, which are divided in relation to the different stages of the character's transformation. The system randomly selects these sequences from the sub-categories. Visitors interact with each of the 64 video sequences as a non-linear experience within a programmed cycle based on five linear periods.

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[365] Peter Grogono, *Dynamic Systems,* (Montreal: Concordia, 2005), 8.

Philomène Longpré, "CEREUS – Queen of the Night"2013, Hexagram, Montreal. Photo by: Guy L'Heureux

The cycle begins with ***The Blue Period***, where the virtual character seems to float on cobalt petals. The blue light is reflected into the entire environment, depicting the cold azure sky found in the desert at sunset. This period was designed to evoke calmness, serenity, and quietness in visitors.

Following is ***The Metamorphosis***, where the virtual character and the responsive video membranes (the petals) slowly mutate, which may elicit anxiety in some visitors as it evokes a surprising mechanism of actions triggered by the transformation.

During the third period, entitled ***The Blooming***, the large petals open first, and then, depending of the amount of data received by the network of sensors, the small petals might open as well. At that moment the petals open, the images of the virtual character also appear on the ground, as though the images are escaping the display, expanding the virtual space into the physical world. This period questions the limitation

of virtuality as well as its intimate interactions with the physical reality. Additionally, by the end of this period, a circle of light can be observed on the ground, and moving luminous lines take over the walls, bringing sensations of excitement and enthusiasm.

With a dramatic touch, the fourth period is represented by ***The Closure***, where the wilted robotic flower returns to its ideal position. During that period, the character becomes darker until it completely disappears, and the structure stays in total obscurity.

Finally, in the fifth period, ***The Procreation***, vivid colors are suddenly projected on the set of petals positioned on the floor near the entrance. The colors are reflected on the walls, enticing the visitors to turn away from the main structure and walk closer to these petals. Thus, these petals interact directly with the main structure, as the video takes form only at the end of the entire programmed cycle. At that moment, a tiny character is projected within the petals on the floor, moving as if it were trapped inside a drop of water. These images are simultaneously reflected on the ceiling of the environment.

While all periods of *CEREUS*' metamorphosis are organized to oscillate regularly, unexpected changes may arise suddenly to capture the participants' attention. For instance, a flash of yellowish lightning can appear during the first period in response to certain actions of the participants, such as their actual positions and distance from the membranes.

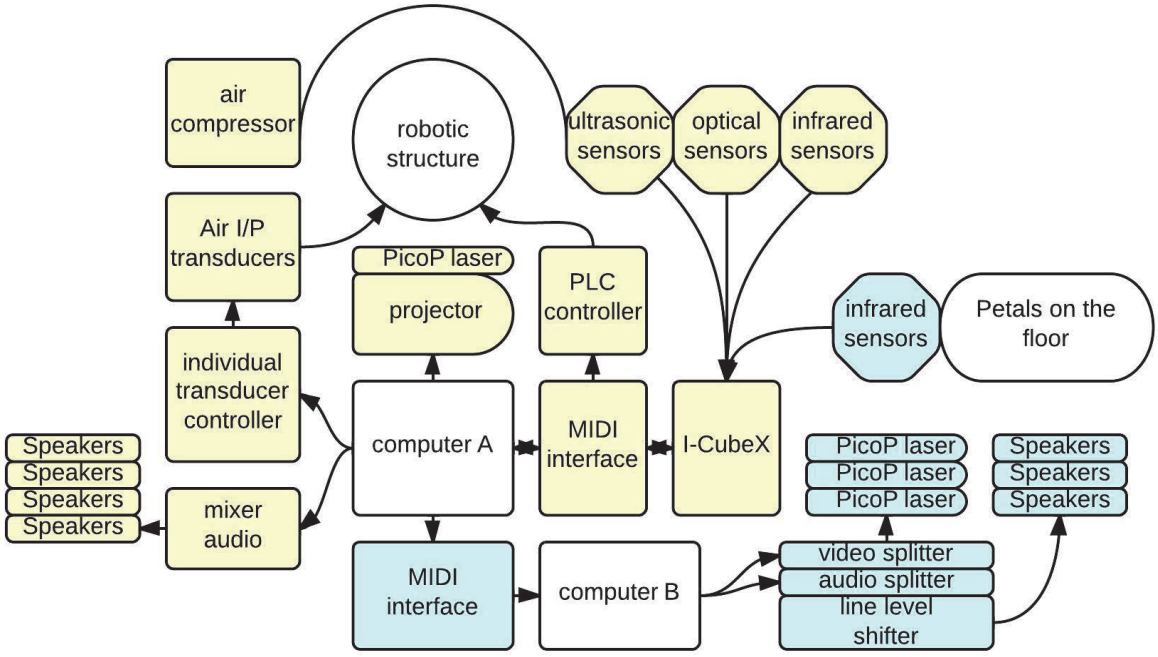
Moreover, during a quiescent state when visitors choose to do nothing but continue to observe, the video sequence plays completely linearly for its total duration of four hours. However, if visitors move closer to the character, the software component

is programmed so that another sequence within the sub-categories is selected randomly. In this case, the overall period's duration is shorter than it would be if visitors were to stay far away. Furthermore, a period does not end until the system receives an important accumulation of data. An I-CubeX digitizer analog to MIDI interface is used to read the received data from the network of six GP15013 optical sensors that act as limit switches for each arm that moves the petals. These sensors are used to avoid an instance where the small petals open if the larger are not yet opened. An output signal is sent to the program. Also, three Parallax's PING™ ultrasonic sensors, placed around the central shaft of the mechanism translate the distance between the membranes and the visitors. Lastly, six Phidgets IR infrared motion sensors positioned near the petals on the floor detect visitor's presence as soon as they enter the space. The data from all 15 sensors are sent to the programs (patches) created in Cycling '74 Max.

In order to control the movement of the robotic structure and activate the movement of the petals, an individual transducer controller was designed with an Arduino Uno (a microcontroller board based on the ATmega328) and a small circuit made with an MCP4922 device, a dual channel 12-bit Digital-to-Analog Converters microchip. Using a program in Cycling '74 Max, this interface allows for controlling the required air pressure (from 40 psi to 90 psi) in each cylinder for both directions by changing the current (from 4 to 20 milliamps) used by the Control Air I/P transducers.

A multi-channel PLC controller, which I built with a PIC16F628 microcontroller device, Omron power relays permits turning on and off the transparency of each petal by sending a midi-note message between 0 to 11 with a velocity of either 0 or 127 via the

program. I also added a quick-blow cartridge fuse of 100 mA for each petal in order to protect them from a short circuit. The Air I/P transducers installed on the suspended structure are linked to the individual transducer controller, the 12 petals to the multi-channel PLC controller, and the fifteen sensors to the I-CubeX system. The programs made in Cycling '74 Max allow generative artistic expressions in real time where the inputs from the sensors are linked to the output for the control of the mechanism, the change in the petals' materiality, and the selection of the projected moving images and soundtracks.



Philomène Longpré, "CEREUS – Queen of the Night", System.

Together, numerous elements and simple rules form a complex system where spatial (scale, location, setting), temporal (how data change over time, movement, rhythms, cycles), visual (color, light, shape, surfaces, texture), audible (pitch, amplitude,

timbre), and tactile metaphors (force, inertia, vibration, hardness, softness)[366] all communicate.

Philomène Longpré, "CEREUS – Queen of the Night"2013, Hexagram, Montreal. Photo by: Guy L'Heureux

[366]Keith V. Nesbitt, "*Modeling the Multi-Sensory Design Space*, " (paper presented at APVis '01 Proceedings of the 2001 Asia-Pacific symposium on Information visualisation, Basser Department of Computer Science, University of Sydney, Australia, 2001), 27-36

5.2 Part 2 - Case Study

The case study on *CEREUS – Queen of the Night* explores how the membrane's spatiality (the on-and-off screen spaces, its settings, environment, and position in the exhibition space), as well as the interactivity (the relationship between the spatial, temporal, and qualitative aspects), alter the perception of the moving images.

CEREUS system was primary exhibited in the Black Box's Hexagram-Concordia Centre for Research-Creation in Media Arts and Technologies from September 28 to October 5, 2012 and later, at the PHI Centre in Montreal from May 4 to 18 May, 2013 as part of ELEKTRA, the International Digital Arts Festival. Christine Redfern was the guest curator for these exhibitions.

A total of 58 individuals ranging in age from 18 to 82 years who came from various cultural and social backgrounds participated in this case study. This group is representative of a population of individuals who visit galleries in Montreal.

During the experiement, participants were asked to experience *CEREUS* system and as soon as they felt ready, answer a sequence of questions. This study was executed by a combination of two methods of measurement: direct participant observation and survey research based on an administered questionnaire.

5.2.1 Results

5.2.1.1 Direct Observations

The direct observation was made during both the presentation of *CEREUS* at Concordia Hexagram's Black Box (location A) where the movements of 23 participants

were traced on the *Graph-location A*[367] and also during its presentation at the Phi Centre (location B) with a total of 52 visitors, *Graph-location B*.[368] Data were recorded in these two locations in order to trace participants' movements and note the duration of their visits. The path of each visitor was traced on a floor plan of the exhibition room (*Graph-location A, Graph-location B)*. Moreover, all data were superimposed to create a statistical projection. Colors were used to visualize the speed of their movements in the space. Red represented a continuous movement. Purple portrayed a slow displacement. Blue was used to depict a static position for one to five seconds, and green denoted more than five seconds. The data were analyzed using a quantitative approach as follow.

First, in location A, I noted that as soon as visitors entered the space, they all walked slowly and directly toward the suspended luminous structure. Once they arrived, 20 of them continued their walk around the structure until the ***Blooming*** period was activated. Then, all participants stopped in one position when the petals started to open. When the structure was wide open, 12 of them continued to explore the space. Next, I observed that at the end of ***The Closure Period,*** when the structure remained in total obscurity, they all stayed in one position and waited for an average of five seconds. Only eight visitors were attracted to the petals on the floor that were suddenly illuminated. The other visitors decided to move closer to the structure, which activated a new cycle, ***The Blue Period.*** Furthermore, all visitors stood very close to the responsive video membrane, which was at least one foot from the structure, before stepping back. Finally, all the participants, whether being alone in the space or in small groups of two

[367] Appendix VII: *CEREUS* – RESULTS. *Graph-location A*, 245.
[368] Appendix VII: *CEREUS* – RESULTS. *Graph-location B,* 246.

to five individuals, went through three different cycles before reporting that they were ready to complete the questionnaire.

In contrast, at the location B, 50 of the visitors stopped as soon as they entered the exhibition room for at least two seconds before moving closer to the structure. Then, 40 of them continued to walk around the structure before stopping in one position. At the end of ***The Closure Period,*** when the structure remained in total obscurity, 46 of the 52 visitors walked to the petals placed on the floor. The majority of them stayed for at least 15 seconds before returning to the main structure. Moreover, all of the visitors remained for at least two cycles before leaving the exhibition room. Of the 52 visitors, 48 stayed for three cycles before leaving (20-40 minutes), and five stayed for four cycles (60 minutes and more).

Finally, in both location A and location B, none of the visitors stayed in one position for more than 10 seconds. Also, I observed that they all stayed in the exhibition room for a minimum of 15 minutes.

5.2.1.2 Interview: Questionnaire

The data collected from each of the questions of the survey were examined separately as follows:

1. Following the experience of CEREUS, what is the first word that comes to your mind?

To analyse the collected data from this question, I first examined the main sources of inspiration for this piece. Then, I identified five groups. I choose ***Fear*** and ***Surprise*** to represent the principal desired effects that I associated with the target expression: weightless and unexpected. Then, regarding to the selected encounter, I choose ***Nature***

for replies that were related to "the natural physical world."[369] Next, the Legend of the Papagos, which was part of the inspiration for this piece, evoked two groups: ***Space***, for any "three-dimensional area as well as with the expanse in which the solar system, stars, and galaxies exist; the universe"[370] and ***Imaginary***, referring to an unreal world. Then, finally I created the group entitled ***Body*** for replies that referenced any physical part of a human, as it was also an important aspect of my research for *CEREUS* system, which was both represented by the virtual charater in the moving images as well as by the visitors in the room of exhibition.

The results have shown that nine visitors used a word that was directly related to ***Nature***, such as flower, tulip, lily, chrysalis, water, and night. Twelve of them responded with a word that referred to ***Space*** by directly citing extraterrestrial words, such as universe, spatial experience, and sci-fi, or words relating to personal space or feelings, such as interiority, isolation, and intimate. Then, the ***Imaginary*** group contained ten words, primarily mystery, magic, and monster. The group, entitled ***Body***, was comprised of eight replies, such as pulsing heart and uterine.

Next, 13 words were regrouped together under the term ***Surprise***, which was comprised of expressions originating from a state of astonishment, amazement, or something unanticipated, such as gorgeous, wow, and amazing. Additionally, ten words were related to a certain ***Fear*** or a state of uncertainly, such as malaise, disturbing, and freak.

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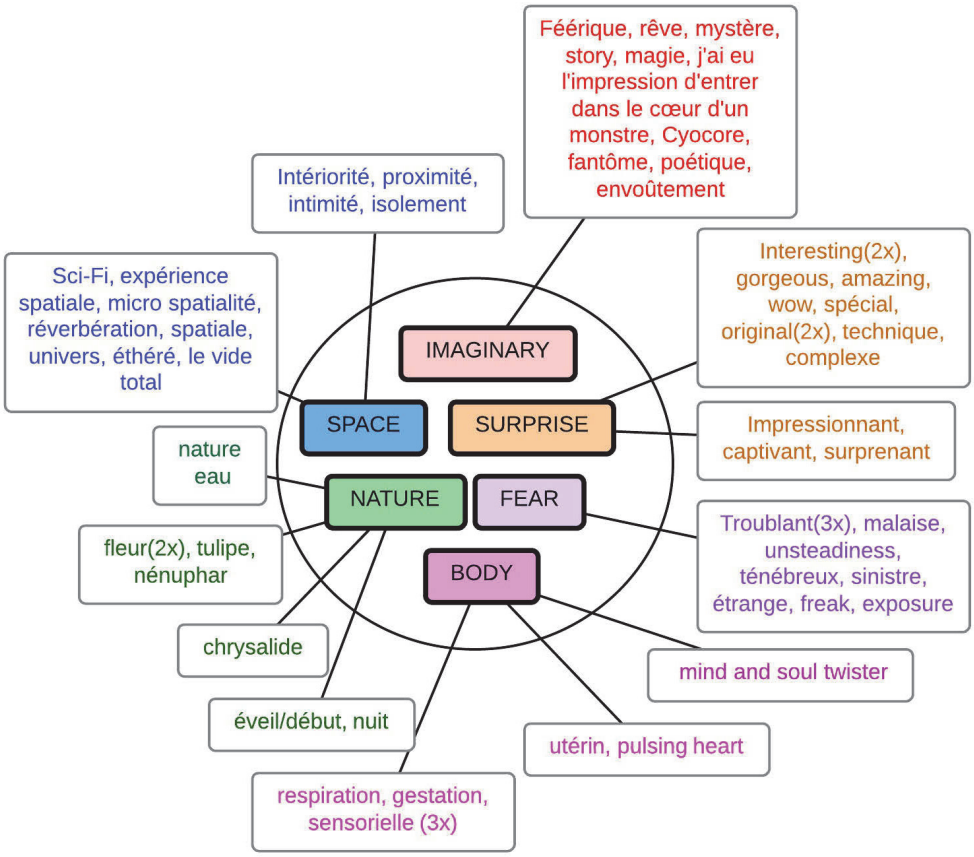
[369] "Nature," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/Nature
[370] "Space," The Free Dictionary by Farlex, 2013, http://www.thefreedictionary.com/Space

Finally, most replies to their first impressions were associated with something that was organic, pertaining to plants, humans, or landscapes. All the replies to this first question were placed in *Figure 2*. Each word (raw data both in French and English) was placed in one of the suggested groups and color coded as follows: ***Fear*** in purple, ***Surprise*** in orange, ***Nature*** in green, ***Space*** in blue, ***Imaginary*** in red, and ***Body*** in pink.

Figure 2 – CEREUS experiment: Answers to Question 1.



2. Which emotions were evoked while experiencing CEREUS?

Responses to the second question were categorized into two groups: those that included only one emotion and those with multiple contrasting emotions. All words were colored wih the same code as presented in the *Figure 2*.

Results demonstrated that 31 participants reported a series of contrasting emotions that were evoked during the experience of *CEREUS*, including curiosity, fear, anxiety, excitement, peace, tranquility, and surprise. For instance, a respondent reported, "I had the sentiment of being elsewhere, in a unique world where it was cold and warm, calm yet eventful."[371]

While 27 respondents described their experience with only one sensation. Ten of them defined their experience as fear and anxiety. For example, a respondent wrote, "Fear. I felt she would come out of the screen."[372] Another respondent stated, "I was a little anxious because of the sounds and the woman that observed us."[373] Whereas, nine other participants' replies were related to curiosity and surprise. For instance, one of them wrote, "I felt a sensation of opening to the world, to the life, and it triggered curiosity and well-being."[374] The others associated with the experience in the space by stating, "It was cold. It was very cold, and I was not able to see anyone."[375] Another participant wrote, "It was like being in the afterlife, a sensation of roaming in a space while traveling in time."[376] The complete replies of all participants were placed in *Table 13.*[377]

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[371] Participant, (19).
[372] Participant, (23).
[373] Participant, (25).
[374] Participant, (2).
[375] Participant, (18).
[376] Participant, (14).
[377] Appendix VII: *CEREUS* – RESULTS. *Table 13 –Case study: CEREUS. Answers to question 2, 247.*

3. How would you describe the space (the environment) of CEREUS?

To this question, I created a table organized into five categories. The categories were selected after an in-depth exploration of how the *CEREUS* space could be described by participants. The groups were chosen in direct relation to the different steps of the realization of this system.

First, in regard to the inspiration for this piece, I choose the group ***Nature*** for replies that would refer to "the natural physical world"[378] in reference to my selected encounter for this piece, and the group ***Imaginary*** for words that would concern the unreal, in regard to the chosen Legend of the Papagos.

Next, during the fabrication of *CEREUS*, many different technologies were used so I considered that the space could be also described by one of its presented elements or the technology used. Thus, I named this group ***Technique*** for answers that primarily would relate to the technical aspect of the system.

Finally, based on the main intentions of this system, I selected two groups. One I entitled ***Experience,*** as the principal aim of this project was to offer a multisensory experience to the visitors. Thus, this group was selected for responses that would focus on the participant's actions rather than the physical space itself. The second group was named ***Emotions*** for descriptions that would primarily evoke a sensation that could be linked to the desired effects of this project: fear and surprise.

Each word in the replies that I associate with one of these groups were colored using the codes in *Figure 1.*

[378] "Nature" The Free Dictionary by Farley, 2013, http://www.thefreedictionary.com/nature

Now, the result of analysis of the collected data show that seven participants described the space of *CEREUS* in relation to nature, specifically plants. For instance, one stated that it was like "a kind of forest, or rather electronic swamp,"[379] or "a night animated by electronic plants."[380] Nine individuals defined the space as being a mysterious world. One respondent saw it as "a dark extraterrestrial world"[381] or "a mysterious, forbidding environment."[382]

Next, a total of 15 visitors explained the installation using a technical approach. For example, one reported that it was "a sensory laboratory centered human beings"[383] or "an audio/video robotic environment with a multi-screen."[384] In this group, four individuals described the space by talking about the content, the subject matter of the video. One of them stated that "a character seems to float or emerge in a liquid"[385] and five of them used sound to detail the space. One visitor wrote that "a space forms by the sound."[386]

Further nine respondents described the space in relation to an experience. One visitor wrote that it was "a vast space in which the spectator is called to find out what is happening. Initially, the darkness is present; it is difficult to walk around. We must go with small steps, and we always end up searching for light."[387] Finally, 16 respondents described the space as being an emotion. This group provided a series of responses,

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[379] Participant, (6).
[380] Participant, (23).
[381] Participant, (20).
[382] Participant, (26).
[383] Participant, (18).
[384] Participant, (2).
[385] Participant, (12).
[386] Participant, (46).
[387] Participant, (17).

ranging from "ingenious, evaluated, contemporary"[388] to "very nice work. I loved it, and I felt I was out in another world. The effect of fear really touched me a lot."[389] One visitor stated that it was "a very dark environment—melancholic, sad, and different."[390] Another one called it "a vast and interactive environment—an inviting space, in the sense that I was called into, and I wanted to explore it more."[391] All the raw data for this question were placed in *Table 14*.[392]

4. For you, what was the CEREUS installation trying to convey?

The collected data for this question were analyzed with the use of a table divided into three main groups, which were selected after an exploration on how the system could be read by the visitors. The categories are the same as proposed for the analysis of question 10 in the survey on *XIA* as seen in the previous chapter. All replies were placed in one of the following categories: ***Experience,*** for replies that would focus on the experience itself; ***Message,*** for responses that would express a specific statement; and ***History,*** for replies that would convey a story or narrative. All the replies to this question were placed in *Table 15*. [393]

The results demonstrate that 31 respondents provided a direct reference to an ***experience*** filled with emotion and diverse sensations when they explained in their own words what *CEREUS* was trying to convey. For instance, visitors described a "sensory

[388] Participant, (42).
[389] Participant, (34).
[390] Participant, (27).
[391] Participant, (29).
[392] Appendix VII: *CEREUS* – RESULTS. *Table 14 –Case study: CEREUS. Answers to question 3,* 248.
[393] Appendix VII: *CEREUS* – RESULTS. *Table 15 –Case study: CEREUS. Answers to question 4,* 249.

and interactive experience"[394] or "a research of beauty, a well-being sensation, an opening to life."[395] Others described "a sensation of being observed by the technology."[396] In this group, a few replies indicate the interactivity between various elements. For example, one respondent described an "intimacy sort of between spectators and the creator."[397] Another one stated, "the body's reaction to sound."[398]

Then, 15 respondents argued that *CEREUS* had a specific statement, a ***message***. One of them wrote that the piece tried to convey that "Our actions affect our environment and surroundings. Sometimes, these bring an opening, but they could also bring impacts that lead to closure and relocation,"[399] or "that humans react to the heart of other humans."[400] Another respondent referenced "the impact or reaction that the environment can have on the privacy of the being."[401]

Finally, nine visitors replied that *CEREUS* conveyed a ***history***. For some, it was the story of the birth of something. For others, it was the history of a woman. For instance, one respondent stated, "*CEREUS* [is] trying to send a subtle message about femininity with the beauty of a timid, young woman. "Another one referenced "a warmer and different way of telling a story through a video image, considering the entire space."[402]

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[394] Participant, (16)
[395] Participant, (1)
[396] Participant, (18)
[397] Participant, (46)
[398] Participant, (50)
[399] Participant, (28)
[400] Participant, (31)
[401] Participant, (27)
[402] Participant, (35).

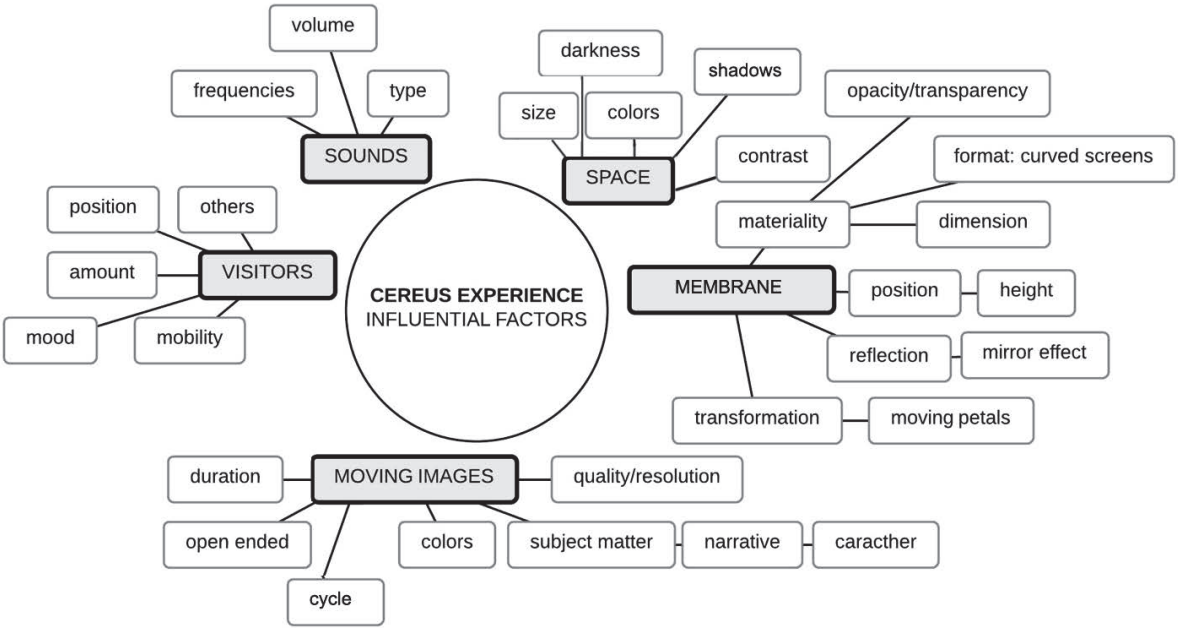
5. *Do you think that the screen's spatiality (environment) altered your perceptions of the visually presented material? If so, how did it alter the experience and did any other factors affect your perceptions of the moving images during the experience?*

For this question, in order to summarize all of the influential factors that were mentioned within the 58 replies, I designed a diagram. Around the main circle, which represents the visitors' experience of *CEREUS,* I placed main elements of this system, which are space, the responsive video membrane, the moving images, the sound, and the visitors. Then, I analyzed each word used in the replies and I placed them in one of the associated categories. The results of this analysis demonstrate that many factors influenced the visitors' experience of the moving images.

First, a total of eight factors were mentioned in relation to the moving images, including its resolution, content, chosen colors, narrative, and the virtual character. Then, ten factors were identified in relation to the physicality of the responsive video membrane. This included its dimensions, the mirror effect, its moving petals, the transformation, and its curved shape.

Next, seven factors were stated in relation to the proposed space of *CEREUS.* This comprises of the facts that it was dark, the size of the room, and the shadow created in the space. I also noted four factors that were mentioned in relation to the visitors, such as their positions in the place, their mood of the day, their mobility, etc. Finally, three participants wrote that the type of sound, as well as its frequencies and volume, did influence their experience. I also noted that all 58 participants wrote that the space did affect their perception of the moving images. In *Figure 3*, I placed all influential factors mentioned in the collected data.

Figure 3 – CEREUS experiment. Answers to Question 5.



5.2.1.3 Unstructured Interviews

Finally, two individuals' discussions were examined in depth to analyze the nuances of the replies to the open-ended questions. Their sensory responses to the experience of the *CEREUS* installation that included both spatiality (the on- and off-screen spaces, settings, environment, and position in the exhibition space) and the triggered interactivity (the relationship among the spatial, temporal, and qualitative aspects of the membrane) were analyzed in the next chapter.

First Interview

In the first interview, the respondent described how cold he felt in the exhibition room. I asked: "And now that you are outside of the space, do you feel cold?"

He responded: "Not anymore!"

I told him that the temperature was exactly the same in both rooms. I asked him what might have triggered that sensation.

He responded: "Maybe the fact that the space was very dark and kind of scary."

I asked: "Do dark and scary always go together for you?"

He responded: "Well, yes! As a child, you know, I was so scared in the dark. Isn't it the same for everyone?"

I asked: "Are there any other reasons why you could have felt so cold?"

He replied: "Maybe, because when I entered the room, the heart, the structure, was completely blue, and sounds were coming from everywhere."

I stated: "I saw that you walked directly toward the structure and jumped when you experienced the yellow flash."

He responded: "Oh, yes. The flashes scared me out. It reminded me of a storm, a lightning storm, which again triggered another childhood memory. I hate lightning!"

I asked: "Can you tell me what happened after these flashes?"

He responded: "Yes. Well, when the character started to transform itself, almost like when a caterpillar becomes a butterfly, I started to hear bees coming from everywhere."

I probed: "Bees?"

He replied: "Well, yes, insects. The sound was fantastic! It was 3D and gave me so many inner sensations."

I stated: "In fact, I did record insect sounds for this piece, such as the vibration of the wings of moths."

He responded: "Yes! Bugs were coming from everywhere. I felt so disoriented at that point. It was like being in the fourth dimension. It was scary, yet pleasant!"

I asked: "Did you see any change in the materiality of the membrane, which served as a video screen?"

He replied: "What do you mean? You know, many things were happening, and I felt that I missed something. I saw that the screens were changing, but I did not understand what it was exactly. It was like magic, and I asked myself if it was an illusion. The woman was floating inside the heart, and she was always looking at me. I felt observed! She was like a spirit, right? You know, it really was like being in another world, being in a dream, another dimension. "

I replied: "Thank you so much for sharing your experience with me."

He stated: "Thank you. I need to try *CEREUS* again."

Second Interview

In the second interview, I asked, "Could you tell me about the first word that came to your mind?"

The respondent stated: "I would say pulsing heart, but there were so many intersections of ideas. It also felt like a divinity, a mysterious divinity. It was a secret object where a holographic figure was floating, like being in the water. I was able to see the figure in 360 degrees. I walked quickly around it. It felt like turning around a sphere of light. I had a beautiful experience. I felt privileged in this odd space always, as if I was inside a pulsing organ. The texture of the image reminded me of a skin, a skin that enveloped the image: the skin of a moving image."

He continued: "Yes, it was like a skin of light, a jewel. The shape also reminded me of faceted gemstones, a clear diamond cut, with surfaces filled with multiple angles. It also gave me the feeling of a beautifully made cocoon. I would say it was more like witnessing an insect's life."

I asked: "How would you describe the space of *CEREUS*?"

He replied: "Really, I don't feel this is a room. It put us in orbit, not a space like a box. It is more like a planet around the sun. It flips the world upside down. I have to say, it was quite disturbing! To me, I had an interesting experience with no linear perception. It open up the sense of a physical space as I was seeing all around! The most important thing is that it's circular. Yes, it's expanding spherality! The perspectives were constructed with so many layers. I would add fragmented layers.

It was like a sphere, definitely a sphere of light, which acts as a mirror, as the images also reflect off the floor. The images were refracted like in the order of the Cubism movement. The image was worked as a painting, yet on multiple facets. The fragmental eyes were the effect.

The petals on the ground had like some drop of water inside, and the figure was swimming in the middle. The sound was rich; crickets, but also I recalled some pastoral bells, thunder, and raindrops. The overall experience was terrifying and transcendent."

I asked him: "And what do you think it tried to convey?"

He stated: "The character reminds me of the divinity Vishnu in Hinduism. It was like being in the manifestation of Vishnu.[403] The inner and outer reflection was phenomenal. The image was multiple and also fragmented, almost fractal. The overall structure was also referring to a flower, a crystal, and also a mirror house. I really felt like I was entering a secret chamber, where the main structure was a kind of god. I would say definitely I was exposed to the transcendent! "

Then, I asked: "Did any other factors influence your experience?"

He said: "Now, the curve of the petals…yes…It is not just a heart because the curve adds to its softness. Yet when the structure turned completely opaque, it was not fragile anymore. It was strong and solid and hid some secrets. It triggered a certain emptiness, a religious object with an organic feel, an organic life inside a religious object.

For me, *CEREUS* makes me fly with thousands of eyes. The intimacy that was created was awesome, unique, and certainly created by the height of the structure in the space. The position at the human level created a unique one-to-one relationship.

All of the essence was inside, yet no captive was inside. My experience was definitely non-linear and, as you can see, triggered so many sensations in a very short period. Impressive! A very unique experience."

I replied: "I am very touched by your testimony! Thank you."

[403] "Vishnu is described as having the divine blue color of water-filled clouds and having four arms," Wikipedia, 2013, http://en.wikipedia.org/wiki/Vishnu

5.3 Summary

Weightless and unforeseen were the two target expressions I selected for this project entitled *CEREUS—Queen of the Night*. Based on a multisensory approach, I identified a series of desired effects that I associated with these expressions ranging from the sensations of fear to surprise. I also choose an experience of the Cereus cactus night-blooming that I had in the desert as the core source of inspiration for the realization of this project. These sensory explorations also served as grounds for the method in which the collected data from the case study were structured and analyzed.

Upon two methods of measurement, I first pursued direct observation of the participants while they were experiencing the system. This occurred in two distant locations varying in dimension and space configuration. During this experiment, the main difference between the observations in the two locations was that participants walked very slowly toward the suspended membranes as soon as they entered the space in the first location, while in the second location, they all stopped at least two seconds at the entrance before they walked toward it. I also observed that during the obscure period, only eight participants of 23 went to the petals placed on the floor in the first location whereas 46 of 52 did so in the second location. Thus, the result shows that participants were not acting similarly in both locations.

In the survey, the first question asked the participants about the first word that came to their mind after the experience of *CEREUS*. Of the 58 participants, I noted that a total of 23 stated a word that I associated with the chosen desired effects for this project, and 21 replies were related to the principal source of inspiration as being nature, space .

The results also revealed that a majority of participants stated that the system triggered a series of contrasting emotions, which corresponded to the sensory experience I had in the desert where I recalled series of sensations in such a short period of time. Furthermore, with this survey, I also observed that the majority of visitors defined the space of CEREUS as an environment made by emotions and sensations. Additionally, the majority considered that *CEREUS* was trying to convey an experience, which came before a specific statement or a story. Lastly, all participants responded that spatiality did affect the perception of the presented moving images. This was also noted by the direct observations. The result of this study identified a series of influential factors that need to be considered during the realization and presentation of such responsive video membranes.

Finally, the results definitely reflected the main intent selected for this project, which was to first offer the visitor an experience filled with contrasting emotions. It also confirmed that each detail of the system did influence visitors' overall experiences. In the following chapter, the results of both the case studies on *XIA* and on *CEREUS* are analyzed in great detail and interpreted using a sensory approach.

Chapter 6: Data Interpretation

When language cannot record memories, we often look to images. When images fail to revive memory, we may look to the well-kept secrets of objects. Unpacking the secrets encoded in images and objects, we find the memory of senses.[404]

— Laura Mark

Whether exposed to pressure, vibration, temperature, or pain, "our skin mediates the most transactions of our lives,"[405] according to anthropologist Nina G. Jablonski. Not only is this protective shield equipped with a myriad of sensors, including thermal, chemical, and mechanical receptors, it also evolves with us, constantly changing and renewing itself.

Like skin, the responsive video membranes of the systems entitled *XIA* and *CEREUS—Queen of the Night* were designed to respond to their respective environments. These membranes are not simply passive surfaces. As visitors are naturally drawn toward them, their programs receive data from strategically placed sensors. Such changes in the environment trigger the projected virtual character to react and the membrane to respond to that alteration by slowly activating its own transformation. For these two artistic productions, the membranes offer a space that affords sensitive skin to swathe the moving images.

For *XIA*, the 3D effect created by the fusion of moving images and its specially elaborated membrane that offer volume for the images to float. In fact, this volume is produced by the superimposition of multiple layers of video sequences in which the

[404] Laura U. Marks, *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses*, (London: Duke University, 2000), 195.
[405] Nina Jablonski, *Skin: a Natural History* (Berkeley: University of California Press, 2005), 2.

movements of a virtual character perfectly match the marks on the paper that received the images. This paper then shifts into what I define as a responsive video membrane at the moment where each detail of its design, such as its color, texture, shape, surface, format, and setting, are chosen to respond conceptually to the content of the moving images and to physically fuse with them, creating a three-dimensional video space. For *CEREUS*, it is both the inner and external reflections due to curved petals made of smart material that create the three-dimensional space for the moving images. This effect is the result of external reflections in which images appear only during certain periods on the walls, floor, and ceiling of the exhibition's room. The internal reflections occur inside the suspended structure, thereby giving the illusion that the moving images are floating also within a confined space.

Moreover, for both systems, the membrane's spatiality, materiality, and interactivity were meticulously chosen in direct relation to selected target expressions: captivity (in the case of *XIA*), and weightless and unforeseen (in the case of *CEREUS*). During sensory exploration, a series of experiences and desired effects were identified, later serving as inspirational grounds for the realization of these systems.

Finally, these two systems were designed with the principal aim of offering an environment in which one could "live" a bodily experience without having to focus on the internal logic of the technologies used. I proposed two systems composed of responsive video membranes that needed to be experienced with all the senses to be understood authentically.

In the following sections, I suggest an interpretation of the given results from the case studies on both systems based on two methods of measurement: direct observation and questionnaires.

6.1 Case Study: *XIA*

6.1.1 Direct Observation

First, the results from direct observation of the participants while they performed the experiment confirmed that the format of representation triggers various viewing behaviors, as well as distinct layers of information. In turn, this influences people's perceptions of moving images.

For this experiment, a video sequence of *XIA* was presented on its specially elaborated membrane, a television, an iPod, and an iPad. As shown by the results, the specially elaborated membrane transformed viewers' postures into those of active participants, inviting them to intuitively move in the space. I noted that all 64 participants went very close and very far away from the membrane. I interpret this as participants being curious about the uniqueness of the surface receiving the images as well as the 3D effect created by that superimposition. Thus, participants seemed intrigued by this unfamiliar environment; it made them walk into the room, which could not have happened with a simple projection on a wall, or on a regular screen, such as the kind used in movie theaters. This fact was confirmed by the experiment with the television and with the mobile devices. In both cases, participants were limited to a frontal viewing, and so did not have any interest in moving to the darkened room. However, attracted by the details of the membrane, such as the imprints of feet on the

membrane, which were accessible only at a very close distance, the participants were forced to experience the piece at different angles and positions in the space. By doing so in the darkened room, some may have become disoriented, which could have influenced their perception of the moving images. Furthermore, the fact that the projected virtual character reacted to the visitors' movements encouraged them to get closer to the membrane so that they could witness the subtle transformation implied both in the evolution of the sounds and the movements of the projected virtual character.

Finally, the results of the observations suggest that besides the format of representation, a series of factors also altered the participants' behavior, and, as a consequence, their perception of the *XIA* system. This fact has been confirmed by data collected from the questionnaire, as seen in the next section.

6.1.2 Questionnaire

A series of questions were structured in the first part of the questionnaire to obtain a better understanding of how participants positioned themselves in relation to video screens. This allowed me to create a profile of the group that participated in the experiment.

To start, the collected data showed that no predominant manner was identified in terms of how a video screen can be defined. I consider this result representative of the current situation in today's society, where video screens are prolific both in public and private spaces, offering a wide variety of format and content types. Therefore, there are a number of different ways in which screens can be described. This situation may be the

result of the current transitional state of the types of interactions people have with screens on a daily basis. For example, the majority of the participants in this study indicated that they stare at luminous screens for an average of six hours a day. Forty percent of them reported that they spend over eight hours in front of a screen daily. This data demonstrated that the majority of group members were using screens not only for pleasure, such as for watching films, playing games, and chatting with friends, but also for work. Moreover, 95% of this group considered video screens to be multisensory rather than solely audiovisual. They justified this manifestation principally due to the content of the presented images. However, factors such as the space surrounding the screen, the ambient light, the context, and the screen's size, format, luminosity, and resolution were also mentioned. This result may be representative of the fact that those who participated in the experiment spend several hours in front of a screen daily. As a consequence, they refer to their screen experiences as multisensory because of the content shown on the screens they are watching, and whether or not sensory memories are triggered. This could also explain the fact that the majority of the participants wrote that they considered the space offered by the screen more attractive than the one in which they live. For example, a few stated that colors were brighter and seemed more alive on the screen. As one participant affirmed, they were "more real."[406] With full high-definition resolution and a response time of only a few milliseconds, crisp, textured images filled the screen with sharpened, enhanced colors; deep blacks; and extra-fine details, all in a high-contrast ratio. Today's screens set viewers up to experience the world through their large, glossy, or matte surfaces framed by a sleek,

[406] Participant, (52).

thin, almost invisible frame. These characteristics may also justify the responses received from the group. For example, one participant wrote: "The quality of the image that we now have access to often gives a gray air to our reality."[407] These replies show that the group have had a very close relationship with various video screens and possess a certain sensibility to screens in general. This needs to be considered while interpreting the results from the experiment with the different formats of representation, as seen in the next section of the questionnaire.

In the second section, questions were elaborated on to identify the influential factors that alter perceptions of moving images. First, it is important to note that 99% of participants stated that the specially elaborated membrane best captured their attention. The uniqueness of this format triggered a completely different response as compared to their experiences with television and mobile devices. Through their cultural and social construction, objects such as televisions imply that multiple layers of information influence viewers' experiences. With the membrane, participants were exposed to unfamiliar displays that they described as being immersive, visceral, and bodily engaging. Such results reflect the principal aim of this project. With this experiment, participants' responses confirmed that the same video sequence presented in distinct formats of representation could trigger a completely different experience. For example, participants described their experience with television as being impersonal and conventional. This could be explained by the recent proliferation of so many kinds of tactile devices, such as iPods and iPads. Thus, the principal reason why people selected the membrane as the most attractive format could be the fact that it was specially

[407] Participant, (24).

constructed for the moving images presented, and that each detail was taken into consideration, contrary to the other formats of representation as seen by the results.

The third section of the survey explored how participants described their experiences with the *XIA* system. First, the accumulated data revealed that each chosen detail brought nuances to the perceptions of the moving images. For instance, 99% of the respondents affirmed that the screen's materiality affected their perception of the content. In addition, the space in which the membrane was exhibited, including its setting, the darkness, the dimension, the context and quality of the sound, the resonance in the space, and the positions of the speakers, were also mentioned by the participants as important factors. This result is definitely representative of the aspirations of the proposed multisensory approach to the design of the responsive video membrane. For instance, one respondent wrote: "The video projection was intimidating, as the screen was a part of the space."[408]

Moreover, the collected data showed that experience of the moving images on the membrane triggered a series of contrasting emotions and sensations. The main intention of this piece was to evoke such contrasts, and to elicit wonder and fear in an absorbing, involving, and changing environment. The results stated sensations of fear, anxiety, sadness, and nostalgia; yet, *XIA* was also described as exquisite, emotive, magnificent, touching, intriguing, and inspiring, words that all expressed a certain sense of wonder. These reactions are representative of my own sensory responses during the experiences that I associated with the chosen target expression. For example, one participant wrote

[408] Participant, (35).

that XIA was a "beautiful piece, disturbing, and yet stunning, all in the same moment."[409] This reply expresses a state of sublimity in which a series of contrasting emotions and sensations were triggered simultaneously. I consider these results to be representative of the fact that each element of the *XIA* system was chosen in direct relation to its target expression. For example, the mutual observation between the visitors and the virtual character was also designed to trigger a certain malaise and discomfort, which was reflected by the data collected. Of course, the fact that the moving images represented human figure calls attention to a certain anthropomorphic attribution. Visitors faced a mirror or a certain projection of their own feelings over the anthropomorphic character, so the mood of the participant could have also affected his or her experience and perception of the moving image.

Finally, *XIA* was designed to offer multiple layers of information that visitors could experience only by physically being in the environment. The results have demonstrated that *XIA* not only triggers strong contrasting sensations, but also elicits a series of possible interpretations. However, the majority of participants related their interpretations primarily to various emotional states and to an immersive experience, which adhered to the purpose of both systems, as discussed in the next section on *CEREUS.*

[409] Participant, (28).

6.2 Case study: *CEREUS — Queen of the Night*

6.2.1 Direct Observation

For the case study on *CEREUS—Queen of the Night*, I observed a difference between the visitors' behaviors who experienced it at Hexagram's black box and the ones who experienced it at the Phi Centre. During *The Closure Period*, only 34.78% of the visitors (8 out of 23) were naturally drawn toward the petals placed on the floor at Hexagram's black box, whereas 85% (46 out of 54) visitors approached them at the Phi Centre. This difference could be explained by the fact that the petals were positioned closer to the central piece at the Phi Centre, which tempted the visitors to move closer when the petals became luminous upon the video being projected onto them. These moving images were also reflected in a much more dramatic way on the wall and ceiling at the Phi Center due to the smaller size of the exhibit's room. Another influential factor that could have caused an attraction to the petals was the position of the entrance door. At the black box, the entrance was on the longer wall of the rectangular room, whereas at the Phi Centre, it was located on a shorter wall. Therefore, at the Phi Centre, the position of the petals at the left of the entrance was much closer to the suspended structure, as well as to the entrance itself. Such a seemingly small detail definitively influenced the visitors' experience, as was shown by the observations.

Finally, the fact that all participants went through at least two different cycles before exiting the environment demonstrated that a certain state of curiosity and intrigue was elicited by the system, which was also revealed by an analysis of the replies in the questionnaire.

6.2.2 Questionnaire

Words such as astonished, amazed, unanticipated, gorgeous, magic, mysterious, surprised, and intrigued were the words first reported by participants after their experience. At the same time, other words related to fear were also manifested, such as malaise, disturbing, strange, spooky, and freaky. These fear-associated words associated with fear could be explained partly by the fact that many adults are afraid of the dark. As demonstrated in the study by William Lyons, darkness is a common phobia: "Fear of the dark is usually not fear of darkness itself, but fear of possible or imagined dangers concealed by darkness."[410] Additionally, the fact that other visitors were roaming in the space and were difficult to see in the dark could have been another cause of such fears. Also, one of the target expressions was unforeseen, which could have triggered a certain feeling of vulnerability, as visitors did not know what to expect as they entered *CEREUS'* environment. In fact, many factors influencing the states of fear and surprise were mentioned, such as unexpected noises and unattended transformations, as well as the mysterious appearance and gestures of the virtual character. With these results, I noted that the first word that came into 72% of respondents' minds was related to emotions and sensations, which is representative of the principal aim of this system. Furthermore, the other 28% of words were associated with something organic, pertaining to plants, humans, or landscapes. These words were chosen in direct relation to the visual aspect of the presented structure. An association was easily made because of the membrane's shapes and colors, which resembled a chrysalis, a flower, a drop of water, and a pulsing heart. However, when respondents defined *CEREUS'* space, the

[410] William Lyons, "Emotion," *Cambridge Study in Philosophy*, 1985, 75.

majority provided their sensory experiences rather than describing a physical or tangible environment; this finding may have been resultant of the fact that the system was conceived with a proposed multisensory approach and focused on sensory responses and emotions that could have been elicited during realization.

Furthermore, all participants stated that the space affected their perceptions of the moving images. They justified this situation by factors such as the dimensions of the room, the context of the presentation, the setting of the membranes, the depth of the darkness, and by a series of others factors, such as the resonance of the sound in the room and the echo that was produced. Additionally, the majority identified the membrane's materiality as well as its movements as being significant influential factors to triggering surprise. I attribute this result to the fact that the membranes captured images during both their optically clear and opaque states. Being made of smart material with changeable properties, and having the ability to reversibly change its states, the membrane brought layers of information and meaning, as well as numerous possibilities of viewing behaviors, and, as a consequence, triggered an unforeseen effect.

Next, words such as floating, ethereal, spirit, and ghost were also reported by participants while describing *CEREUS.* These words represented what I aspired to create with this system by exploring the target expression of weightlessness. This was reflected by the choice of material, the type of movement of the character, the shape of the membrane, its movement, and the setting. For instance, one participant stated: "For me, *CEREUS* makes me fly with thousands of eyes."[411] This is an example of where a participant used words that I associated with weightlessness (such as "fly" and

[411] Participant (23).

"thousands of eyes"). In fact, there was a very interesting image evoked by this statement, as with *CEREUS* it was possible to see all around. Visitors were encouraged to move around the suspended structure and experience the moving images at each angle without having to confront any rectangular frames. *CEREUS* redefined the notion of a video screen, as the images could be seen in the entire space encompassed by continuously moving shadows; pulsing light projected onto the visitors' bodies; reflections of the moving images on the walls, floor, and ceiling; and the floating image created by the holographic film of each petal, giving the illusion that the images were not on a surface, but rather inside a video space—that they were physical, tangible, virtual objects.

According to Lev Manovich, everything was becoming virtual in the 1990s. However, the next decade could be considered to be about "physical space, albeit altered by electronic and visual information."[412] Although *CEREUS* suggests a physical space filled with electronic and audiovisual information, it was initially designed to trigger a sensory experience in which visitors did not need to focus on technological logic to appreciate their experience of a particular piece. As soon as they entered the room, the system began to receive the information and slowly mutate. This was the aim of offering layers of information and eliciting rich amounts of sensory memories, associations, and imagination in relation to the chosen membrane's shape, colors, light ambience, sounds, and proposed system. As a consequence, participants described their experiences in great detail through a series of strong images and a variety of sensations.

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[412] Nina Czegledy, "Augmented Reality," in *Proliferation des Écrans*, Eds. Poissant Louise and Tremblay Pierre (Collection Esthétique. Presses Université du Québec, 2006), 146.

All emotions mentioned by respondents were the ones that I felt during the experience in the desert: fear, anguish, patience, excitement, amazement, nostalgia, vulnerability, and disorientation. Using a multisensory approach to design, each element of *CEREUS* was chosen in direct relation to these emotions, and they were all translated using choice colors, sounds, shapes, gestures, and textures.

Next, through this experiment, I also identified another important factor that altered the perceptions of moving images during this experience; however, I did not include it in the initial structure of this case study. It is important to note, though, this unexpected influential factor that did alter people's experience of *CEREUS.* It happened as follows: At the Phi Centre, the exhibitor's attendants invited people to enter the dark room of *CEREUS*. I observed that if the attendant said to the visitors, "This is an interactive piece," the visitors automatically focused on the technological logic, searching for sensors and trying to understand the rules, as if they were playing a video game. However, if the attendant used the word "sensible" rather than "interactive" in the introduction, visitors entered the space without knowing what to expect. They explored the room with an open mind, leaving it free to their sensory experiences and interpretations, as shown by the replies in the unstructured interviews in which participants described a series of images related to sensory association and imagination. One described his experience by saying, "This is so intriguing! The robotic machine seems to be alive! I was transported to another world."[413] I consider that it would have been very important to add a question in direct relation to how the pieces were introduced. I did observe a difference in the way people were responding to the

[413] Participant, (42).

question, as well as to the behaviors in the exhibition's room. This could have provided interesting data if I would have been able to evaluate it in a structured experiment within this case study.

Finally, after completing the questionnaire, I observed that the majority of participants went back to the exhibition's room. They were looking forward to returning to *CEREUS'* environment, as they felt that there was much more to be discovered. The mutation of the responsive video membranes, the continuous transformation of the virtual character, and the evolution of the sound all elicited interest. In the case study, the results confirmed that all the details of the selected elements played an important role in the resulting experience, and that they provided a series of nuances for the participants.

6.3 Summary

The results from both the *XIA* and *CEREUS* case studies demonstrate that participants considered the screen's materiality (size, format, shape, and physicality) and spatiality (setting, space, ambient light, position, and size) as important factors in their perceptions of moving images. The interactivity between each chosen element, such as between the moving images, the participants, the membrane, and the space, also influenced their experience

For both installations, the replies stated a series of emotions and sensations that directly overlapped the ones that were elicited during the experiences I associated with the chosen target expressions. The multisensory approach, as proposed in Chapter 3, forces the designer to consider all the details during conception, realization, and

presentation, which, in this case, were reflected by the given results. For instance, although the sensory experience of being in a dark room altered the visitors' behavior, it also confirmed that the size and configuration of the room made a difference. However, the mood of the visitors as they entered the galleries could not be controlled. A piece of artwork can transform an actual mood, but the next day, the same visitor may experience it completely differently.

Furthermore, words used in an introduction to such an experiential piece or text written on a wall may also alter a visitor's experience. The way visitors are prepared just before entering an exhibition room can also influence the way they will interact with the work of art.

The results of this study also suggest that images and sounds alert people's sensibilities. With *CEREUS* and *XIA,* it gives them the opportunity to relearn how to see and how to listen. For instance, François Laplantine investigated how images and sounds alert people's sensibilities in regard to cinema. He highlighted films by Friedrich Wilhelm Murnau, Erich Oswald Stroheim, and Manoel de Oliveira, to name a few, as examples that truly delve into the realm of the sensible when the filmic space and the outside frame *(Hors-champ)*[414] fuse together. However, the content of the moving image is discussed without recognizing other influential factors that such interfaces may trigger. An example would be the direct relationship that occurs between the physical properties of the actual screen and the presented moving images. Theorists have often discounted the importance of the physicality of the screen that displays the images.

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[414] François Laplantine, *Le social et le sensible: Introduction à une anthropologie modale*, (Téraèdre, 2005), 81–85.

Video screens are an important factor in the experience of presented content, yet they are often evaluated as passive objects that only transmit and diffuse moving images. Thus, this study has demonstrated reasons as to why each detail should be taken into consideration in order to trigger a series of emotions and embody the experiences of the moving images presented. Therefore, refined screens as matrices of sensation—which will be discussed in the next chapter—will conclude this research.

Chapter 7: Conclusion—Matrix of Sensations

As they have mediated our engagement with the world, with others, and with ourselves, cinematic and electronic technologies have transformed us so that we currently see, sense, and make sense of ourselves as quite other than we were before them.[415]

—Vivian Sobchack

The proliferation of video screens in both public and private spaces has significantly extended people's worlds while simultaneously curtailing physical distances. The earth seems smaller, yet spatial awareness much vaster. The immediacy offered by the digital screen appears to stretch out days while giving one the impression of experiencing them at a much faster rate. Since the advent of built-in sensing systems, screens have become even more sensitive to viewers, who have slowly shifted into participants. Just like human skin, today's screens read not only the pressure of a touch but also temperature, humidity, and density of light to name a few. They are receptive to detected signals and responsive to external stimuli. However, does this responsiveness influence people's perceptions of moving images?

This exploratory study set out to identify the principal factors that alter the perception of moving images and sought to discover whether a multisensory approach to the design of responsive video membranes could allow it to build a deeper connection to not only its content but also to the people. This research and creation project was pursued in order to answer two main questions: How can a multisensory approach to the artistic

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[415] Vivian Sobchack, ''The Scene of the Screen: Envisioning Cinematic and Electronic 'Presence,''' in *Materialities of Communication*, Ed. Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer (Stanford: Stanford University Press, 1994), 83–106.

development of responsive video membranes result in the enhancement of people's experiences of moving images? Furthermore, how can the chosen membrane's materiality, spatiality, and interactivity influence people's perception and appreciation of moving images?

7.1 Empirical Findings

The collected data from both case studies demonstrated that the responsive video membranes developed for the *XIA* and *CEREUS* systems did influence the aesthetic understanding of the moving images presented. These membranes have transformed visitors' experiences by triggering a series of contrasting emotions and sensations as well as sensory memories, associations, and imaginations. The results also established that when people experience moving images, their senses are stimulated and affected differently in response to the properties of the displays. For example, as shown in Chapter 4: *XIA*, the outcomes of the experiment confirmed that one video sequence presented in four distinct representation formats—such as on a specially elaborated membrane, a television, an iPod, and an iPad—did not evoke the same experience in each medium. The majority of study participants reported that only the specially elaborated membrane gave them a sense of absorbing and intriguing involvement. I attributed this result to the fact that all details of the membrane were considered during its fabrication, as it was specially designed to respond to the chosen moving images. The findings also revealed that people's perceptions were influenced not only by the membrane's materiality, but also by its spatiality (i.e., its setting) and interactivity (i.e., its programs). In fact, the principal objective of this research was to present an

experiment that could not be compared with others, primarily aiming to validate and identify an approach to the design of responsive membranes. When asked to describe their experiences, participants all mentioned a series of qualities that can be associated with the embodiment of the presented images, such as *visceral*, *enveloping*, *immersive*, *unique*, *unexpected*, and *absorbing*. One participant stated: "My experience was definitely nonlinear and triggered so many sensations in a very short period. Impressive! A very unique experience."[416] This result was also reflected in art reviews, which focused on the emotions that the piece elicited. Art historian Rebecca Hiscott wrote, "*XIA* is at once beautiful and terrifying, combining classic painterly techniques with a thoroughly modern use of digital technology."[417] She continued: "The piece encapsulates the juxtaposition of beauty and terror, the figure's movements somewhere between graceful dancer and desperate captive. Such is the appeal of the exhibit as a whole, illustrating the dualities of life and decay, male and female forces, freedom and restraint. . . . *XIA* is beautiful as long as its figure remains trapped. The viewer is forced to confront the primordial impulses that drive creative expression—and perhaps even life as a whole."[418]

Similar reactions to *CEREUS* were expressed by art critics. For example, historian Guillaume Evrard wrote: "*CEREUS* offers a multi-sensory experience based on the specific use of a new sensitive membrane that responds to movements of a virtual character as well as the visitors through a complex set of sensors and reactive cylinders

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[416] Participant, (3).
[417] Rebecca Hiscott, "Between Darkness and Light, Anima Shares the Vision of Ana Mendieta," *The Link*. Montreal, Sept.13, 2011.
[418] Idem.

meticulously positioned. *CEREUS* defies the constraints of the terrestrial gravity field, when it occurs, between heaven and earth, between life and death, between light and darkness."[419]

Such responses triggered by the experience of these systems suggest that the proposed multisensory approach described in Chapter 3: Methodology allows the design of the membrane to generate layers of information, and in consequence, to offer matrices of sensations for visitors to navigate.

In order to do so, the first step in the proposed method was to select target expressions. The chosen term for the conceptualization of *XIA*, *captivity*, brought multiple possibilities of interpretation and aroused emotions ranging from fear to wonder. To describe their experience of *XIA*, participants mentioned words that refer to the "condition of being captive; imprisonment"[420] of a space, of time, body, or history. The target expression was reflected in art reviews as well. Jeannine Parkinson, for example, explained: "The woman in *XIA* is trapped in a prison of a collapsed present, sliding down a spiral of infinite regress. This is artificial, digital time: time that slips out from under standard linear perceptions and progressions. Like Bill Viola, Longpré's work is highly crafted, lyrical, and poetic and makes the most of advances in ever affordable and accessible digital technologies."[421]

In the case of *CEREUS—Queen of the Night,* the term *weightlessness* was explored as a state that defies the constraints of the gravitational pull between heaven and earth,

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[419] Evrard, "*CEREUS – Queen of the Night," Isomorphism, Art Interdisciplinary Field*, March, 2012, 62-63.
[420] "Captivity" in The Free Dictionary, 2013, http://www.thefreedictionary.com/Captivity
[421] Jeanine Parkinson, "Moving among moving images: Philomène Longpré's *XIA*,"
Driving Creativity, Artengine blog: Art and Technological Experimentation, August 5th, 2011.

triggering a stark contrast in emotions from fear to surprise, from cold to sudden waves of heat. Further, the core inspiration for *CEREUS* was the expression *unforeseen* as a vehicle for the feelings of curiosity, surprise, fear, and astonishment.

The next step was to conduct a series of conceptual and sensory explorations through the gathering of sound files, photos, objects, and smells that I associated with the chosen expressions. This step was inspiring since it fed my sensory memories and imagination and stayed in my mind while I was fabricating these systems. For instance, one sample that I brought from an experience I had in the desert in Chihuahua was the essential oil of the Cereus flower as well as the dried petals of its bloom. Smelling the perfume and touching the silky petals triggered sensory responses that I used while creating the *CEREUS* system, such as the choice of material to work with for the responsive video membranes (color, shape, surface, texture, thickness) as well as the clothing of the virtual character (texture, tonality, feeling, thickness). The moving images and the membrane were conceived as one unit in which the membrane serves as a three-dimensional space allowing the images to float.

The medium (the responsive membranes) was designed to keep participants involved longer by offering unexpected visual effects and transformations. It was produced to give the illusion of continuously mutating its physicality to the eye of the observer while responding to both internal inputs coming from the video sequences selected by the program as well as the continuous external inputs from visitors roaming in the space by monitoring their movement and position in space. The result of this study, as discussed in Chapter 6: Interpretation, revealed that the interaction between

the membrane and the moving images shows how the screen, space, and bodies help to gather a combination of sensory memories, imaginations, and knowledge because participants were physically involved. For instance, within the *CEREUS* system, yellow flashes were programmed to appear when people were approaching the suspended structure, yet they could happen only at a certain time during the cycle, which aroused questions among the visitors. Art historian Rachel Levine described these surprising behaviors: "The enormous bud looks weightless, as if floating. Its mechanical parts offset the curvilinear flower with its graceful petals. Once visitors arrive, things start to transform. The room fills with eerie, almost terrifying insect sounds. The petals of the flower change in opacity and begin to open. A ghostly woman's image appears on and within the petals."[422]

Next, with the proposed multisensory approach, I noted the importance of my being completely involved during the entire program. This included the sensory explorations, fabrication of the membranes, production of the sound, realization of the moving images, the design of the programs and electronic circuits, and the presentation of the system as well as the design of the case studies and evaluation of the data. Being engaged in all these steps was essential for me since focusing on the individual's sensory experiences permitted me to examine my own responses to the chosen target expressions to deeply examine the desired effects before asking participants to describe their experiences. The outcome of such involvement presented a continuous flux of informative data during the creative process as well as during the evaluation of the

[422] Rachel Levine, "Philomène Longpré's Queen of the Night," *Cult MTL*, May 2, 2013.

collected data. Further, questions were structured in order to focus on how participants were feeling in these unfamiliar environments, and their replies were analyzed in great detail, giving priority to evoked emotions and sensations rather than to their interpretation.

In addition, it is important to note that a surprising finding also emerged while presenting *CEREUS*. As seen in the interpretation of the results in Chapter 6, besides the membrane's materiality, interactivity, and spatiality, the way the pieces were introduced also affected visitors' experiences; their behaviors changed considerably in response to different introductions. For instance, if the word *interactive* was used in the introduction, people would intuitively search for sensors and focus on the technological logic of the piece in much the same way they would with video games. However, if the word *sensible* was mentioned, then participants' behaviors were completely different. This observation demonstrated that many factors could affect one's experience.

Finally, the results of both case studies not only provided persuasive reasons for designing video displays in direct relation to the chosen moving image and identified principal influential factors, but also indicated that the context of the presentation could completely alter the principal effect desired by the designer or researcher. However, I also observed a few factors that I could not predict during the design of the membrane or consider while using the multisensory approach. In the next section, I identify the various limitations that such factors could put on both the method of measurement and the evaluation of the data in the analysis stages of the research.

7.2 Limitation of the Study

First, an important factor that was impossible to predict was the mood of the visitors at the moment that they entered the exhibition room. In the case of the proposed systems, entitled *XIA* and *CEREUS*, visitors' emotional states as they entered the room did influence their sensory responses.

In this context, the sensory imagination that each chosen element could unfold was also a factor that could not be taken into account. According to the collected data, the resulting interplay between the visitors and the medium elicited contrasting emotional responses. Persons can live an embodied experience only by referring their experience to their sensory imagination. Perception provides enough information to mentally reproduce the physical world and to feel sensations related to one's memory. For instance, anthropologists and ethnologists often need to analyze current situations by referencing previous sources in history. Based on their constructed sensory knowledge and imaginations, they interpret the feelings and sensations they experience. The method of analysis proposed for this research was based on the use of sensory memory and accumulated knowledge. However, while producing the design, I could not identify all the possible sensory associations that people brought with them in their replies. For example, each of the 58 participants in the *CEREUS* case study gave a different word that came to mind after they first experienced these systems. One limitation of evaluation of the data was that it was based on my personal interpretation of each word, and it is extremely difficult to express the nuances of such an embodied

experience. Consequently, the interpretation presented is a very personal perspective on the results.

Finally, a few questions could have been added regarding how the systems were introduced. An experiment on this subject would have offered very important data for this research. This drawback could eventually be explored in my future research, as suggested in the next section.

7.3 Conclusion: The Future Responsive Video Membranes

Video screens are continuously becoming even more sensitive to both the external world they occupy and the internal one they present. Their immediacy provides a direct connection to spaces—both physical and virtual—and as a result people's interaction with them continuously evolves.

Marshall McLuhan,[423] Chris Meigh-Andrews,[424] and Jojada Verrips,[425] among others, have discussed television as a vehicle for both emotional and physical experiences that automatically involve all of the senses. According to Verrips, any type of screen is multisensory, which contradicts David Howes'[426] and Dominic Lopes'[427] discussions. In order for the eye to be "touched," as described by Verrips in regard to

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[423] Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA :MIT Press, 1994).
[424] Chris Meigh-Andrews, *A History of Video Art: The Development of Form and Function* (New York: Berg, 2006).
[425] Jojada Verrips, "Offending art and the senses of touch," *Material Religion* 4, Issue 2, (2008), 6.
[426] David Howes, "Screening the Senses,"in *Wildness and Sensation: Anthropology of Sinister and Sensuous Realms,* Eds. Rob van Ginkel and Alex Strating, (Apeldoorn, The Netherlands: Spinhuis, 2007), 295-313.
[427] Dominic M. Lopes, "Art Media and the Sense Modalities: Tactile Pictures", *The Philosophical Quarterly* Wiley-Blackwell. Vol. 47, No. 189 (Oct., 1997).

the screen,[428] Howes and Lopes consider that it needs physical contact. However, in this research, I have proposed two responsive video membranes that redefine the rectangular frames provided by the regular screens discussed in those theories.

Designed as matrices of sensation, these membranes were both specially elaborated to get closer to the subject and designed to trigger a series of contrasting emotions in the visitors in a short period of time. As seen with the empirical findings, numerous factors must be considered to get such a result since each detail influenced people's perceptions of the moving images. In fact, it was the combination of the chosen elements of the presentation (e.g., the content of the moving images, the specially designed display, the space in which the images were presented, and the context) that triggered such multisensory manifestations and stressed the perception of the moving images.

Art historian Whitelaw affirmed that in the twenty-first century works of art are "becoming more complex, continually growing, evolving, and mutating."[429] Perhaps the proposed responsive video membranes in this research were slowly mutating into a "social canvas, an embodied metaphor of our recent evolutionary past,"[430] as Nina Jablonski defines human skin. Future research on the design of a responsive video membrane could focus on representing an extension of the metaphor of skin for video. Given that the results of this study demonstrate that the screen's materiality, spatiality, and interactivity are key factors with respect to altering the participant's perception and

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[428] Jojada Verrips, "Haptic Screen and our Corporeal Eye," *SCREENS*, *Stichting Etnofoor*, Vol. 15, No. 1/2, (2002): 14.

[429] Mitchell Whitelaw, *Metacreation: Art and Artificial life* (Cambridge, Massachusetts: The MIT Press, Mitchell 2004), 56.

[430] Nina Jablonski, *Skin: a Natural History* (Berkeley: University of California Press, 2005), 2.

because screens augment sensory, affective, and cognitive responses to a moving image, the interplay between the video, its display, and the audience could turn a membrane into a life force that confronts the frontiers of one's own individuality. Based on these findings, I will now be able to extend this research using the same multisensory approach but exploring evolutionary computational methods for the development of future responsive video membranes in order to bring the medium even closer to its contents. Also, doing a study of the evaluation of how the introduction to such an experiential piece or text written on a wall can alter a visitor's experience may yield important data to explore, as I noted in this research that the way visitors are prepared just before entering an exhibition room can also influence how they interact with the work of art.

To conclude, the video screen can be considered one of the most powerful tools ever created and plays a huge role in learning, imagination, imagery, motivation, and social patterns—not to mention the immense impact it has on people's perceptions of themselves. The screen, through its different iterations, continues to provide sinuous pathways to express and explore ways of life. Using the proposed multisensory approach to design as well as taking into account all the influential factors mentioned in this research, those who accept the challenge of developing the next sensitive video display could take their inspiration from the sky—the ultimate evolving screen.

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Appendix I: *XIA* - Questionnaire

CASE STUDY by Philomène Longpré, SIP PhD Candidate (Sept. 28 to October 7, 2011)
The exploration of how the materiality of video screens can alter one's sensory perception.

Section 1: Basic Information
* If you do not want your name or age to be disclosed, please write "anonymous" under Name and Age.

1. Name:
2. Age: 66
3. Gender: MALE
4. Area of Specialization: EDUCATION / STUDIO ARTS - SCULPTURE
5. Occupation: ASSOCIATE PROF: (RETIRED) STUDIO ARTS

Section 2: Screens

(1) How would you describe a screen for moving images? ANY SIZE FLAT OR TEXTURED SURFACE ON WHICH OR THROUGH WHICH AN IMAGE CAN BE PROJECTED ON EXTERNALY OR INTERNALLY MADE UP OF ANY NATURAL OR MANUFACTURED MATERIAL.

(2) Approximately how many hours a week do you spend in front of screens (including the computer monitor, television, iPod, iPad, cell phone, cinema screen, video game devices, etc.)?
ABOUT 35 HOURS

(3) Do you consider those screens to be only audio-visual, where sight and hearing dominate the other senses, or as multisensory devices, which evoke other sensorial memories? Why? THESE SCREENS ARE USUALLY SIGHT AND HEARING DOMINANT BUT DEPENDING ON THE PROGRAM ON THE DEVICES AND THE INTENT OF BOTH THE VIEWER AND PROGRAM DESIGNER OTHER SENSES CAN BE ACTIVATED ALLOWING THESE DEVICES TO EXTENT INTO MULTISENSORY DEVICES. BUT A SMELL OR TOUCH HAS TO BE TRIGGERED WITH THE VIEWER'S OPENNESS AND SENSITIVITY

(4) Do screens offer a world more attractive than the one in which viewers live? In other words, is the virtual space overtaking reality? If so, how? THE SCREENS CAN OFFER A MORE ATTRACTIVE WORLD PROJECTION BECAUSE ALL INFORMATION CAN BE EDITED MANIPULATED AND ALTERED AND CONTROLLED FOR SPECIFIC OUTCOMES. SINCE WE HAVE BEEN SO INUNDATED AND BOMBARDED WITH THESE DEVICES - THEY ARE QUICKLY BECOMING A SUBSTITUTE FOR REALITY. REALITY CANNOT BE DOCTORED OR ALTERED - BUT IN COMBINATION WITH THE VIRTUAL DEVICES IT CAN REDIRECT REALITY - WHERE THE VIRTUAL BECOMES MORE EFFECTIVE AND REAL.
WITH EVERYTHING HAPPENING ON THESE DEVICES - PACKAGED AND CONTROLLED FOR A SPECIFIC PURPOSE AND WITHIN A SPECIFIC TIME FRAME - PEOPLE ARE BEGINING TO SEE THIS AS REAL AND HAVE EXPECTATIONS THAT ARE QUICK AND INSTANT. THIS CAN ALREADY BE SEEN IN THE FUNCTIONING OF THE I PHONE CULTURE. THESE DEVICES OFFER A FANTASTC POTENTIAL BUT WITHOUT APPROPRIATE BALANCE TO REALITY THEY CAN BECOME DECEPTIVE

Section 3: XIA Within Three Modes of Representations.

(1) During the experience, which presentation best captured your attention? Why? THE ATTENTION GRABBER WAS THE LIFE SIZE PROJECTION BECAUSE IT ENGAGED THE VIEWER IN PHYSICAL SCALE AND HAD AN INTERACTIVE DIRECT EFFECT ON ONES OWN PHYSICAL SCALE. ONE COULD MOVE CLOSER SIDEWAYS AND BACK OFFERING AN INTERACTIVE PARTICIPATION BEYOND JUST VIEWING

(2) How different were your experiences when watching XIA sequence in the three formats of presentation? How would you describe your experience with each format?

Video Projection: WAS INTERACTIVE - TO PHYSICAL SCALE - STRONGER IDENTIFICATION WITH THE IMAGE AND ACTIVITY - ONE COULD SENSE THE MOVEMENT - FLOATING - AND SOMETIMES FELT AS IF ONE COULD BE ENGAGED IN THE ACTIVITY OF THE SCENE - BY BEING ABLE TO MOVE FORWAD - BACK + SIDEWAYS ONE WOULD GET DIFFERENT RESPONSES AND THUS WOULD SENSE THE ACTIVITY AS MORE REALISTIC.

(A) Television: WAS LIKE WATCHING A PROGRAM. THERE WAS NO REFERENCE TO SCALE - WAS IT LIFE SIZE OR A SMALL SCALE ACTIVITY? THERE WAS NO INTERACTION - ALSO THE TV WAS ANALOGUE SO THE PICTURE CLARITY WAS LOWER THAN THE PROJECTION - BECAUSE OF THE SIZE OF THE TV THE AWARENESS OF THE SPACE AROUND THE TV IS ALWAYS A PERIPHERAL CONCERN DRAWING VISUAL ATTENTION

(B) iPod: THIS WAS AN INTERESTING CHANGE - BEING HAND HELD THERE WAS A NOVEL INTERACTION + RESPONSE - THE IMAGE ROTATED WITH THE DEVICE + CHANGED IN SCALE WHEN THE SCREEN WAS TOUCHED - IN THIS DEVICE ONE FELT AS IF WE HAD SOME CONTROL ON WHAT WAS HAPPENING ON THE SCREEN - THE IMAGE/ACTIVITY WAS BEING CRADLED IN THIS HAND HELD DEVICE - IT FELT LIKE PLAYING WITH A TOY OR GAME. THE CONTROL OF THE DEVICE SOMETIMES BECAME MORE IMPORTANT THAN WHAT WAS BEING PROJECTED.

(3) Do you think that the screen's materiality altered your perception of the visual presented within? ASIDE FROM THE FULL SCALE PHYSICAL PROJECTION ALL OTHER DEVICE SCREENS (LARGER OR SMALLER) SIMPLY REFERENCED THE INFORMATION ON A LARGER OR SMALLER FORMAT - THE I PAD GAVE A MORE PERSONAL TOY LIKE INTERACTION TO THE IMAGE - WHILE THE TV WAS JUST A VISUAL PROJECTOR - THE I PHONE CREATED ANOTHER EXTENSION WHILE WATCHING THE PROJECTE IMAGE THOUGHTS OF WHAT HAPPENS IF THE PHONE RINGS - IT WAS HARDER TO CONCENTRATE ON THE IMAGE

(4) Beside its materiality, did any other factors affect your perception during the experience? PERCEPTION WAS AFFECTED BY CONSTANT COMPARISON - IT WAS DIFFICULT TO SEE EACH DEVICE IN ITS OWN CONTEXT WITHOUT COMPARING WHAT ONE IS SEEING TO THE OTHER DEVICES. BUT IT WAS VERY CLEAR IN THIS COMPARISON HOW DIFFERENT THE SAME IMAGE CAN BE. I SAW THE PROJECTION - TV - I PAD - I PHONE. WHAT IF THE SEQUENCE OF VIEWING WAS REVERSED - OR MIXED UP - WOULD ONE GET THE SAME RESPONSE? WHAT BECAME CLEAR WITH THIS VISUAL EXPERIENCE WAS HOW WE ARE INUNDATED WITH SO MUCH VIRTUAL INFORMATION AND HOW MUCH OR REALITY IS FALSIFIED BY INFORMATION THROUGH TECHNICAL DEVICES. WE ARE DRAWN INTO EACH DEVICE WITH WATCHING INFORMATION - AND IT IS ONLY WHEN WE ARE GIVEN SPECIFIC ORDERS (COMPARE THE INFORMATION) DO WE START LOOKING DEEPER INTO WHAT WE ARE SEEING

Section 4: XIA Video Projection Installation

(1) For you, what was XIA Installation trying to convey? XIA WAS TRYING TO EXPLORE A SENSE OF PHYSICAL ENGAGEMENT WITH A SCREEN EXPERIENCE IN A VIRTUAL FORMAT. IT TRIED TO CREATE AND ENGAGE THE VIEWER IN WHAT WAS HAPPENING ON THE PROJECTED SCREEN: THE SENSE OF SPACE, MOVEMENT, FLOATING ETC AND TO IDENTIFY WITH THE FIGURE ON THE SCREEN. IT ALSO CHALLENGED OUR PERCEPTION AND CONCEPT OF REALITY AND WHAT WE EXPERIENCE. CAN WE EXPERIENCE THINGS ONLY IN REALITY OR CAN OUR MIND AND PREVIOUS EXPERIENCES ENGAGE US IN A "REAL" EXPERIENCE - THE OTHER DEVICES GAVE THE VIEWER AN IMMEDIATE INDICATION OF HOW DIFFERENT THESE TECHNOLOGICAL ITEMS PLAY ON OUR SENSE OF PERCEIVING REALITY + FANTACY

(2) Which emotions and sensations were evoked while experiencing the XIA Installation? FEELINGS AND EMOTIONS ARE EVOKED TO WHATEVER DEGREE OF INVOLVEMENT ONE CHOOSES TO ENGAGE IN WITH THE PROJECTED ACTIVITY - ONCE ONE CHOOSES TO ENGAGE AND NOT JUST WATCH, ONE IS DRAWN INTO THE ACTIVITY - ANXIETY FEAR, FLOATING, DRIFTING, MOVING ARE EXPERIENCED - EVEN A SENSE OF PHYSICALITY AND NON PHYSICALITY IS EXPERIENCE - WHICH DOES NOT HAPPEN WITH THE OTHER DEVICES

(3) Other comments: I THINK THE WHOLE EXPERIENCE INCUDING THE DEVICES IN DIMINISHING SCALE IS A PERFECT EXAMPLE + CHALLENGE TO HOW WE ENGAGE WITH THESE DEVICES AND DEPENDING ON OUR AWARENESS OF THIS ENGAGEMENT OPENS UP NEW DOORS GIVING US INSIGHT INTO HOW WE TAKE WHAT WE SEE THROUGH THESE COMMON DEVICES, FOR GRANTED AND HOW THIS EXPERIENCE GIVES US AND REINFORCES THIS FOR US

Thank you very much for your time and collaboration for this Case Study on Video Screens.

Feel free to contact me at any time for any matters related to the research: philox@philox.net

THE BOTTOM LINE IN ALL THIS IS THE MINDSET WITH WHICH WE APPROACH THING IS WHAT WILL GIVE US THE LEVEL OF EXPERIENCE IN THE ART CONTEXT IT IS A COMBINATION OF WHAT THE ARTIST USES AS "MATERIAL" TO CREATE THE STATEMENT AND WHAT AND HOW MUCH THE VIEWER BRINGS THAT MAKES THE EXPERIENCE WORK

Thanks for the opportunity to be moved + engaged in a new dimension. Cheers

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The exploration of how the materiality of video screens can alter one's sensory perception.

Section 1: Basic Information
* If you do not want your name or age to be disclosed, please write "anonymous" under Name and Age.

1. Name: _____
2. Age: 19
3. Gender: female
4. Area of Specialization: Art History
5. Occupation: student at Concordia, first year

Section 2: Screens

How would you describe a screen for moving images?

a surface that can receive a (moving) image
b can be any size or material,

Approximately how many hours a week do you spend in front of screens (including the computer monitor, television, iPod, iPad, cell phone, cinema screen, video game devices, etc.)?

at least 40 → 45 hours / week

Do you consider those screens to be only audio-visual, where sight and hearing dominate the other senses, or as multisensory devices, which evoke other sensorial memories? Why?

many of these screens also involve touch, as in typing or texting but they can bring memories of smell, taste and feel because of what is shown

Do screens offer a world more attractive than the one in which viewers live? In other words, is the virtual space overtaking reality? If so, how?

more or less virtual world can be ideal and give us an utopia world, one we would rater experience than our reality. But I think they also present all the vices and unattractive things about our society, like capitalism and greed / competition / war and domination.

Maybe we are observing the world, reality through these screens because they comment on reality, perhaps it is overtaking reality in that sense

Section 3: XIA Within Three Modes of Representations.

During the experience, which presentation best captured your attention? Why?

the large interactive projection

How different were your experiences when watching XIA sequence in the three formats of presentation? How would you describe your experience with each format?

Video Projection:

challenging and somewhat shocking. Because of the scale of the projection ~~and the~~ → the imposing space it occupies in the room makes it intimidating and mesmerizing at once. The ~~life~~like size of the woman is alerting.

Television:

I was more conscious of the frame around the video. Not as enveloping. Not as challenging, it felt more familiar already, maybe because it was not as unexpected (the tv and the video)

iPod:

felt very intimate because I was holding the screen and I could bring the image as close to me as I wanted (unlike the tv) ~~and~~ the woman wall smaller

Do you think that the screen's materiality altered your perception of the visual presented within?

yes, even in the darkness of the gallery, I was very aware of the screen, the material it was projected or coming from, I couldn't just focus on the images.

Beside its materiality, did any other factors affect your perception during the experience?

the quality of the sound was different from one screen to the other. the projection had great SORROUND sound. the ipod have very good quality of the sound, the itouch not as much. The interactiveness of the projection

Section 4: XIA Video Projection Installation

For you, what was XIA Installation trying to convey?

Tourment/or display~~ed~~, the woman's tourment, emotional tourment creates a beautiful visual forms, a dance for the viewer. She is reacting to our movement and expressing her own cenner movements.

Which emotions and sensations were evoked while experiencing the XIA Installation?

Shock, worry, but it is also desperately beautiful and feminine because of the pink and the lyrical shapes of her body and dance

Other comments:

I thought it was unusual and great and really pleasant.

Thank you very much for your time and collaboration for this Case Study on Video Screens.

Feel free to contact me at any time for any matters related to the research: philox@philox.net

Appendix II: *XIA* – Results

Table 1 – Case study: XIA. Repertory Grid.

Participants	**Status**			**Distance**			**Mobile Devices**	
	Static	Mobile	Both	Far	Close	Both	1 hand	2 hands
Type of Screens								
Membrane			64	1		63		
Television	64				64			
I Pad	60	4			64		4	60
IPod	63	1			64		10	58

Section 1 — Video Screens

Table 2 – Case study: XIA. Answers to question 1.
(How would you describe a screen for moving images?)

Window

- A window that gives you the impression that you're looking into another world.
- Une fenetre sur le possible dans la creation.
- Une petite porte sur un autre monde, un monde de representation ou de creation.
- A window to a virtual or cinematic space that delights our perspective with a supposed reality.
-Une ouverture sur le monde et la vie.

Space

- Un écran est un espace aux dimensions variable influencé par l'espace qui l'habite.
- Espace de representation 2D.
- Espace recevant une projection.
- A container of information.
- An area, usually rectangular, on which light can be projected (from front, back, internally) to display arbitrary images.
- As an augmented space, or a virtual window onto a framed and/or created space.

Others

- Everything, material thing is a screen.
- A reflection; a window; a mediator; a wall/barrier ; a postal; an editing device.
- A screen for moving-images acts as a frame for a floating dream.
- I would describe it as an infinite, dynamic canvas.
- It is a dictatorial painting bringing closer the intent to the viewer.
- A founding block of today's modern society.
- Projections would describe as membranes.
- Moyen d'expression, permet de faciliter l'expression des idées, il s'agit d'un medium or un medium est un vecteur d'information, de divertissement, d'images. Le sens de la vue est le plus stimulé.
- Un tableau animé.
- It gives the illusion of a reality that is not present and is therefore a portal to project people into a virtual (representation of)reality.
- C'est l'aspect visual, c'est un partie de l'oeuvre et non uniquement un support. Par l'écran, l'oeuvre prend vie et prend différentes formes selon le type d'écran.
- Something interesting, which captures attention easily.

Surface

- A surface that can receive a moving image, can be any size or material.
- Flat 2D surface of various size that emits a light in programmed patterns.
- It's a surface of any shape, material or size, which shows or on which is shown a moving image.
- Any surface that renders a combination of light particles.
- Un écran est une surface plate et statique à travers laquelle on peut voir des images.
- Any size flat or textured surface on which or though which an image can be projected on externally or internally made up of any natural or manufactured material.
- Une surface qui réfléchit la lumière.
- An electronic 2D projection surface.
- A flat surface, white, square to rectangle that varies in dimension.

Device

- Entertainment device, communication tool, artistic medium, canvas.
- Interface d'affichage établissant le pont entre les machines et l'humain.
- As a material support for images to be projected on to or displayed.
- Comme une plateforme de projection dynamique.
- Un support qui permet de faire projeter les images. - Le format peut influencer la projection de l'image.
- Il s'agit d'un support visuel qui permet de presenter les images.
- I, with emphasis on myself, find screens to be handy appliance for media. Our relationship does not extend far past that.
- A display. A thing to contain/expose something.
- A material structure that either emits visual information as light or receives visual as projected light from a separate source.

Table 3 – Case study: XIA. Answers to question 2.
(Approximately how many hours a week do you spend in front of screens (including the computer monitor, television, iPod, iPad, cell phone, cinema screen, video game devices, etc.)?)

Nb Hours/Week	*< 10*	*11-30*	*31-59*	*60-70*	*> 71*
Nb of Participants	*3*	*11*	*23*	*26*	*1*

Table 4–Case study: XIA. Anwers to question 3.
(Do you consider those screens to be only audio-visual, where sight and hearing dominate the other senses, or as multisensory devices?)

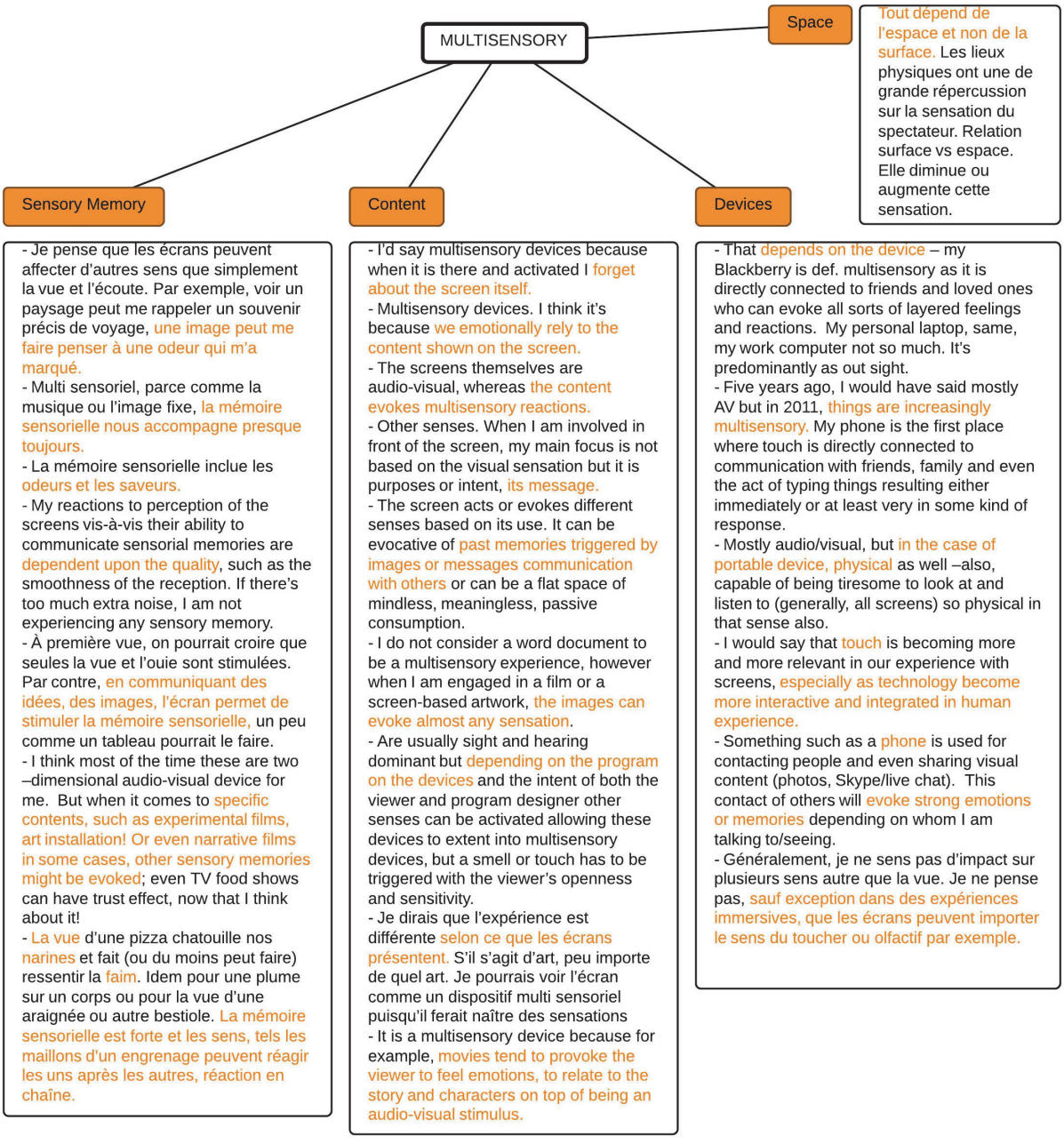


Table 5–Case study: XIA. Answers to question 4.
(Do screens offer a world more attractive than the one in which viewers live?)

Yes - Absolutely
- Yes, I believe that the virtual world is more attractive in certain ways due to the fact that everything is calculated, pre-designed; the virtual world is an artificial creation whereas reality is not. - Yes. I agree. When I visit someone who listens to television, I don't stare at my friend but at the screen. I would say it is often appealing because of its non-quietness compare to our world. - Possibly. The first example that comes up to my mind is people watching TV shows and who are addicted to it. Or movies. Some worlds and narratives created and shown on screens can be really attractive. - Yes. A screen doesn't talk back, throw punches and doesn't require effort. It's lazy, which makes it more attractive, to most people. The screen is also at our command. - Oui, on peut y créer des motifs, des mondes imaginaires, on peut créer des textures et mélanger plein de ressources ou mediums (sons, etc.) - I think that virtual space offer possibilities that reality cannot offer. However, the reality is a way much more rich.. You can see screen as a sub dimension in many perspective. -Visuellement oui, car il offre un cavenas qui permet à celui qui le regarde de compléter ce qu'il voit par le biais de l'imagination, des références personnelles, ect. - Oui, la lumière, l'intensité des couleurs la vitesse, le temps y sont compressés, tout semble moins gris et plus vivant. - I would agree that screens do often offer a world more attractive than our own. I would also say things that appear on screens are made to appear more attractive or perfects there is a lot of ideology. - Oui, je pense que la qualité de l'image à laquelle nous avons maintenant accès donne bien souvent un air gris à la réalité. -I think in most ways yes, but it is also bringing the world together in ways that wouldn't allow such a global understanding of other cultures/places/beliefs. - The screens can offer a more attractive world projection because all information can be edited manipulated and altered and controlled for specific outcomes. Since we have been so inundated and bombarded with these devices. They are bodily becoming a substitute for reality. Reality cannot be doctored or altered, but in combination with the virtual devices it can redirect reality where the virtual becomes more effective and real. With everything happening on these devices, packaged and controlled for a specific purpose and within a specific time frame-people are beginning to see this as real and have expectations that are quick and instant. This can already be seen in the functioning of the IPhone culture. These devices offer a Fantastic potential but without appropriate balance to reality they can become deception. - Spontanément, je dois avouer que je dis oui, le virtuel dépasse la réalité puisqu'il n'y a pratiquement pas d'obstacle, pas de limite dans ce monde. Tout semble possible. Mais il manque l'essentiel, le contact humain réel qui suscite des émotions vives, fortes. - Sur plusieurs aspects, oui. L'écran permet de projeter des rêves, fantasmes et autres concepts qui ne pourraient pas être possibles dans la réalité. Donc, on se base sur les concepts existants, et on laisse l'imagination et les idées, selon les standards du communicateur. - I think in some regards, yes. However I don't know if its because its "better" or that its become a way of preserving reality. People have difficulty just openly experiencing the world, we feel obliged to create some sort of proof, elevating the screen to a truth provider. -For me it is, as almost every idea I consume and come across lately has been through the screen. But this acts in phases; so sometimes I'll reach a limit and disconnect, to reconnect with live human beings, live speech. - Not more attractive but certainly more controlled, more manageable –more "encadré", which is a world. I use a lot in teaching to describe how culture and cultural constructs help us take a world of risk, anxiety, and fear, and manage all that with some sort of framing of control. I don't feel that virtual space is overtaking reality but I do feel that screen –framed space is becoming increasingly compelling as more and more unusual thing, seam to happen more-versus the non-mediate of "real" world. -Au sens où il est un constat, le monde virtuel peut dépasser le réel, il est un amalgame d'idéaux et de scènes dites "parfaites" puisque de toute façon inatteignables. L'impossible, l'inaccessible, n'est-ce pas un idéal romantique ? Dans la réalité, pouvons-nous savoir si le monde virtuel vécu dans la projection, est réellement mieux que la réalité ? Impossible de savoir ce qu'il y a de l'autre côté. - More or less, virtual world can be ideal and give us and utopia worked, one we would rater experience than our reality. But I think they also present all the vices an unattractive things about our society, like capitalism and greed/competition/war and domination. Maybe we are observing the world, reality through these screens because they comment on reality, perhaps it is overtaking reality in that sense.

Table 6–Case study: XIA. Answers to question 4.
(Do screens offer a world more attractive than the one in which viewers live?)

No- I prefer the real world
- No, I prefer the light of the sun. Je suis un résistant à ces espaces virtuels. Je n'ai pas de télé, pas de IPhone, ni Ipad, pas de Facebook, ou autre. Par contre, le monde me rattrape, je me retrouve à utiliser ses écrans dans mes projets artistiques. Je suis peut-être déconnecté pour bien des gens de ma génération. Donc, je pense que oui virtual space is take more and more space. - Screens are becoming less a representation of alternate realities and more of a piece of our western fabric. They are also ruining our eyes, making us become less affected by flashing images. - No. But this is qualified statement. If, it is or what is being experienced is an original creation made for that specific media-machine, then it is potentially attractive as anything else in the this viewers livable world. - Non, le monde réel est encore le meilleur. Ça peut être très captivant, mais ce n'est jamais aussi convainquant.- Selon moi, le monde virtuel n'est pas plus attrayant que la réalité puisque celle-ci nous réserve toujours des découvertes. De plus, rien n'arrive à surpasser la beauté de la nature. Par ailleurs, c'est l'expérience qui change notre rapport au monde. Le monde dans lequel nous vivons peut nous sembler terne si nous ne savons pas bien le regarder. Le meilleur écran, c'est en fait notre regard.

No- Not Yet
- The world represented by screen is often designed to be an ideal one, but only serves the purpose of embellishing contemporary life, but I do not think it can reveal with life at least not yet. The two are increasingly coexisting, however, as screens become the center of more and more aspects of work and leisure. - Je ne pense pas. Le virtuel même s'il est hyperréaliste reste coincé par le médium même. Nous sommes spectateur participatif et non acteur de la pièce. - Maybe for some. Not for me. - Parfois, surtout dans les grandes villes ou le béton, les belles voitures inondent le quotidien, mais l'écran n'est rien comparé à une vue en nature, par exemple, ou l'odeur, la température englobent l'instant. - No. Not yet, as long as I am physically able to escape in our world, and find beauty (and a truly complete sensory experience, like a moonlight might or the powerful persistence of a river under my paddle. It will have some difficultly competing. However, it is true that I feel the majority of the population is loosing touch. With our beautiful planet and the beautiful part of our planet does seem to be shrinking. So there may be a time for this convergence… and at that time the virtual vehicle/escape pod, will become the place to escape to, and I suppose in the construct of city life… there are many times where the virtual escape is easier even for myself. - Don' believe it's overtaking reality I see it as enhancing or complimenting "real" experiences. This Answer may change dependent on someone's digital/virtual access and their generational bias. Regardless, what we see on a screen is, for the most part, still mediated, still contrived. It can never present a more attractive world-or can it? Are we talking aesthetically attractive or appealing or what? - I don't think so, at least not in my own life. - The screens that are coming out more and more, yes. They capture a different perception than previous screens such as video projection

No- two different worlds
- In general, no, it's simply a different world. - Not more attractive, caters different needs. By mooring from one world to the others, you appreciate them more as there is something to compare those worlds with. Some people may get frustrated with the real world and got stuck in the cyber world, but screen is only the portal. - Je ne pense pas que les écrans offrent un monde plus attrayant mais peut être les considère comme complémentaire dans certains cas. - Les parallèles à la réalité. Il peut nous faire lire la réalité autrement mais ne la surpasse pas. - A screen offers an alternative understanding to the world in which we lived or the reality we feel is experienced the scale created by viewing a landscape on top of a hill offers an attractive sense of isolation, majestic force of nature a sense of purity however these things emotions manifest are through are perceived as though or similar to a screen, because it gives the sensation of another place another reality, a separate existence. - Je ne dirais pas que c'est plus attrayant à cause de l'écran. Tout dépends du contenu, que ce soit virtuel ou réel. Les écrans sont toutefois généralement plus faciles d'accès, ou d'approche, que les situations réelles. - I would not say they are more attractive than our actual reality, but giving an alternate reality that pairs with it. I think the virtual space is just expanding our existing reality.

Blurred Border
- Screens are devices for artificially altering perception and for rendering the content of the imagination perceptible via artistic techniques. As long as screens continue to be understood as discrete objects. As window we can look into. Virtual images & video. I think continue to be perceived generally as taking place in a sort of video space in usually a flat rectangle. Recent development in projection mapping wherein video is overlaid onto commonplace structures, buildings. That are not automatically symbolically interpreted as screens, do seem to point toward a blurring of virtual and real space. -Tout dépend de l'écran et à ce qui s'y passe, et de la réalité vécue par celui qui se retrouve devant un écran. L'écran est peut-être plus malléable que notre réalité, d'où l'attrait de s'y perdre. Ceci dit, la "réalité "pouvait également être perçue comme un écran, où chacun affiche sa propre vision/projection du monde. La distinction entre un écran et la réalité apparait surtout dans les limites perceptibles-immersions, poids, volume, et dans l'illusion de contrôle qu'offre un écran. Réalité ou écran, on y projette et perçoit des données.

Section 2 - Experiments on Materiality

Table 7–Case study: XIA. Answers to question 6.
(How different were your experiences when watching the XIA *sequence in the three formats of presentation?)*

1- MEMBRANE
- Visceral, more connected to the woman on the screen, felt like a personal experience even if the space is shared with others, less focused on technology and more on the content of the screen heightened senses. - In a way, this feels "larger than life", almost like to encounter with a beautiful and painting projection/being. The room was sort of taken by it. In contrast of the other devices, this one felt more immersive. - Very powerful, peculiar, captivating: it was immersive, and a unique feeling. - I move around the physical object more. I wanted to touch it and interact with it. I was more aware of the space and particularly the other people in the room. The piece seemed larger and more important. - It was scary at first, visually blurry, felt like she was in the room. - The projection offered a complete immersive experience. The piece is life size making it more personable. The lack of physical screens or equipment accentuates this and makes it more real. - Challenging and somewhat shocking. Because of the scale of the projection the imposing space if occupies in the room makes it intimidating and mesmerizing at once. The life like size of the woman is alerting. - The noises surround me in a womb-like experience, which created sensations not usually accessible in other formats. - This was my preferred experience. The large pink light fit nicely in the backspace of the gallery the sound filled the space nicely. - Strong immediate impact due to the size and sound quality. But the image was sometimes dark and unclear. - An active image of the painting and the subject as painting, palimpsest effect. - Impressively 3D and textured. Lighting created a certain dark mood. - Fully engaging, captivating, the figure and myself seemed to be sharing a certain space between the three-dimensionality of the figure and the darkness of the room, there was no distinct barrier. - It was interactive to physical scale, stronger identification with the image and activity one could sense the movement. - Floating and sometimes felt as if one could be engaged in the activity of the scene – by being able to move forward back, sideways one would get different responses and thus, would sense the activity as more realistic. - The contrast was darker so the details were vague leaving the viewer in mystery. - Intriguing. Wanted to spend longer exploring minute details of the works. - Most representative of life. - More intimidating. - Personification of the subject. - The environment played a lot during the video projection. The quality of the projection was more blurring which made it more surrealistic. - Intriguing. - Life size, better impression of a physical presence. - It was the most fascinating experience. The video was displayed in an idea way I guess. I imagine that the artist took really a good care of the display and the environment. It makes the screening more controlled and it was the first time I was seeing the video. - Allowed me to take in the presentation without considering the format too much. - C'est le seul médium où le spectateur n'est justement pas uniquement spectateur, mais acteur. La tension, le stress, la frayeur liée à l'emprisonnement sont clairement ressentis. Une expérience multi sensorielle. - Impressionnant, imposant, englobant. - Grandeur nature donc plus bouleversant. Interaction, expérience globale plus physique. (Déplacements, stéréophonie, etc.) - L'interactivité joue énormément dans l'expérience et nous fait légèrement participer. Elle est plus subversive et nous plonge totalement dans l'univers par la noirceur et les haut-parleurs qui créent des sons 3d. - La dimension et la présence dans l'espace créent une ambiance plus intimidante, voir angoissante. - Impressionnant, envahissant hypnotisant. - J'ai eu l'impression d'entrer dans la projection et d'être complètement absorbé par les images. - Intime et riche en émotions, beaucoup de présence. - Enveloppante, capte beaucoup mieux les sens. - Très personnel, la technologie étant très discrète, on y croit volontiers et spontanément pourrait être un peu plus lumineux, pièce plus sombre. Le son est enveloppant. - L'expérience est plus intime. Un dialogue se crée. Le personnage s'impose davantage et nous entraîne dans son univers. Les réactions du personnage semblent être mêlées à celles du spectateur. - Meilleur immersion. Puisque le medium s'accaparait de la majorité de mes champs visuels, L'expérience a été plus captivante. - Absorbé par l'espace, on s'interroge plus sur le vidéo et la relation avec la surface de la projection. - Sentiment de l'espace.

Table 8–Case study: XIA. Answers to question 6.
(How different were your experiences when watching the XIA *sequence in the three formats of presentation?)*

2-Television
- Bland. - The colors were less bright, the image smaller, the sound less immersive. - Largely informed by the experiences watching too much television as a child. Difficult to separate what I'm seeing from the experience here. - Dispassionate. Felt like I was watching video documentation of work or an art-historical special on A&E. - Choice of monitor and furniture make a huge impact on the effect of a viewer's relationship with screen. As displayed on an AV Card it had a more trapped and mundane effect. - Completely passive. More details caused for more distraction towards other things (pleats in dress, charcoal, like stains behind. - I was able to grasp more details, the colors were richer, and I was less into it. The sound was terrible and very annoying. - Better impression of depth, but the size is small, almost like a book, impression of distance. - This was interesting; the piece was surrounded by black, the silver frame of the television. The textures felt lost and I was less engaged and more aware that I was watching a TV. - Least preferred experience. Found that the light of TV washed out the piece. The audio coming at me from the front felt bombarding. - Sharp and clear image, good sound not quite visceral as video but better for understanding and details. The sound resolution on the television brought out or brought to my attention the individual sound features insect like, the movements. - Nicely " lit" but felt to claustrofophic enclosed. - When seen on a television, I seemed to focus more on the technical aspects of Xia, since the figure was reduced in scale flattened and restricted by the screen. I saw a figure being filmed from above not trapped on a wall. - Television was like watching a program. There was no reference to scale, was it life size or a small-scale activity? - There was no interaction. Also the TV was analogue so the picture clarity was lower than the projection because of the size of the TV the awareness of the space around the TV is always a peripheral concern drawing visual attention. - The sound was less imposing but the details were crisper due to the contrast, this allowed for a crisper sense of the image. - Pretty much the same as the video projection. However the fact that it was smaller and playing on a TV, made it seem less authentic. The video projection is a screen in the dark so it is just like a "floating "image. - The television separated the experience from the space and was more obvious in what was being seen. - Very aware of the frame, flattened the image and the experience, felt like more of an audience than a participant, lost focus on the content and drifted off to other concerns. Except thinking how made quote the television was for display. - Flat TV screens are at least to me, hysterical artifacts (like anything else, I know) but the sensations in this case are related to "dated "experience. - Passive experience, forgetful and not as moving. - The emotion was lost for me. Much less compelling – a scale that was neither dramatic not bijou-I felt as non-interactive I usually do watching ordinary sized TV. - It became more clear, less blur, I got more used to the noise. - The television commands attention simply because of its physically in the space. It's impersonal because it does not seem real; it's contained in a large box. I was more conscious of the frame around the video. Not as enveloping. Not as challenging, it felt more familiar already, maybe because it was not as unexpected (the TV and the video). - Non-immersif, froid, peut-être intéressant sur plusieurs écrans. - La moins intéressante, la qualité de l'image et de l'objet de diffusion créent un décalage, une distance qui empêche le lien entre l'ouvre et le spectateur. - Image avec pixels, le rectangle de l'image étant sur la hauteur laisse les côtés noirs trop larges. - Les trois autres formats, télévision iPod et iPad peuvent être intéressants mais ne produisent pas du tout l'impact du vidéo. - Distance de l'image, un regard plus détaché, plus analytique. - Plutôt conventionnelle, restreinte, par le cube et distante. - C'est le format qui m'a le moins touchée. Je crois que c'est entre autres parce que l'usage de la télévision est banalisé. - Approche moins intéressante, le petit format de l'écran ainsi que la distance de l'écran créent un détachement. - Indifférence, j'avais l'impression d'être simplement spectatrice d'une animation. - Le moins intéressant du lot, on voit trop la TV, le son est mal rendu. - Il y a une plus grande distance entre le personnage et le spectateur. L'émotion provoquée par l'oeuvre est moins forte puisque nous nous sentons moins impliqués dans l'oeuvre Moins bonne immersion. Probablement du au fait qu'il s'agit du medium le plus courant. Tout semblait plat, moins de relief, moins de profondeur. - L'aspect tridimensionnel est complètement évacué. La télévision est un médium que je n'utilise jamais, où très rarement, peut-être est-ce pour cette raison que j'ai trouvé l'expérience plus froide, distante, éloignée de moi. L'habitude d'un médium le rend-t-il plus "sympathique", rassurant, facile d'approche ? Apparence d'un cadre, aucune émotion. - À force de voir plus de publicités qu'autre chose à la télévision, y voir de l'art est tjrs un peu étonnant au XXe siècle. Presque devenu ringard, le dispositif télévisuel date l'oeuvre. - Elle crée une distance entre nous et la vidéo. On se sent moins plongé.

Table 9–Case study: XIA. Answers to question 6.
(How different were your experiences when watching the XIA *sequence in the three formats of presentation?)*

3- iPad/iPod
- Luxurious, personal, futuristic. - It was more an individual experience and many factors in the environments were disturbing the screening. - Heavy, dislike the feeling. - Irritating. The loss of resolution made it difficult to perceive detail. More, I had a hard time to focus on the screen. Shape/size, cultural coding of this device encourages hyperactive viewing patterns conversely, makes it anathema to slower work. - Id says that it felt more personal and less intimidating. - Intimate experience. - The details were clear. Definitely less into it. Felt holding a human. - Small, but had the feeling of better seeing the details. - Attractive device, but holding this character in your hands has an even more impersonal feel, unless of course it was interactive. - Seeing my reflection was distracting though made me think of power, violence, and history. - The iPod size intimate experience, the piece seem to have more details visible. The colors were vibrant, however it would be interesting to made this seen interactive. - Surprisingly interesting especially the ability to see detail and feel. Just too small to be experience. - With smaller portable screens, I felt like I was holding the figures reality, as if I was holding a music box, the dancer spun, or was holding a snow globe in which I could not control the movement of the show. - Nice and clear but not as dramatic as TV. The motion and image were pleasant to look at, the framing was overpowering, and I paid more attention to the face than the body's language. - This was an interesting change, being hand helped there was a novel interaction response. It felt like playing with a toy, a game. The control of the device. Sometimes became more important than what was being projected. - It was more pixilated but the image was bright, like the TV. The sound was clear but again not as imposing. - Definitely made me pay more attention to detail. The TV and the video projection made us look at the whole picture, but the smaller devices permitted us to look at the movement of the eyes (that I had not noticed previously) and the position (tension) of the feet. - Ipad created a sense of intimacy in the piece, you could cradle the sleeping figure in the palm of your hand. A more private emotional response. - The IPod still feels like a novelty piece. I associate it with games and music videos and photographs could not lose myself in the content. The audio hit both ears in a similar surround sound way. - I'm still amazed at the quality of the images and sounds these little devices can have. The size though does not compare to the larger screen in terms it bodily impact. - Interesting experience to be holding the artwork in my hands, as if I had captured XIA. I could sense a role reversal. - Felt very intimate because I was holding the screen and I could bring the image as close to me. - IPod-very intimate-I lost the sense of other people around me. - I felt that with these mediums the experience of the piece is more casual. - La sensation de posséder le dispositif et en faire partie rend l'expérience moins impressionnante et plus “dominable”. - Tactile (vibrations ressenties dans les mains). Les images étaient plus claires. - Intime puisqu'on tient la projection dans les mains, mais le fait que nous n'avons pas les écouteurs, diminuait l'impact des sons. - C'est un peu plus voyeuriste comme expérience. La petite taille des écrans donne l'impression qu'on entre par infraction dans la vie de XIA. Cependant la familiarité rend ces outils beaucoup plus accessibles. (Que la télévision, dans mon cas). Le fait de tenir l'oeuvre fait qu'on se l'approprie. - Distrait par le gadget, l'objet. - J'ai davantage senti la vulnérabilité du personnage parce que je le tenais dans les mains et que les deux instruments vibraient lorsque différents sons étaient émis. Ça donnait vie au personnage et je me sentais davantage en relation avec lui. Il y avait comme une sorte d'intimité, un accès privilégié. D'ailleurs, j'ai eu envie de toucher le personnage lors de la présentation sur le IPOD, comme pour le réconforter. - Facilement distrait, passé facilement à autre chose, comme si c'était un vidéo quelque sur You tube. - Plus intéressant que la télé car la proximité de l'appareil et le fait qu'on le tienne dans nos mains permettent un rapprochement par notre l'ambiance crée par le rapprochement. Par contre, l'ambiance créée est beaucoup moins puissante qu'avec la projection. - Etant petit, très intime dans la main. - Une impression d'image, hyper réelle, de grande précision, un certain détachement dans le regard. - Amusante, car le format nous donne l'impression d'un univers micro. - 'iPod est intéressant, bien que petit, il y a une expérience intime. Toutefois, le manque d'interactivité est un bémol par rapport à la projection vidéo. Pour le IPod, aucune connexion sur les émotions du format, trop petit. - L'iPod était petit donc j'ai réalise que je fixais des détails plutôt que l'être attentive au contenu. - Image plus vraie que vrai. Sensation que Xia est vivante, un peu comme regarder un oiseau immobile, qui respire. - Les différentes textures présentes dans l'oeuvre semblent moins importantes et l'attention est accordée plus difficilement à chaque mouvement du personnage. - Intéressant, surtout l'iPod. La résolution était particulièrement élevée. On aurait dit que le personnage était entre mes mains dans une cage de verre.

Section 3- XIA System

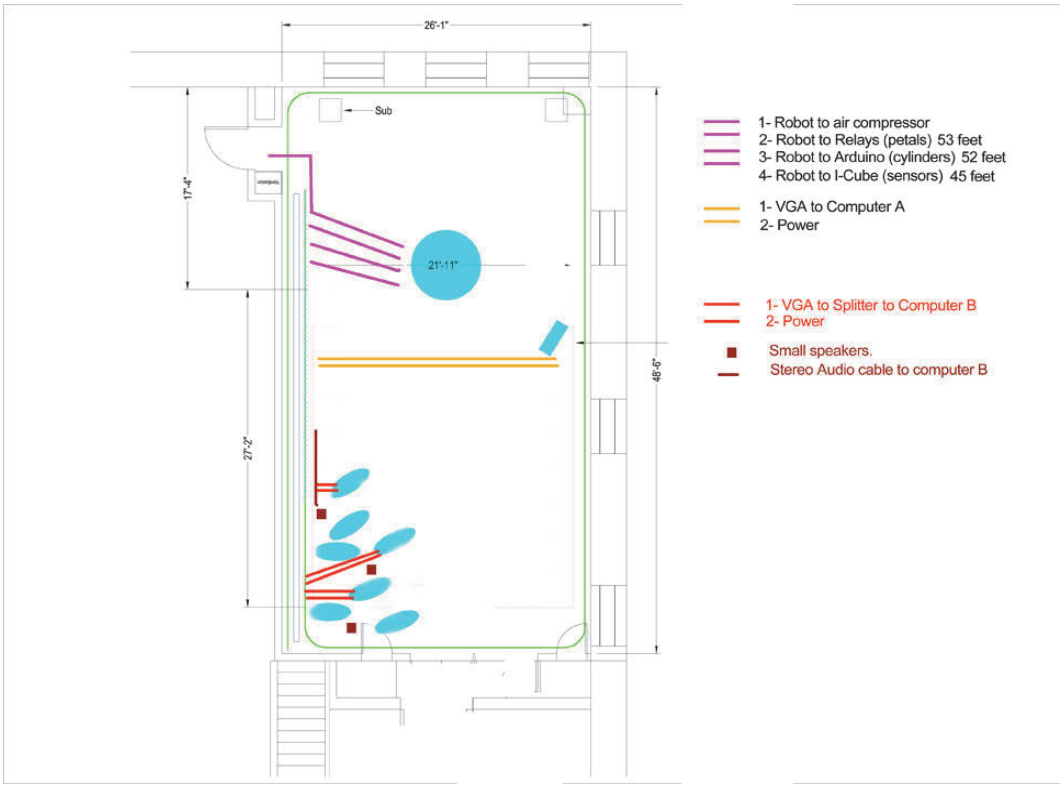
Table 11–Case study: XIA. Answers to question 9.
(Which emotions were evoked while experiencing the XIA Installation*?)*

one emotion (fear)	contrasting emotions
- Anxiety, a body within the mind. - Captivity, feeling of being observed by the viewers and for viewers, feeling of watching someone helpless. - I see suffering from the persona. - Spooky, mostly due to sound, personal, connection projection. - Escaping, bounds, frustration. - Depression, madness, self-consciousness. - Creepy-ness up and down my back, discomfort, fascination, curiosity, wonder, faint nostalgia, empathy, sadness, panic, power.-Sadness and pain. - Overwhelming Fear-I was immediately reminded of some nightmares I have had. - Angoisse, peur, malaise, confinement, noyade. - Une inquiétude, les mouvements parfois brusques, l'ambiance sonore…puis une soudure. On sent que l'oeuvre est notre complice et vice-versa. -L'angoisse, la peur, la tourmente, la perdition. -Étrangeté, tristesse. Les couleurs sont fantastiques. -La torpeur, la nostalgie, le tourment. L'air qui flotte, les textures visuelles, l'ouïe. Une installation intéressante qui mérite d'être soulignée dans le cadre de d'autres évènements multidisciplinaires.	- Détente et contractions, chocs et réactions. Inspirant. - Pour moi, le recueillement, l'expressivité, l'idée de la naissance, la révolte, l'action et une grande familiarité, car le personnage pourrait être une partie de moi."La trace du corps" dans le mouvement est la piste qui me rejoint le plus. - J'aime beaucoup la bande sonore et l'opposions de l'oeuvre. Nature vs ville, calme vs compulsions. - La vulnérabilité, l'inconfort, le trouble, la pitié, l'empathie, la violation, le dédain, mais aussi l'attrait presque coupable. -Une certaine forme de peur on se sait pas vraiment ce qui se paseé et pourquoi le personnage réagit de la sorte. Beau projet, j'ai adoré l'expérience. - Vaguement inquiétant puis libérateur, au fil de Xia qui prend vie sous nos yeux. Très mystérieux, l'énigme persiste même après un examen répété. Surprise aussi, Xia ressemble parfois à un démon chinois. Très astucieux, impressionnable à souhait. On sent que sous l'eau calme se cache une Abysse de remous. - La solitude est selon moi très présente dans l'oeuvre. Étrangement, le personnage semble vouloir dialoguer avec le spectateur par l'entremise de ses mouvements. Il y a alors deux solitudes qui s'épousent. Une tension est aussi communiquée au spectateur. Ce qui s'efface; ce qui renaît, correspond aux fluctuations de la vie formée de mort et de renaissance. La texture dans laquelle le personnage est allongé n'est-elle pas accumulation de bribes de mémoire? Nous sommes amenés à penser que parfois la mémoire blesse. Il y a aussi un certain manque de liberté chez le personnage qui semble enfermé dans sa coquille. La liberté collective ne commence-t-elle pas par la liberté individuelle de se sentir bien avec soi-même? Le noir présent dans l'oeuvre est-il le trou noir dans lequel nous tombons parfois? Bravo encore une fois pour ton oeuvre qui m'a profondément touchée. - Inquiétude, curiosité, pitié, sensations de déjà-vu, immersion réussie. Superbe oeuvre à la fois au niveau visuel et sensoriel. J'ai beaucoup aimé.- Angoisse, crainte, stress, épuisement, exaspération, protection, repli sur soi-même, impression d'oppression, naïveté, insouciance. L'eau était pour moi omniprésente au niveau du visuel, du son mais créant aussi chez le (spectateur) visiteur un état d'apesanteur.- Comme la toile choisie par le peintre, le bois sélectionné par l'ébéniste, l'écran choisi par l'artiste décrit lui-même l'oeuvre et ne peut plus être dissociée de celle-ci.- Bon boulot, couleurs, poésie, angoisse, complicité.- A loneliness, anger, strife, effort, longing, dreaming. - Anthropomorphism, projection of my own feelings over the character. Sensation of weightlessness in some cases. - A certain tension and defined curiosity. Empathy for Xia, don't know why. I would not say happy, but I could not say sad, but if I had to pitch it would be something towards the sad and not the happy, something more complex that this going and but nit same I can describe it other than maybe its just.- Voyeurism, feelings of opposition: intrigued by the figure, but one edge, because of the horror, aesthetic around her. Twitching, sporadic, sounds. - Feelings and emotions are evoked to whatever degree of involvement one choose to engage in with the projected activity- once one chooses to engage and not just watch, one is drawn into the activity, anxiety, fear, floating. Drifting, moving are experienced even a sense of physicality and non physicality is experience, which does not happen with the other devices. - I think the whole experience including the devices in scale is a perfect example and challenge to how we engage with theses devices and depending on our awareness of this engagement opens up new doors bring us insight into how we take what we see through these common devices, for granted and how this experience gives us and reinforces this for us. The bottom line in all this is the mindset with which we approach thing is what will give us the level of experience. In the art context, it Is a combination of what the artist uses as material, to create the statement and and how much the viewer bring that makes the experience work. - Fear, terror, beauty loathing pain. - Beautiful piece, disturbing and stunning all in the same moment. - As I stated, it feels womb-like and so when there is a loud noise or sudden violent movements its impact is very strong and I get taken aback. It is very natural in a way, however. Great job. I felt empathetic towards the curled up figure, her "small" fragile nature was effective, while other scenes, like the running sequence was much more powerful on the larger canvas.- First thing that care to mind, This is beautiful, It was a pleasant experience at first, a bit more intense emotionally as I was draw into it. - To elaborate on the last sentence, I felt a curious need to understand this fixed, then moving, "immaterial"woman, appearing and disappearing and I could not. The audio created uncertainly and doubt, as if to prevent me from understanding. I very much enjoyed the scale o the projection and the physical space it created. Very well done ! - Anxiety, sympathy, curiosity, repulsion a device to feel the material of the figure –the dust, charcoal, powder. - I wanted to feel the same textures as the figure on screen was feeling. - Sensations: hearing the noise/ Seeing what happens to the woman.- It was odd… I was repulsed and yet intrigued all at once. Would come see again ! - Shock, worry, but it is also desperately beautiful and feminine because of the pink and the lyrical shapes of her body and dance. - I thought it was unusual and great and really pleasant.
one emotion (wonder)	
- Béatitude, l'oeuvre est exquise à regarder. - Une émotion esthétique intense couleurs matière texture éclairage. L'impression d'être devant une oeuvre signifiante. - Travail magnifique, très touchant! - Intrigue. - J'ai été impressionné par le 3D de Xia, le 3D et la dimension de la projection faisaient que Xia semblait toute proche. Les sons ont aussi capté mon attention. Ils contribuent grandement à la mise en place de l'ambiance. - L'installation XIA est un chef d'oeuvre. - Une envie de rester, voir, découvrir toutes les séquences enfouies, cachées. - Félicitations pour une si belle réalisation. - Very inspiring/ thank you. - Beauty, touching, weightless. - Its wonderful presentation, really felt like she was in the room at first projected very large. - My ears were pretty tickled. When the character was unsettled it was pretty upsetting. When she was calm it was calming. - La femme ne cesse d'évoluer dans ce monde, par la créativité, c'est vraiment fabuleux cette présentation.	
one emotion (other)	
- J'avais l'impression que le personnage a été lancé avec de la peinture et qu'elle était collée! - It looked like she was an insect in pain "angoissée". - Une sensation d'immédiat et d'inusité. Le rapport que j'ai avec l'espace est unique en mon sens à moi, nice works. - Confinement, a moving stillness.	

Table 12–Case study: XIA. Answers to question 10.
(For you, what was the XIA Installation *trying to convey?)*

EXPERIENCE	MESSAGE	HISTORY
- Different states of emotions. - I think it was representing the obsession of a certain thought. - I would say I convey a distorted sense of time, entrapment beauty, slave of the self. - Stress, captivity. - An idea of captivity and an alternative representation. - Representation of the body in motion or rest and its relationship with 2 dimensional representations. - A lifetime of emotions and persona struggles. - Frustration and struggle. - Art making process: vulnerability, embodiment. - I get the feeling of an internal conflict and a mix of nature and man-made. Sometimes the actions are very violent yet sometimes serene and it seems like I am seeing inside someone's thoughts represented by the woman. - I think that it was trying to provoke us with its "weirdness". - Each time I watched it, I think of different interpretations depending on my own mood for that day. Usually I think of mark making, of embodiedness, isolation, drowning, control vs. loss of control, frantic-ness. Sometimes I feel a sense of guilt for being a voyeur or powerful viewer who revels in XIA's capture, but does nothing to help her. - The woman seemed scarred, perturbed by presence and mind. I felt like a witness to something out of the ordinary inner battles. - Un état d'âme. - Pour moi Xia transmet un sentiment d'angoisse et de malaise d'être et peut-être une forme de lutte avec angoisse. - Je vois dans cette oeuvre les mouvements intérieurs qui assaillent l'être qui se débat avec lui-même, mais aussi dans l'environnement dans lequel il évolue. Je perçois aussi une réflexion sur la mémoire individuelle et collective; mémoire du corps et de l'esprit qui laisse des traces. - Nous sensibiliser aux détails du mouvement, aux textures, à l'environnement sonore, à la fragilité du personnage en mouvement. - L'effet d'emprisonnement du personnage. -L'éveil des images au mouvement du spectateur. L'exploration de la psyche du personnage. - L'idée d'inconfort face à l'autre, de malaise interactionnel. - Un ressentiment de lutte pour atteindre une liberté. - Tout en sortant de l'écran de manière tridimensionnelle, le personnage demeure prisonnier (de son corps, d'un filet invisible, des préjugés etc.). L'impression d'ouverture créée par le 3D est en fait une "fausse "impression puis le contenu invite à l'introspection, au repli. Cette dualité renforce l'émotion et l'angoisse. - Une présence; celle de l'écran qui rencontre celle du spectateur et ne devient qu'une. - Une sorte de fusion entre le réel (mouvement) et le virtuel, (mouvement du personnage) surtout sur une base artistique. - Rendre une relation possible entre le regardeur et la vidéo lier les deux en une symbiose/ irréel et réel. - Xia was trying to explore sense of physical engagement with a screen experience in a virtual format. It tried to create and engage the viewer in what was happening on the projected screen. The sense of space, movement, floating and to identify with the figure on the screen. It also challenged our perception and concept of reality and what we experience. Can we experience thing only in reality or can our mind and previous experiences engage us in a real experience. The other devices gave the viewer an immediate indication of how different these technological items play on our sense of perceiving reality and fantasy. - For me, it was trying to convey the expression of a relationship between pain and personal experience. We are directly responsible for any pain she's experiencing.	- The chaotic beauty of the dream world. Restlessness, fear. - A desire to maintain control over chaos/madness/energy, even while that energy/power is creative and productive. - The blurry live between animated and static representations of existence, and the dynamic in between those 2 modes. But that's my intellectual approach or attempt of making sense out of it. My physical and emotional reactions (weird, stimulating, peculiar, grungy, …) were far stranger. - It questions my private space. - La manière dont les contacts et stimulus extérieurs guident ou influencent notre comportement, ici de manière plutôt négative, mais aussi comment nous pouvons avoir un impact sur le comportement, et la réaction des autres. - Une mutation sociale, le pigment au sol. Le mouvement du personnage nous amène a une sorte de méditation sur le mouvement, la position de nos vies, nos échappatoires, une fragilité et une force vivre. - L'impact de la présence humaine et de ses émotions. -On veut peut-être nous faire réfléchir sur la vulnérabilité, sur la violation de l'intimité, sur la position de l'observateur par rapport au sujet observé et sur l'impact que l'observateur peut avoir sur le sujet observé. On veut peut-être aussi témoigner de l'inconfort, du trouble engendre par certaines circonstances, et ce, d'une manière très physique, via un personnage qui ne prend pas la parole, mais qui se contente de se manifester par le corps, le mouvement, dans une sorte de demi-conscience.	- A trapping, a desire to leave a mark, met with a tired and resistive feel. Also, brings a string context of womanhood and feminity. This is apparent in the video but not necessarily in the overall approach. - The transformation of a quiet character into some strange demon. - Captured subject, nature, looks back to the male gaze; the gaze was turned around to some degree. - Something about a dream, a journey, a something to be understood. Either a puzzle to be solved or a state to exist in. - A definite darkness, running away, running toward. A body entrapped, in the womb of our life. The drab chiascurro. - Une impression de mise en boite, comme si XIA cherchait a atteindre qqch qui sort de sa réalité confine (la vidéo), qui veut fracasser la frontière de l'écran (faute d'un terme plus exact) pour toucher celui qui regarde, à l'extérieur, au fond, non-existent du point de vue strict de Xia.

Appendix III: *CEREUS* - Floor Plan

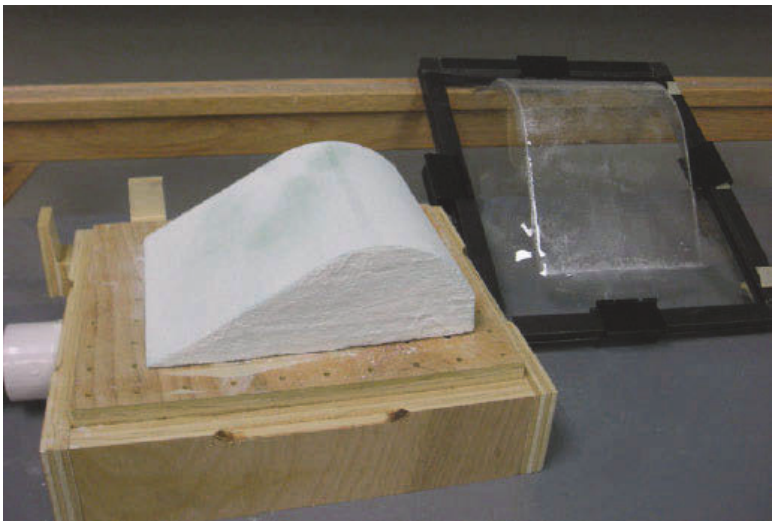


CEREUS (Robot)

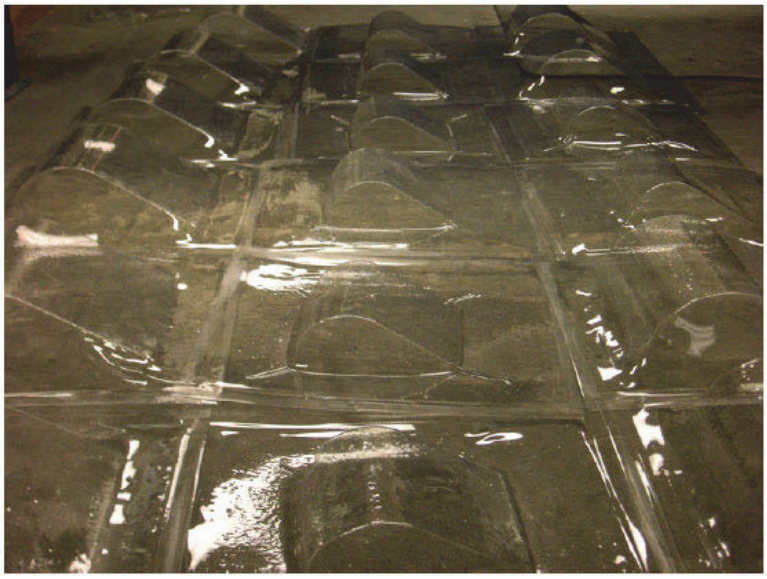
CEREUS (The Petals)

Appendix IV: *CEREUS* - Prototypes

The printed curve in three dimensions (3D) on a Z-Corp machine.

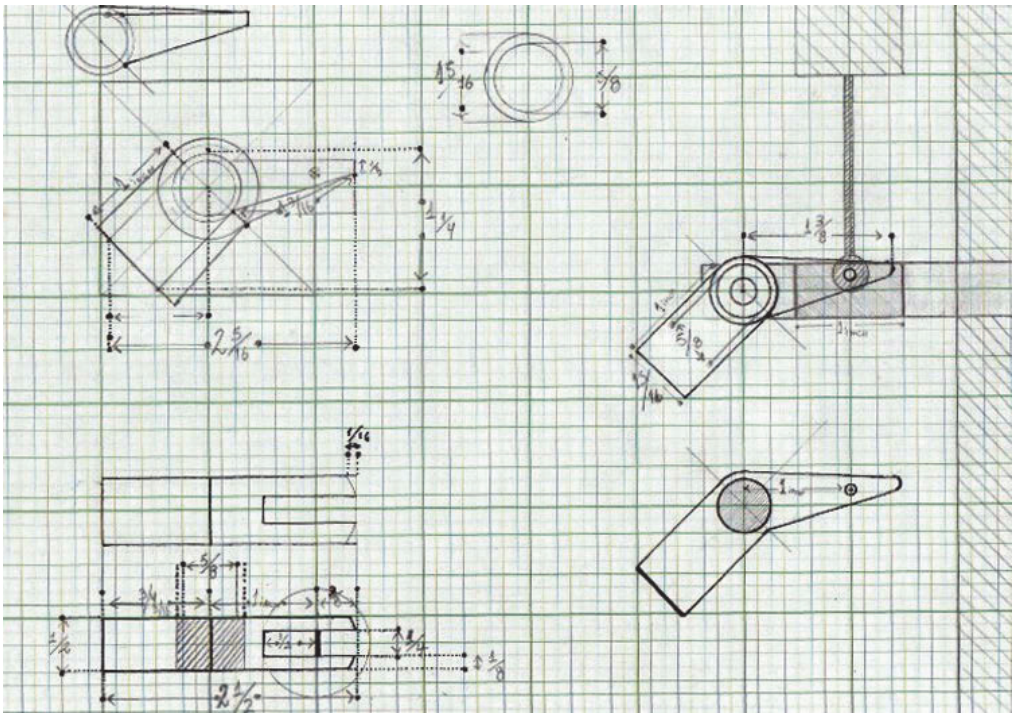


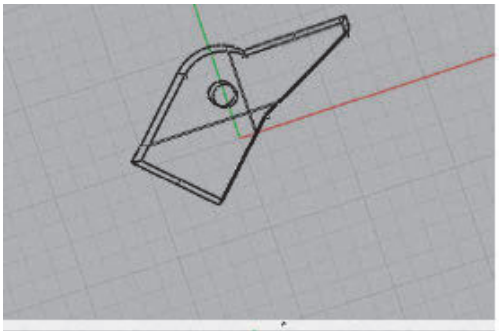
Vacuum-formed petal.

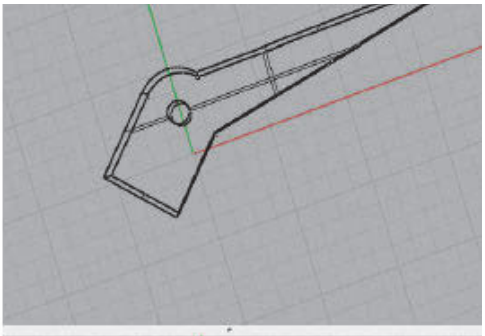


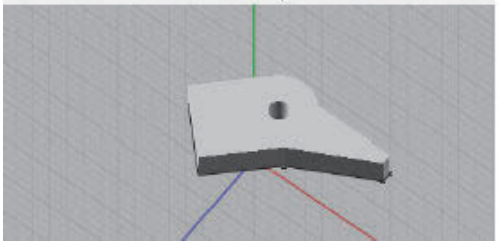
Appendix V: *CEREUS* - Mechanism

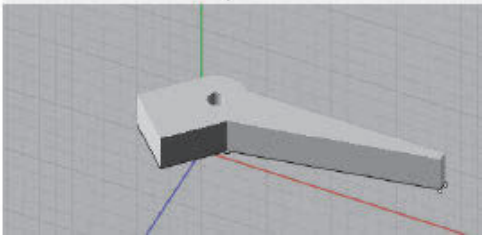
Drawings



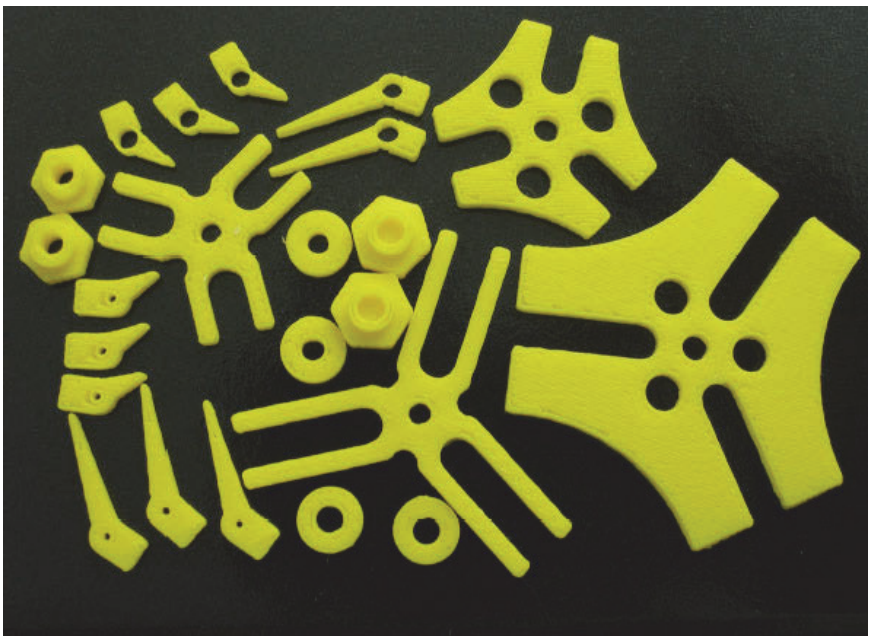








3D printed Parts on ABS plastic



Waterjet cutted Aluminum Parts – Mechanism

Parts – Mechanism

Appendix VI: *CEREUS* - Questionnaire

SUJET D'ÉTUDE par Philomène Longpré, SIP Doctorante (3 octobre au 5 octobre 2012)

L'exploration de la spatialité de l'écran vidéo en tant que facteur de modification de notre perception sensorielle.

Section 1 : L'œuvre CEREUS

Suite à l'expérience CEREUS, quel est le premier mot qui vous vient à l'esprit ?

fleur

Quelles émotions et sensations furent évoquées en expérimentant l'installation CEREUS ?

La fleur est le symbole de la vie; lorsqu'elle est ouverte, elle inspire la légèreté, donc la liberté, mais fermée, elle reflète l'homme qui est parfois prisonnier de lui-même, de son corps, de son environnement. J'y vois le passage de la souplesse d'un pétale à la lourdeur du corps; chemmement qui peut aussi être inversé et mener à une ouverture de l'être sur le monde malgré sa fragilité.

Comment décrivez-vous l'espace (l'environnement) de CEREUS ?

L'espace mène à la naissance; à la vie. De l'obscurité totale naît la fleur de la vie et l'espoir. Un univers noir agit comme un monde en soi et cache la magie d'une fleur forte qui suivit à l'adversité. L'espace nous ramène à nous-mêmes.

D'après vous, qu'est-ce que l'installation CEREUS essaie de transmettre ?

L'espoir, la force malgré la fragilité, la magie de la vie présente en un pétale, la nature plus forte que tout, la profondeur de l'être, la naissance dans le désert de la vie, la beauté se cache partout; à l'extérieur et en nous.

Autres commentaires :

Nous sommes telles des fleurs, chaque pétale est un reflet d'un aspect de notre être. Cereus est aussi comme une goutte d'eau; de rosée qui repousse l'obscurité.
Le bonheur se cache toujours dans une fleur; c'est la résidence de l'espoir.

Section 2 : Les écrans vidéo

Approximativement, combien d'heures par semaine passez-vous en face d'un écran (incluant un moniteur d'ordinateur, télévision, iPod, iPad, téléphone cellulaire, écran de cinéma, jeux video, ect.)

10 à 20 heures

Pensez-vous que la spatialité (l'environnement) où se trouve l'écran modifie votre perception du visuel présenté ?

oui, puisque la fleur semblera différente selon l'environnement; c'est ce qui se passe dans la nature. La fleur ne semble pas la même dans le désert qu'au sommet d'une montagne.

À part la spatialité, y a-t-il d'autres facteurs qui ont affecté votre perception durant l'expérience de Cereus ? Si oui, lesquels, indiquez-les par ordre d'importance ?

- la lumière
- le mouvement
- le son

Autres commentaires :

oeuvre extraordinaire, magnifique, magique
On y retrouve une grande profondeur qui nous mène au coeur de la vie. La forme de la fleur Cereus me fait penser à la forme d'un coeur. Aurions-nous un coeur floral?

Section 3 : Informations

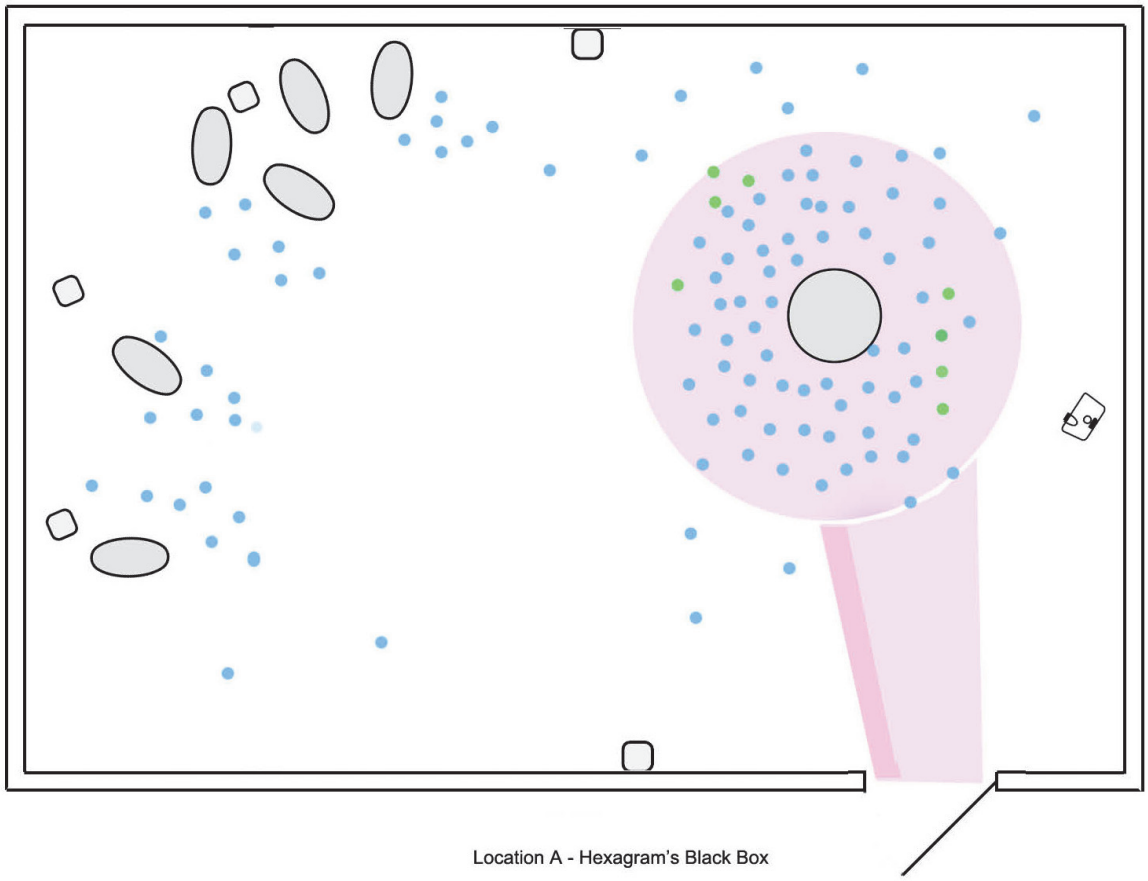
*Si vous préférez que votre nom et âge ne soient pas divulgués, s.v.p. écrire "anonyme" à Nom et Âge .

1. Nom : [redacted]
2. Âge: 32 ans
3. Domaine de spécialisation: poésie; haïku, création littéraire
4. Occupation: enseignante de français au secondaire
5. Courriel :

Merci beaucoup pour votre collaboration et votre temps accordé à ce sujet d'étude sur les écrans vidéo. Si vous avez des questions au sujet de cette recherche, n'hésitez pas à me rejoindre en tout temps : philox@philox.net

Appendix VII: *CEREUS* – RESULTS

Graph-location A: Concordia Hexagram's Black Box (location A)

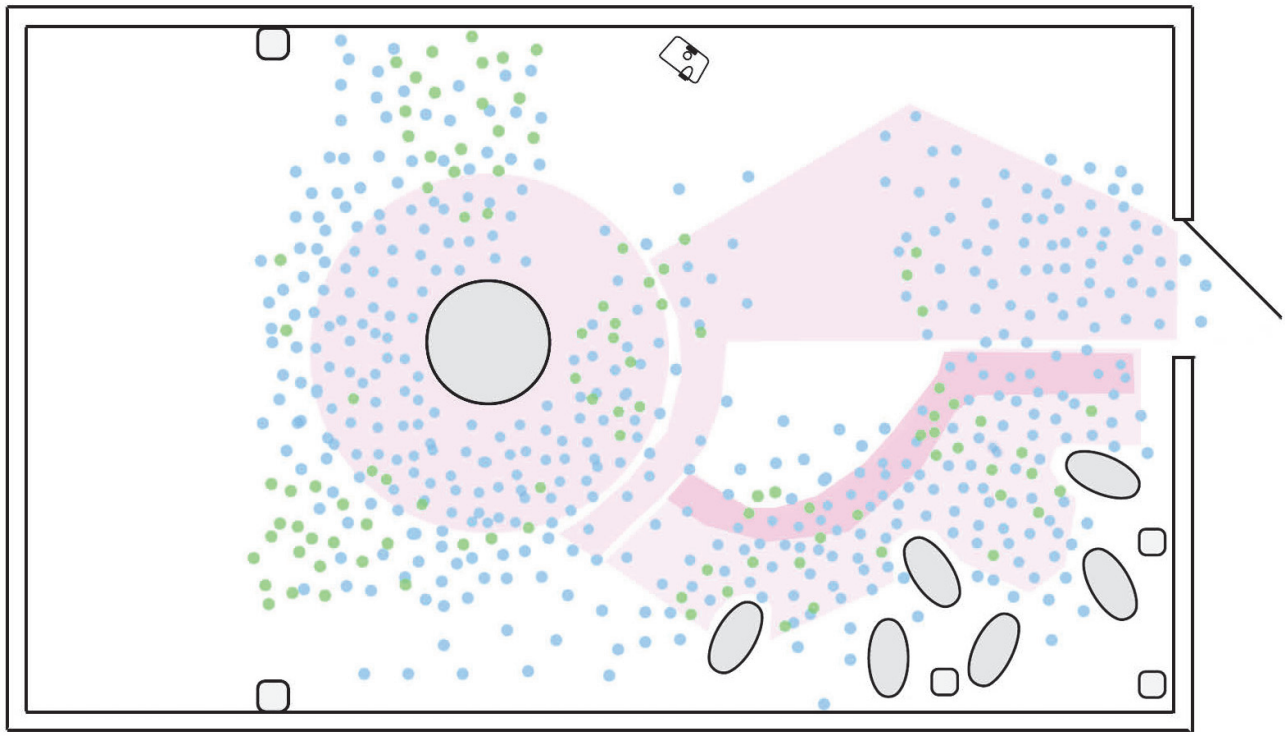


Suspended responsive video membranes

Responsive video membranes placed on the floor

Speakers

Graph-location B: Phi Centre (location B).



Suspended responsive video membranes

Responsive video membranes placed on the floor

Speakers

Table 13 –*Case study: CEREUS. Answers to question 2.*
(Which emotions were evoked while experiencing CEREUS?)

CONTRASTING EMOTIONS	ONE EMOTION
- Un voyage spatial qui est angoissant et réconfortant en même temps. - Malaise, peur, dérangement, réflexion sur soi-même. - Drôle, malaise. - La peur et l'émerveillement. - Curiosité, peur, angoisse, malaise. - Troublante, inquiétante, mais intéressante. - Peur, impressionné, plaisir. - Curiosité, peur. (x3) - Obscur, attractive. - Malaise, questionnement, un peu peur. - L'interaction initiale avec Cereus m'a pris par surprise. Les sons et l'image vidéo m'effrayaient un peu, mais la séquence et la façon dont Cereus réagissait m'a beaucoup intrigué. - J'ai ressentis un léger stress mais surtout de la curiosité face à l'œuvre. - Vibration intérieure, curiosité pour le processus d'animation. - Intrigue, beauté, angoisse. - Tranquillité, surprise. - Curiosité, intrigue, attendrissement, introspection, éloignement. - La solitude, l'incompréhension, l'étonnement. - Curiosity, intimacy, shame, surprise, delight, inhibited, self-conscious. - Paix, curiosité, excitation, peur. - Découverte, calme, angoisse, surprises, émerveillement. - Curiosité, intérêt, fascination. - Fascination, angoisse, mélancolie, hésitation. - Mystérieux, beauté. - Loss, curiosity, puzzlement, anxiety, searching. - Mysterious, transcent, terrify. - Peur. Le mystère de celle qui est seule dans un lieu - Puzzley, beauty, visual aesthetic, synesthesia, light/image, asbract.. - Paranoïa, la peur, anxieux, le rêve. - Poésie du corps féminin, pureté, contribution, cloisonnement, - Proximité, féminité, nature. - Intimité, intronisation, environnement.	- Désir de rester dans la contemplation de l'objet et fascination créée par le son et les doubles images. - Sensation d'ouverture au monde, à la vie, émotion: curiosité, bien-être. - Curiosité, intrigue. - Curiosité, surprise. - Curiosité, sollicité. - Intrigant. (x2) - Curiosité de voir quels mouvements feraient quoi. - Curiosité. - Beauty- The screen/flower. Difficult to take your eyes off. - Vie, légèreté, fragile. - Mystère sidéral. - La vie après la vie, sensation de se promener dans l'espace, un voyage dans le temps. - Multiplication des espaces. - J'avais FROID, et je ne voyais personne. - Sentiment d'être ailleurs, autre monde, froideur, chaleur, calme, et mouvementé. - Anxiety, fear, frustration, exilation. - Incertitude. - La crainte, l'incertitude, vécu au son et à la réaction imprévue de cereus. - Anxiété. - La peur, j'avais l'impression qu'elle allait sortir de l'écran. - Une légère angoisse à cause de la musique et de la femme qui nous observe. - C'est un peu épeurant. On ne sait pas à quoi s'attendre. - J'ai surtout été impressionné par l'interaction, et le son qui accompagne l'image. Et j'avoue que les images et l'environnement dans lesquelles on se retrouvait était épeurant. - peur, angoisse. - peur, angoisse, tristesse, colère - Le suspense: le son qui était fort et les images qui se déplacent rapidement m'a laissé sous le choc.

Table 14 –Case study: CEREUS. Answers to question 3.
(How would you describe the space (the environment) of CEREUS?)

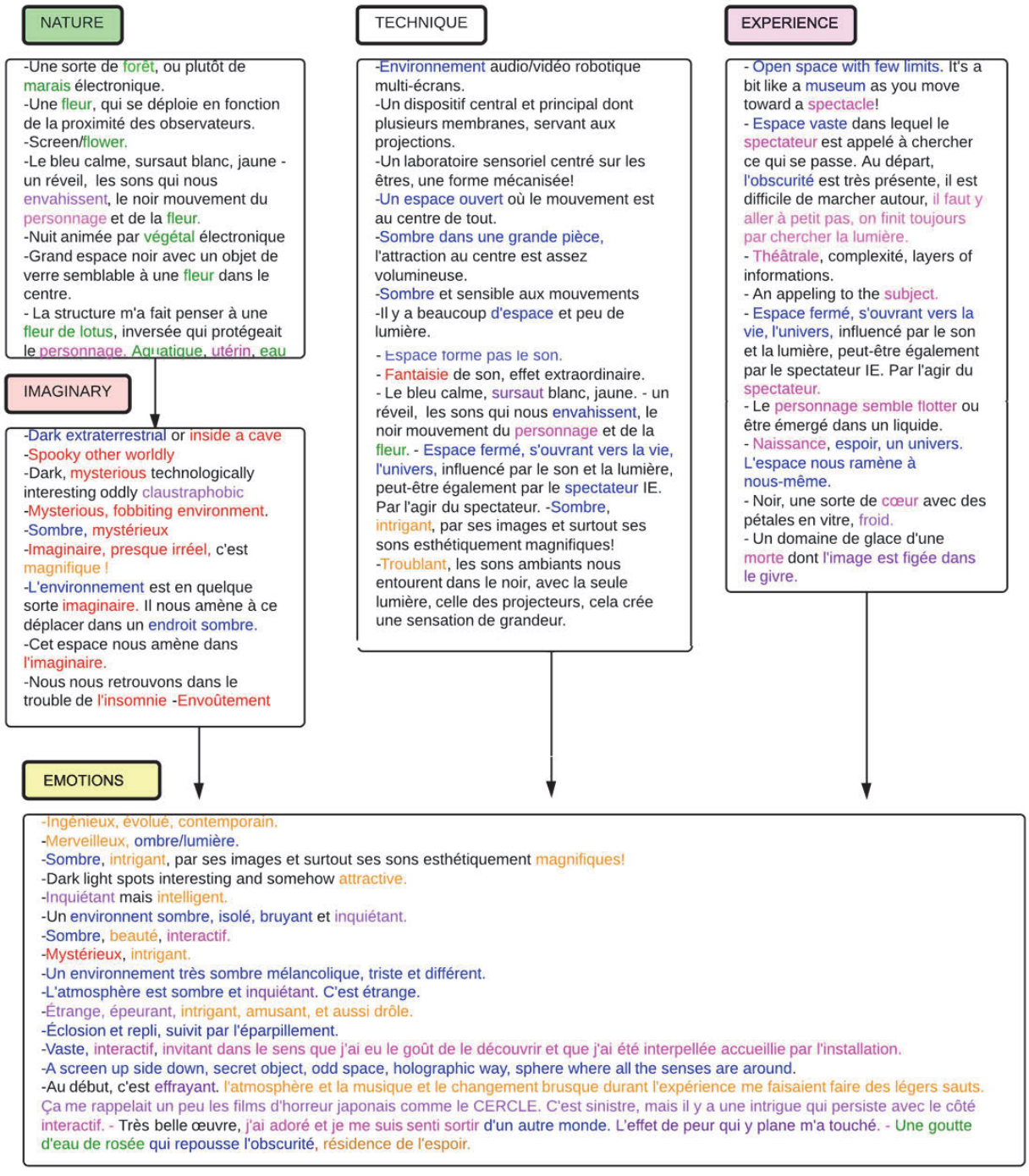


Table 15 – CEREUS experiment. Answers to question 4.
(For you, what was the CEREUS installation trying to convey?)

EXPERIENCE

- Une expérience interactive et sensorielle.
- Les sens dans un espace plus que mystérieux, donnent une sorte de quatrième dimension, déjà hors de la vie terrestre.
- Une certaine sensibilité, une attraction puis un éloignement du personnage principal, une dynamique de déplacement dans l'espace vers les pétales au sol.
- Le procédé holographique et multi-écrans perturbe notre réception et nos sens une autre matérialité, une réalité évanescente, d'un corps en évolution.
- Une recherche de beauté, un sentiment de bien-être, une ouverture à la vie.
- La recherche de la lumière. Cette lumière dicte les actions et les gestes de l'homme. Sans lumière il est difficile de trouver son chemin.
-Renforcement et difficulté de communiquer avec l'entourage et le monde.
- Une expérience unique dans l'espace sonore et visuelle.
- Des émotions. (2x)
- Incroyable comme expérience.
- L'émotion de l'auditoire en image numérique.
- Moi, j'ai surtout réalisé qu'en focalisant sur mon point central, on oublie de regarder autour.
-Tourment, trouble, hésitation.
- Confinement.
- Captivity.
- Something about being trapped.
- Order of cubism, perception fractmental of the eye, no glass, center of attention, organic, life in life.
- Un sentiment de détresse à travers les mouvements des personnages.
- Peur, douleur, questionnement.
- Le cauchemar de l'âme, le subconscient.
- Sentiment d'être observé par la technologie.
- Interactive communication, one way with the artist is kind of a paradox -Intimacy sort of between spectators and creator. Self-consciousness of spectator as participant in the artist's event. I would say it is a dialectic of sort between the desire to see the object of that gaze unwrapped as it were and the consciousness of the impertinence of that desire at least for a middle class male intellectual.
- Elle essaie de transmettre un message à l'aide de plusieurs médiums.
- La réaction au corps physique et de l'être humain psychologique vis à vis des autres personnes et interaction que l'on peut avoir. La différente facette de la psychologie, les émotions et problèmes mentaux. Nous sommes tous prisonniers de notre mémoire, nos émotions de qui nous sommes.
- La sensibilité chez les gens.
- Cereus veut transmettre un message de l'imaginaire la réaction du corps face à des sons.
- Je pense qu'elle essaie de transmettre un certain malaise, qu'elle essaie de nous faire réfléchir sur nous-même et de l'impact de notre présence.
- Elle essaie de nous transmettre ses sentiments. Comment elle se sent dans sa bulle, qu'elle veut s'évader à tout prix.
- Nous sommes perméables aux images comme la matière de l'œuvre. Nous nous ouvrons ou nous fermons selon notre état de réception.
- Relationship between nature, technology and humanity, image and movement.

MESSAGE

- Fragilité de l'être vivant.
- Espoir, la force malgré la fragilité, la magie de la vie, la nature plus forte que tout, la profondeur de l'être.
- L'impact ou la réaction que l'environnent peut avoir sur l'intimité de l'être.
- Que nos actions sont des répercussions sur notre environnement, entourage. Que parfois ces répercussions sont souhaitées et portent à l'ouverture, tandis qu'elles peuvent aussi mener vers la fermeture et le déplacement.
- Qu'il y a des conséquences à nos actions. À partir de nos mouvements l'œuvre réagit.
- Pouvoir lié à la présence des choses et notre capacité à changer l'environnement.
- Que les humains réagissent avec les cœurs des autres humains.
- Le sommeil et les rêves nous fascinent et nous terrifient à la fois.
- La peur du monde extérieur et des autres.
- Intimité, bulle de confort importante pour chacun.
-This is a superb piece that defines mystery the human consition, power, technology central illusion, beauty, anxiety, exhilation, in reality, in metaphor, in illusion.
- Electronic Art.
- Video sculpture.
- Installation technologique sensible. C'est super!!

HISTORY

- Cereus essaie de transmettre un message subtil derrière la beauté féminine d'une jeune femme craintive.
- Le cycle éternel.
- Un être emprisonné dans un écran.
- La peur et l'angoisse d'une jeune femme face aux inconnus. Le trouble qu'elle ressent au cœur de la nuit.
- Ce que l'installation essaie de transmettre est le mystère de cette femme durant une nuit et comment elle se comporte lorsqu'elle se retrouve seule.
- Une façon différente plus chaude de raconter une histoire à travers l'image vidéo tenant compte de l'environnement spatial et sonore.
- La genèse de quelque chose, l'origine de la naissance.
- Birth of something.
- La naissance, la peur.

COMMENTS: - Impression of a painting. - The moving character questions the relationship human/machine. - I really liked the way the pannels moved, and the images changed. Very curious to learn how it is controlled ! and how it comes Alive! - The clips and the sequences yield at the beginnning. However still the overall state is the opposite of peaceful. - Magnifique travail remarquable, tout en subtilité.- Une très belle machine, précieux bijou! - Certainement l'oeuvre la plus accomplie et complète que j'ai vue! - Love it, Cereus is very absorbing. - Technically amazing.- Maîtrise de la technique, alliance de la technologie dans un mystérieux rendez-vous de l'art et du questionnement. - Très beau - Inspirant ! - Perfectionnisme, technique, formes, images. - J'ai bien aimé, c'est différent! -There is something religious, the lighting, emptiness, pulsing organ, ski of light, mechanical heart, diamond cut faceted stone, jewel, textural, ode (...)