

Dynamic Illusion

Designing Unpredictable Interactive Experiences

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Dedication

Dedicated to my dear parents, ShuJun Liu, QingQuan Zhi, and my husband Yufeng Sun. Thanks for the endless encouragement, support and sacrifices you made on my behalf; thank you for always standing by my side through those happiness and sadness; thank you for everything.

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Abstract

My thesis investigates the vocabulary and role of dynamic illusion in the interactive environment. I am particularly interested in utilizing visual illusion to create an immersive, exploratory, unpredictable, poetic, and meaningful experience that activates both physical and mental participation by an audience.

Visual illusion is an indispensable communication approach that has been broadly exploited in traditional art and design for centuries. It surprises viewers, leads them to stop, stare, explore, rethink and revalue beliefs by engaging their mind.

However, traditional media, largely a broadcast paradigm, limits the potential for illusion. New media, due to its dynamic and interactive natures, brings infinite possibilities to employ illusion as a compelling communication strategy. By incorporating visual illusion in the digital environment, a designer can arouse audience's curiosity, inspire their imagination, evoke their emotion, guide their thinking, enhance their experience, and reinforce their memory by encouraging multi-sensor engagement.

My thesis examines the potential of illusion in new media through extensive research and two major projects: "Live Painting – Bamboo Garden" and "On Your Way – Blowing Away the Myth of Illusion". In "Live Painting – Bamboo Garden", I explore interactive behavior as a metaphor for the way we look at things and challenge traditional art forms by creating immersive three-dimensional illusive experience. In "On Your Way – Blowing Away the Myth of Illusion" case study, I create a poetic interactive environment that allows an audience to break illusion and discover truth by literally blowing away metaphorical obstacles.

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01

Introduction



Why Illusion?

As a child, fairy tales took me to a wonderland where a swing could transform into a princess or a frog into a prince; kaleidoscopes, covered my vision with their beautiful moving and sparkling patterns; and the haha mirror, the magical filter always turned my figure to unexpected sizes. Those illusive objects consistently captured my attention, invoked my curiosity, and engaged my imagination. The surprising, unpredictable, and immersive experiences urged me to observe, to wonder, to imagine, and to discover. With my parents' encouragement, I used to record my imagination through drawing. Today, as an interactive designer, I continue asking myself: what is visual illusion in the digital medium? What qualities and benefits of dynamic interactive illusion contribute to human communication? And how?

From a historical scientific point of view, illusion, as distortion of sensory perception, occurs with each of the human senses. Because vision often dominates the other senses, visual illusion is the most thoroughly researched and used form of illusion. Visual illusion is characterized by visually perceived images that are deceptive or misleading. In other words, it is something you see that is not exactly what it is. Why does illusion happen? Because our brain often makes general assumptions according to previous knowledge and past experiences during the perceiving process. When the assumption does not meet the "reality", illusion occurs.

There are two major types of visual illusion: physiological and cognitive. Physiological illusion occurs naturally, such as when you see an afterimage after looking away from a direct gaze at an image for a certain time. Cognitive illusion can be demonstrated by specific visual tricks, such as ambiguous figures, distorted images and paradox structures. In most cases, the goal and consequence of cognitive illusion is to intentionally distort the truth in order to mislead the viewers.

Whilst part of what we perceive comes through our senses from the object before us, another part (and it may be the larger part) always comes out of our own mind.

— *William James*

In traditional art and design mediums, artists, designers and filmmakers explored cognitive illusion as an indispensable communication strategy in multiple fields. By teasing viewer's common sense of perception and bending their mind, creators used deception to create dazzling and unexpected art works to manipulate viewer's perspective, lead them to stare, question and think.

However, the limitations of traditional mediums gradually appear as new medium concepts "dynamic" and "interactive" influence our communication process. Compared to old mediums, new media offer the potential for artists and designers to better capture viewer's attention, invoke their curiosity, motivate their awareness, inspire their imagination, reinforce their memory by fully activating their physical and mental participation. Viewers are drawn into the dynamic interactive illusive environment by devoting the entire concentration, energy, emotion, and physical action into the experience. As they become aware that what they perceive does not match their belief, they stop and start to doubt, question, and think over back and forth.

Now the questions are, why new media has more potential than traditional media, and why "dynamic" and "interactive" play such significant role in human communication process in the digital age?

First, by manipulating multiple representations of forms such as motion, transformation, environment, texture and sound, new media designers regard design more as a

entire modifiable process, rather than a single, static and unchangeable object. Users can not only independently choose to interact with the narrative scenarios or environment in a non-linear way, but also affect or manipulate the context and the environment based on their need. By combining multiple representations forms which support each other, creating engaging contexts through producing harmony, tension and collision, the designer has unique opportunities to communicate with the users more effectively.

Second, interactivity provides designer's potential to create and carry the two-way dialogue between themselves and the users by engaging multiple sense and physical participation. When the user forms physical connections with the systems, such as touching or moving, mental and emotional responses occur either consciously or subconsciously, and multiple intelligences such as spatial, logical and interpersonal ones are activated. Direct multi-sensory interaction in tangible three-dimensional space make it possible for designers to create private or social connections by giving the user freedom to interact or manipulate with digital systems, environment or other users physically. And during the interactive process, the user's role is much more active and unique, thus the experience is much more personal, concrete, and richer compared with passive listening or watching. The dynamic interactive system responds to specific user input to create variable experience is what traditional media such as paintings cannot do. Ultimately, it is the user's emotional response that makes the communication process rich and valuable.

This thesis investigates the approaches of utilizing illusion to facilitate and enhance communication via digital media and to fully engage audiences both physically and mentally by creating immersive, exploratory, poetic and unpredictable experience. In the first part of the thesis, I will review and evaluate visual illusion from both scientific and artistic perspectives. In the second part, I will investigate dynamic illusion by presenting two major case studies: "Live Painting – Bamboo Garden" and "On Your Way – Blow Away the Myth of Illusion".

02

Contextual References

The theoretical research of this thesis is grounded within illusion from scientific and psychological perspectives. From how we perceive the world to the theories and classification of optical illusion, I build the theoretical foundation of why, when and how visual illusion occurred. In the second part of this section, I include extensive research of visual illusion applied in both traditional and digital age's art and design domain, which shows how visual illusion, as an indispensable communication strategy, can be used by artists and designers to communicate effectively.

Illusion in Science and Psychology

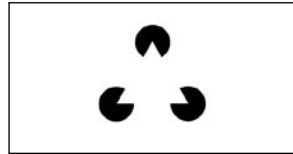
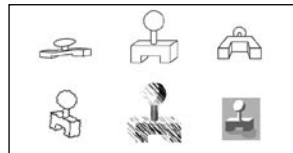
1. How We “See”

We are aware of things around us because of our senses and what we perceive is the result of a thinking process. Among all human senses, vision is the dominant sense because seventy percent of all receptor cells in our body are in our eyes. The perception of the event “seeing a picture” depends on how our brain interprets it. Although we seem to be able to perceive the reality in the accurate way, our perception is often subject to limitations and constraints. The reason is because we “see” things not only by the information our eye provide, but also based on our background and predictions that we made from past experience. For example, we often believe that a bright object is closer to us than a darker object, however in reality they may exist in the same distance. When we are aware of our misperception, we feel strange, and we usually stop and ask ourselves, is our mind or our senses deceiving us?

2. Gestalt Psychology

It is crucial for designers to understand the theory of human perception such as form-forming process in order to design more meaningfully and efficiently. Contrary to a traditional belief that elements of an object could be analyzed separately for reducing the complexity, the School of Gestalt developed a series of principles that redefined the approach of human perception from a psychological perspective.

Developed in Europe in the early 1900s, Gestalt psychology is a theory of mind and brain that proposes that the operational principle of the brain is holistic, parallel, and analog. This branch of psychology helps us to understand how we perceive visual forms by organizing its components into a meaningful whole instead of just seeing a collection of shapes such as dots, lines and curves.

*Dog Picture**Reification**Rubin's Vase**Invariance*

The four key properties of Gestalt theory are emergence, reification, multistability, and invariance. The first property, “Emergence”, focuses upon the fact that the object is not recognized by identifying its parts but is perceived as a whole all at once. As shown in the “Dog Picture”, the dog which is sniffing on the ground is actually the shade of the trees.

The second property is “Reification”, which states that the experienced perception contains more explicit spatial information than the sensory stimulus on which it is based. As shown in the picture, a triangle appears in the middle of the dot although no triangle has actually been drawn.

The third property is “Multistability”, which is the tendency of ambiguous perceptual experiences to exchange between two or more alternative interpretations. A good example is “Rubin’s Vase”, either a vase or two faces could be perceived at one time.

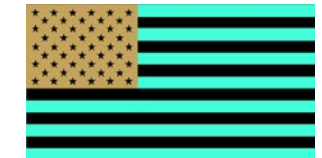
The last property of Gestalt systems is “Invariance”, which means geometrical objects can be recognized not only by rotation, translation and scale, but also by elastic deformations, different lighting and component features.

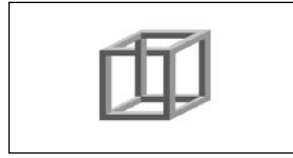
3. Optical Illusion

We can perceive the world around us is a natural magic, because what we perceive is not only exist in our conscious mind, but also suggest that a belief in reality. While every living creature in this world is equipped with it’s own organs, senses, and brain, each one sees and feels differently. Optical illusion is characterized by visually perceived images that are deceptive or misleading.

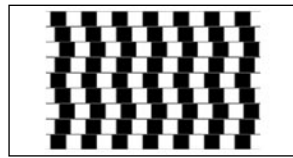
The first major type of optical illusion is physiological illusion. Physiological illusion occurs naturally, such as the afterimages following bright lights or adapting stimuli of excessively longer alternating patterns. The theory is that stimuli have individual neural paths in the early stages of visual processing, and that repetitive stimulation of one or a few channels causes a physiological imbalance that alters perception. Take the picture “United States Flag” as an example, if you stare at it for thirty seconds, then immediately look at a blank wall or piece of white paper, you will see the afterimage. In the afterimage, the colors of the flag will be corrected.

As the second major type of optical illusion, cognitive illusions, are assumed to arise by interaction with assumptions about the world, leading to “unconscious inferences”, an idea first suggested in the 19th century by Hermann Helmholtz. In most cases, the goal and consequence of this type of illusion is to intentionally distort the truth in order to mislead the viewers.

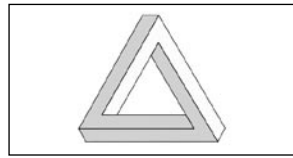
*United States Flag*



Necker Cube



Café Wall



Penrose Triangle

The three most common types of cognitive illusion are ambiguous illusions, distorting illusions and paradox illusions. Ambiguous illusions are pictures or objects that elicit a perceptual switch between the alternative interpretations. Take the “Necker Cube” as an example, it will often seem to flip back and forth between the two valid interpretations when a viewer stares at it. Distorting illusions are characterized by distortion of size, length or curvature. As a striking example, “Café Wall” illusion makes the parallel straight horizontal lines appear to be bent. Paradox illusions are generated by objects that are paradoxical or impossible. Such as the “Penrose Triangle” which appears to be a solid object, however the combination of properties cannot be realized by any three-dimensional solid object in the physical world, unless using certain perspective tricks.

Besides these three types, some other types of cognitive illusions include upside down illusions, depth illusions, movement illusions, color illusions, perspective illusions and fiction illusions.

Illusion in Art and Design

1. Painting

1.1 Surrealism

“Surrealism is a style in which fantastical visual imagery from the subconscious mind is used with no intention of making the work logically comprehensible” (www.artcyclopedia.com). Surrealism artists attacked traditional ways of seeing and thinking, deeply influenced by the psychoanalytic work of Freud and Jung, they devoted special significance to art history by direct using illusion as strategy to express or convey certain message.

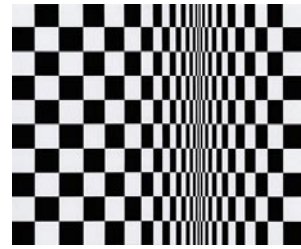
The surrealists state that by exercising the imaginative unconscious mind to the dream-like state, we can liberate our mind and society. The surrealism circle was made up of many great artists include Salvador Dali, Rene Magritte, Max Ernst, Man Ray, Joan Miro and Giorgio de Chirico. As a visual movement, the surrealists use the method of exposing psychological truth by revealing ordinary objects of their normal significance, in order to evoke viewer’s empathy by creating compelling image that was beyond ordinary organization. For example, in his non-reversing mirror in “La reproduction interdite”, Magritte remarkably caught the audience’s attention and broke their expectation by using a mirror to reveal the backside of the man instead of the front side.



La Tentative de l'impossible,
Rene Magritte, 1928

1.2 Optical Art

“Optical Art is a method of painting concerning the interaction between illusion and picture plane, between understanding and seeing” (John Lancaster. *Introducing Op Art*, 1973). Optical art, inspired by the constructivist theory and practices



*Movement in Squares,
Bridget Riley*



Untitled, Julian Beever

of the Bauhaus, stressed the relationship of form and function within a framework of analysis and rationality. Most optical art works are abstract, when the viewer stares at them, they see movement, hidden images, flashing, vibration or patterns. Optical artists include Victor Vasarely, Josef Albers, Bridget Riley and Oscar Reutersvard.

1.3 *Trompe l'oeil*

Trompe l'oeil is a technique of visual deception, especially in paintings, in which “objects are rendered in extremely fine detail emphasizing the illusion of tactile and spatial qualities” (Dictionary.com Unabridged v 1.0.1). As a French word, *trompe l'oeil* means: “trick and deceive the eye”. Dated back to Greek and Roman times, this technique was employed in murals, a painting might depict a window or hallway to enlarge a room visually for example.

Some contemporary artists, such as Julian Beever and Kurt Wenner created drawings on pavement or murals that produced a three-dimensional illusion scene when viewed from a certain angle. They also used an anamorphosis technique to defy the law of perspective.

1.4 *Anamorphism Art*

An anamorphosis is a deformed image that appears in its true face when viewed in a particular manner. According to Webster’s 1913 dictionary: “A distorted or monstrous projection or representation of an image on a plane or curved surface, which, when viewed from a certain point, or as reflected from a curved mirror or through a polyhedron, appears regular and in proportion; a deformation of an image.” Anamorphism art has been around since the time of Leonardo Da Vinci and was popular in the 17th and 18th centuries. *Trompe l'oeil* artists often used this method to create illusions combined with architectural elements which hide secret images or political messages. In “The Ambassadors”, Hans Holbein’s portrait, he created a realistic human skull by drawing the brown smear near the bottom of the painting, and the skull can be only recognized if the viewer see it from the top right corner.

1.5. *Others*

Dutch graphic artist, Maurits Cornelis Escher was a master at creating mathematically and perspective inspired works, such as woodcuts, lithographs and mezzotints. Majority of his works were explorations of tessellations patterns, impossible and infinity figures. In his masterpiece “Drawing Hands”, Escher portrayed two hands, each drawing the other.



*The Ambassadors,
Hans Holbein, 1533*



Drawing Hands, Escher



Das gekrümmte Schachbrett, Sandro Del Prete



Shadow, Istvan Orosz

“Everything that we see can be seen in another way. Therefore, I ask myself; isn’t everything that we see an illusion anyway?” (Sandro Del Prete). Sandro Del Prete is a Swiss artist expert in creating impossible construction and ambiguous figures to deceive viewer. In his work, the objects that the viewer perceives can have multiple interpretations from different viewpoints at the same time. In “Das gekrümmte Schachbrett”, he amazingly depicted a chessboard by correctly drawing it’s individual parts, however as the whole piece, the chessboard is a impossible figure.

2. Sculpture

“... When I have drawn these impossible objects, I did hope everybody would understand my intention, the intention of a Hungarian designer at the end of the 20th century who does not tell the truth just in order to be caught in the act” (Istvan Orosz). As an expert of creating impossible objects, double-meaning images, anamorphism drawings and installation, Istvan Orosz created illusion by using another illusion, which produced brilliant outcomes.

Shigeo Fukuda is a Japanese artist and designer who is one of the most prolific illusion creators in the world. His two-dimensional and three-dimensional works include impossible objects, ambiguous figures, distorted projec-

tions, and anamorphism art. In his installation work “Reflections of a Piano”, Fukuda constructed a bizarre piano lines that coincide with the lines of a real piano. The viewer could see the reflection of the physical models in the mirror in the perfectly normal structure. In another piece “Disappearing Column”, Fukuda made the impossible sculpture possible by building it up in the physical world, and again, it worked from only one particular perspective.

3. Performance Art

As a world-renowned American magician and illusionist, David Copperfield is famous for his storytelling through spectacular illusions. Works such as making the Statue of Liberty disappear, walking through the Great Wall of China and separating his own body astonish the viewer by deceiving his perception. He elevated magic to a new level by creating intensive, breathtaking, and sometimes even terrifying experiences.

4. Animation

Bill Plympton is a legendary American animator who created dozens of feature films, music videos and commercials. His works are about life, humanity and politic issues, which are full of imagination, surprise, and humorous. In his 1987 Academy Award-nominated animated



Reflections of a Piano, Shigeo Fukuda



Magic, David Copperfield



Your Face, Bill Plympton



*Let Forever Be,
Michel Gondry*

film “Your Face”, Plympton twisted, distorted and transformed a human face in dozens of astonishing ways, which highly capture viewer’s attention.

5. Commercial and Music Video

As an Academy award winning screen writer, film, commercial and music video director, Michel Gondry is famous for his astounding visual style and image manipulation approaches. Marked with explorative and creative vision, Gondry’s work is full of fun, adventure and surprises. His brilliant approach of playing with time and space, reality and illusion, make the audiences surprise, stop and reflect of they see and what they believe.

Illusion in New Media

1. Virtual Reality

“Virtual reality is a computer-created and computer-mediated simulation of a real or imagined environment” (Encyclopedia of New Media). It has been broadly used in many fields, including art, design, entertainment, education, medical areas and gaming applications. Virtual reality is most commonly a three-dimensional visual environment used to achieve different purposes by providing illusions of reality.

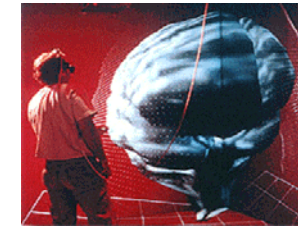
As a well known virtual reality example, the Cave (Cave Automatic Virtual Environment) is “an immersive virtual reality display device used for art, scientific visualization, and collaboration” (Encyclopedia of New Media). It was developed in 1991 by Daniel Sandin and Thomas DeFanti at the University of Illinois at Chicago. In most of the Cave system, there were projectors directed to all sides of the room in order to produce most convincing realistic effects.

The potential of interacting with the illusive space is tremendous; the immersive and realistic experience virtual reality bring is astonishing. The technology will be integrated into our daily life and activity in various ways such as in merchandise industries and hospitals in the near future.

2. Video Installation

Paul Sermon is an English artist well known for his new media installation works. In his installation piece “Telematic Dreaming”, he deliberately plays with the ambiguous object - double bed as “telepresent projection surface”. The image functions like a mirror that reflects one person within another person’s reflection.

As Paul stated, “The psychological complexity of the object dissolves the geographical distance and technology involved in the complete ISDN installation.



*Cave Automatic Virtual
Environment*



*Telematic Dreaming,
Paul Sermon*

The ability to exist outside of the users own space and time is created by an alarmingly real sense of touch that is enhanced by the context of the bed and caused by an acute shift of senses in the telematic space. The users consciousness within the telepresent body is controlled by a voyeurism of its self. The cause and effect interactions of the body determine its own space and time, by extending this through the ISDN network, the body can travel at the speed of light and locate itself wherever it is interacting. The user exchanges their tactile senses and touch by replacing their hands with their eyes” (www.hgb-leipzig.de).



Hotel, Han Hoogerbrugge

3. Interactive Animation

Han Hoogerbrugge is a Dutch new media artist who is famous for his pioneering online interactive narrative pieces such as “Modern living” and “Hotel”. His original, humorous, and lively style brings the viewer into the world of illusion, mystery, and discovery by invoking their interaction and multi-sensory engagement. In the “Hotel” series piece, he created a lively figure actor Dr. Doglin who tries multiple strange experiments with his volunteers. The audiences can interact with each character to discover how the scenarios continue.

4. Performance Art

ART+COM is a forward thinking German new media company focused on developing interactive projects. Their works ranges from screen application and web site design to multimedia installations. In the piece “Medial Stage and Costume Design”, they projected virtual architecture onto a large background screen, and also created computer-generated costumes for the singers. As they stated, the projects goal is “to take the stage set on from its classical, static incarnation towards a reactive and dynamic design that plays its own vital role in the opera, bolstered by the dramatic storyline” (ART+COM).



*Medial State and Costume
Design, ART+COM*

04

Case Study I

Live Painting

Bamboo Garden

The real voyage of discovery consists not in seeking new landscapes, but in seeing with new eyes.

— *Marcel Proust*

Overview

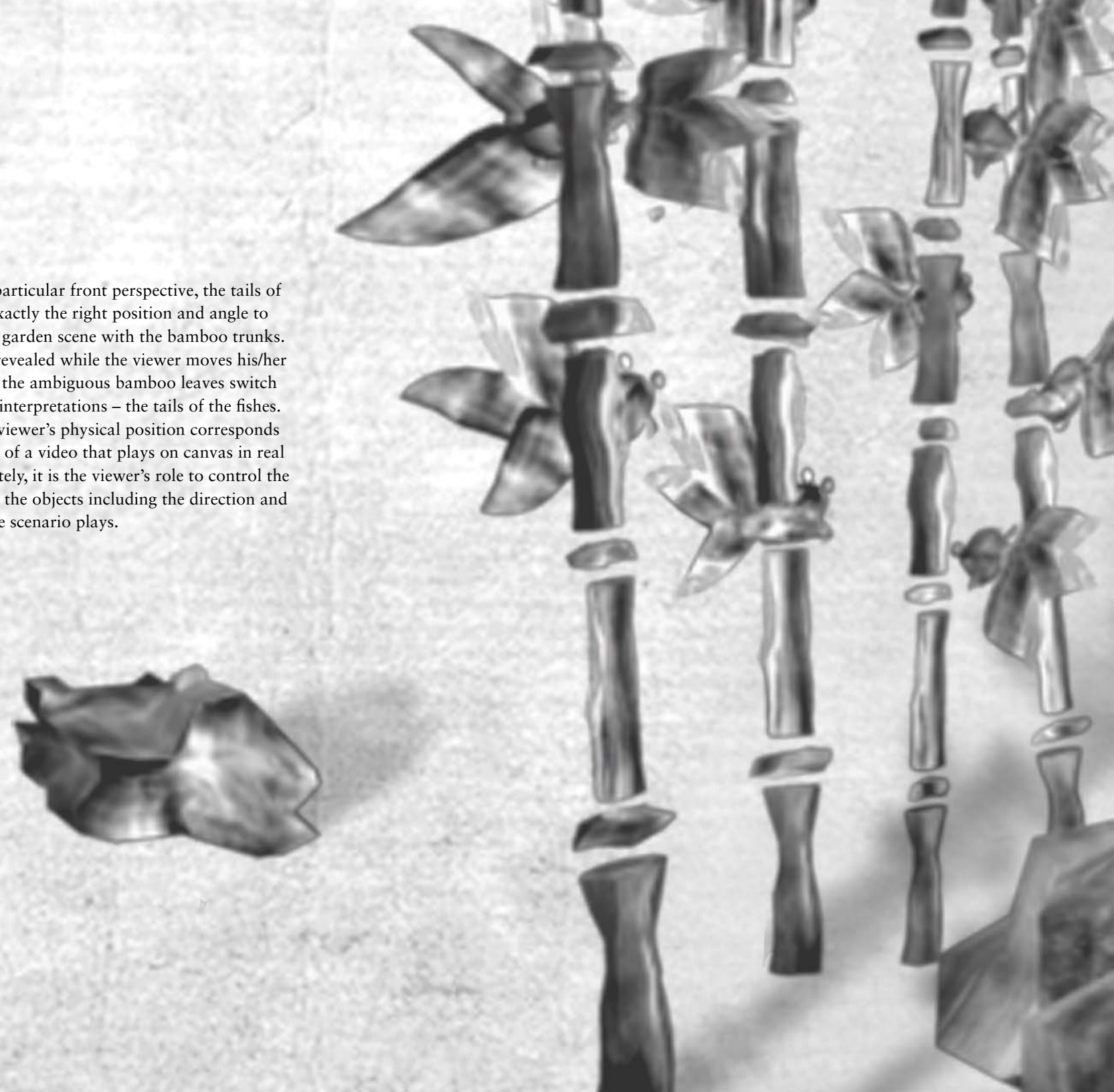
Imagine you enter into a gallery with numerous paintings hanging on the wall. As you walk through, some works attract your attention, make you stop and stare, while others do not. No matter how close you stand in front of the works physically, you always feel the distance mentally. Because they are flat, always quietly hanging there, never responding to any of your thoughts, emotions or actions. This is the inadequacy of traditional art medium, it only communicates with the audience in one way, and the audience's role is relatively passive.

I created this case study “Live Painting – Bamboo Garden” with the provocative intention of bringing the prime ingredient of new media interaction into the traditional art domain of painting. By providing the audience with active roles, involving their physical movement and multi-sensory participation, I hoped to engage their concentration and immerse them in a poetic, illusive and unpredictable experience. Instead of granting the author entire control of the context of paintings, the viewer now has the opportunity to effect or even manipulate the scenario that plays on the canvas independently.

As a metaphor of choosing the way we look at things, “Bamboo Garden” is a movement-driven, illusive virtual painting installation. The visual and aural context the audience perceives is dependent on his/her body movement through tangible physical space. For instance, if the audience looks in the middle of the painting, he/she perceives a static bamboo garden scene. As he/she moves towards either the left or right side, the scene is modified three dimensionally. The audience surprisingly discovers that the bamboo garden is actually a reflection on the water, and all the bamboo leaves are the tail of fishes. In the end, the fishes swim away and the water becomes silent again.

In this project, I applied two visual approaches to create the immersive illusive experience: false perspective and ambiguous structure. The bamboos, rocks and fishes are virtual illusory sculptures that exist in three-dimensional space. When

viewed from the particular front perspective, the tails of the fishes are at exactly the right position and angle to form the bamboo garden scene with the bamboo trunks. As the “truth” is revealed while the viewer moves his/her physical position, the ambiguous bamboo leaves switch to the alternative interpretations – the tails of the fishes. Technically, each viewer’s physical position corresponds to a certain frame of a video that plays on canvas in real time. Thus ultimately, it is the viewer’s role to control the perspectives of all the objects including the direction and speed at which the scenario plays.



Stills from the sequence in “Live Painting – Bamboo Garden”

Process

The first challenge was to transform the way of thinking from graphical to three-dimensional with the z-axis. I started with several experiments by building simple three-dimensional forms in Maya to understand the multiple approaches of how to use perspective to create illusion, such as building distant illusions, ambiguous structure and upside down images.

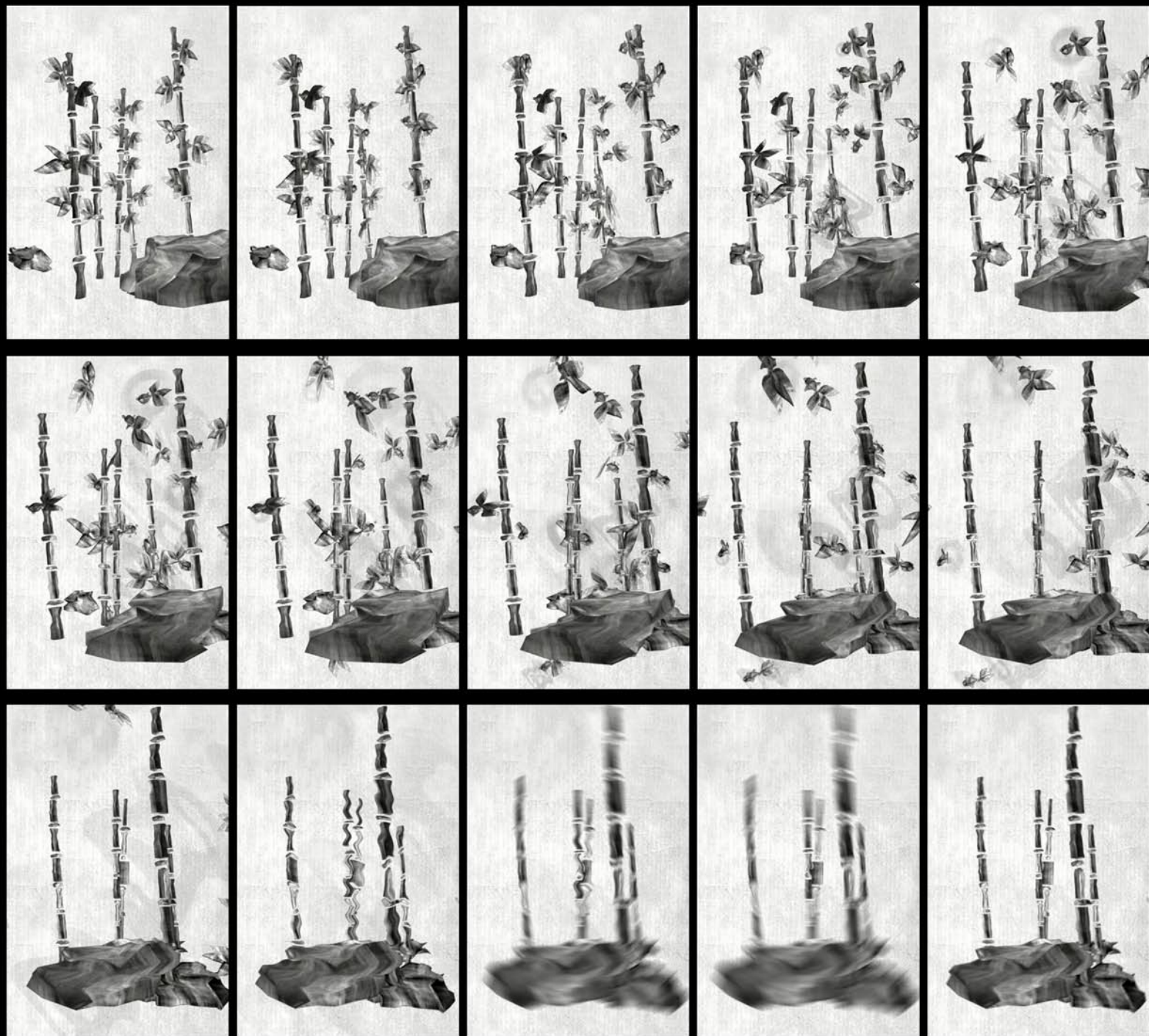
The next step was to decide the subject, one that met my objective of creating immersive and illusive experience while reflecting my own culture background. I selected bamboo as the leading character because in Chinese culture, bamboo is a symbol of longevity and it is collectively referred to as one of the “Four noble ones” along with plum blossom, orchid and chrysanthemum. In Confucian ideology, bamboo is admired for its perseverance under harsh environmental conditions and is known as one of the “Three friends in winter” along with the plum blossom and the pine tree. I was also drawn to bamboo as a subject because I have observed and illustrated it for twenty years. I was inspired by two drawings I created at age five, “Panda and Bamboo” and “Gold Fishes”, to create an illusive experience by finding the alternative meaning between the bamboo garden and fish scene. Surprise could occur when the viewer perceives the juxtaposition of two distinctively different environments while they move their physical location. This unpredictable effect urges viewers to rethink their relationship to a painting, and also is a poetic metaphor of the way we look at things.



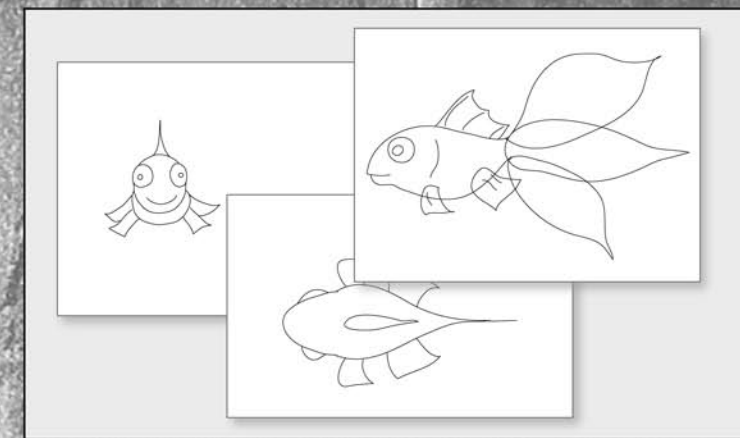
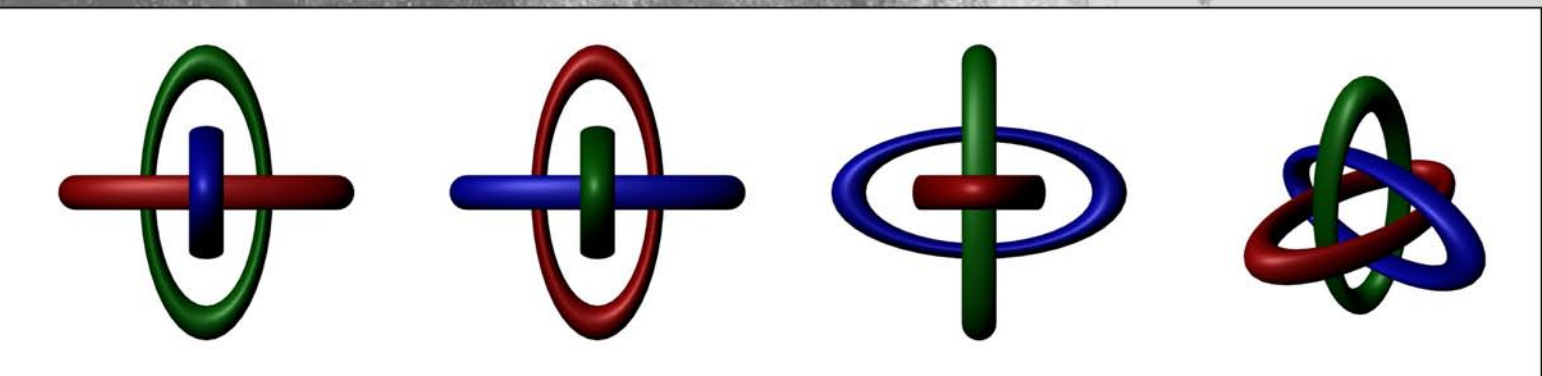
Panda and Bamboo, 1987



Gold Fishes, 1987



Stills from the sequence in “Live Painting – Bamboo Garden”



After deciding my subject, I built tangible bamboos, rocks and fishes by using the modeling clay in the physical world. It was an invaluable experience to make, modify, and feel the texture of the models with my own hands. After that, I hand drew all the textures with Chinese ink, built the models and animation in Maya, created the water effect in Adobe After Effects, and edited environmental water sound in Adobe Audition. By utilizing visual elements such as texture, tones, repetition, layering, transformation, speed, contrast and sound elements such as volume and intensity, I realized the initial goal of creating compelling illusive dynamic Chinese painting in virtual three-dimensional space.



Early Experimentations


3D Models

Final Installation and Reflection

For the final installation, the “painting” was projected on framed vertical translucent vellum rice paper, which hung in a dark and quiet space, to create the visual texture and an oriental atmosphere. The distant sensor, which sensed viewer’s physical location and recorded them as numerical data, was installed on the side of the path where the viewer located. As the viewer interacted with the digital painting, data was sent to the Macintosh where they were analyzed in real time through Macromedia Flash Actionscript Language. Then Flash triggered the direction and speed of how the video played on the canvas, and also controlled the sound correspondingly.

Visually, the transformation of the video and sounds worked tightly together; both bamboo garden and under-water scene were successfully realized as I envisioned initially. The viewers quickly understood that it was their physical position, which controlled the scenario that they perceived on the canvas. They also seemed to understand the conceptual thinking behind the project – a metaphor of the way we look at things. The viewer’s experience was immersive, exploratory and unexpected in a poetic way.

Overall, it has been a precious experience to devote and immerse myself in thinking, experimenting, testing, building process; and finally creating a three-dimensional virtual painting successfully. I achieved the initial goal that encourages a viewer’s physical movement, visual and aural engagement while they enjoy the painting by granting them certain control of the context. The convincing illusionary scenes captured viewer’s attention, broke their anticipation, and immersed them into the entire interactive process. I was eager to create more profound content in the next case study, one which would arouse an audience’s deeper awareness by deceiving them more.



Computer
Projector
speaker

Computer
Projector
speaker

Distance sensor

Distance sensor



Final Installation



05

Case Study II

On Your Way

Blow Away the Myth of Illusion

Given my will to make the most familiar objects scream.

— *René Magritte*

Overview

The concept originated from the idea that during the journey of life, we encounter different people, go to different places and learn different things through the process of observing, thinking, questioning, discovering and reflection. In many cases, our minds are misled or deceived by the appearance and surface of what we perceive. The project “On your way”, is an interactive installation that lets the audience explore and experience the process of breaking illusion and discovering truth by literally blowing away metaphorical obstacles. My objective is to inspire viewers to observe the world from a different point-of-view.

The project is also an investigation of how dynamic visual and auditory elements and interactivity can make communication more compelling than traditional mediums. “On Your Way” examines how to engage the audience both physically and mentally by creating an immersive, illusive, unpredictable, and playful experience. The final installation testifies the methodology through a series of visual metaphor, motion, sound elements, physical tools, and space. The context is projected on a screen and a microphone is set up as a data collector. Viewers activate and control how content appears on the screen by blowing into the microphone.

The visual context includes five sections, there is a pair of character in each section that symbolizes how we see and/or how we are through the journey of life. The five pairs of characters are ordered in a sequence according to different period of our lives. The five pairs of characters are: Mickey Mouse and Alfred Hitchcock; Marilyn Monroe and an African man riding on an ostrich; Adam and Eve and a fighting couple; “The Thinker” and a relaxing horse; evil and a pregnant Asian lady who is playing a flute. The silhouette version stands for “illusion”; and the detailed color version stands for “truth”. Each interactive examination is, in essence, an interactive animation. The audience’s interactive behavior – blowing away obstacles to uncover the “truth” is a metaphor of continuing dedication.

Visual design and Sound design

1. Visual Design

1.1 Visual Metaphors

When I was six, there was a mark on the wall at my home, my mom inspired me to imagine what the mark looks like. I told her that was a man riding on a horse. Then she asked me to imagine who was he and where he planed to go. This experience served as the primary inspiration for my visual experimentation on this project.

There are three levels of visual metaphors in this case study. First, I use fog as a metaphor for obstacles, barriers, and difficulties in our lives, and create a mysterious environment that invokes viewer’s curiosity. Second, the five pairs of characters are the metaphors of whom we see and/or who we are through the journey of life. Third, for each pair of characters, the silhouette version is a metaphor of Illusion; and the detailed color version is a metaphor of truth.

Among the challenges: all the symbols must be well known to the general public; the visual forms should be highly convincing in order to deceive the viewers; the meaning of the symbol should not only be significant, but also be dramatically different in order to create the collision and surprise. It was a long process for me to determine the right characters and the best visual medium for representation. Initially, I developed twenty concepts before deciding upon five pairs that fit my purpose best.

A. Illusion: Mickey Mouse

Mickey mouse is a lively, happy and popular comic animal cartoon character that has become an icon for The Walt Disney Company. All the kids love him because he is cute, little, and naive. It is a perfect symbol for childhood and lovely silliness.

Truth: Alfred Hitchcock

As a highly influential film director and producer, Hitchcock pioneered many techniques in suspense and thriller movies. The majority of his works draw heavily on fear and intense experience. Seeing him and thinking of his work remind us of reality, crime, and conspiracy.

B. Illusion: Marilyn Monroe

Marilyn Monroe was an American actress, singer, model and pop icon that remain one of the 20th century’s legendary public figures. Besides her performance skills, she was known for her appealing and sexy appearance.

Truth: An African man riding on an ostrich

As an extremely unpredictable symbol opposed to Monroe, an African man riding an ostrich indicates ancient, remote lifestyle with no sexual overtones.

C. Illusion: Adam and Eve

Adam and Eve were the first man and woman created by God according to the Bible. The main story elements are the creation of man and woman, the temptation and the Fall, the expulsion from Eden and the subsequent populating of the world outside the Eden garden. The behavior I create is Adam and Eve walking towards each other peacefully, which is an indication of pure attraction, trust, and love.

Truth: A fighting couple

The best symbol to represent the concept of hate and distrust is an angry, resentful, and dangerous couple that is ready to fight. I also push the unpredictable experience forward and add some humor by switching the sex of each character. The previous naked man is currently a woman hiding a knife in her hand, while the previously naked women is currently a boxing man who is lifting his arm.

D. Illusion: Auguste Rodin’s “The Thinker”

“The Thinker” is a bronze sculpture by Auguste Rodin that depicts a man in sober meditation battling with a powerful internal struggle. It is also used to represent philosophy in some cases.

Truth: A relaxing horse

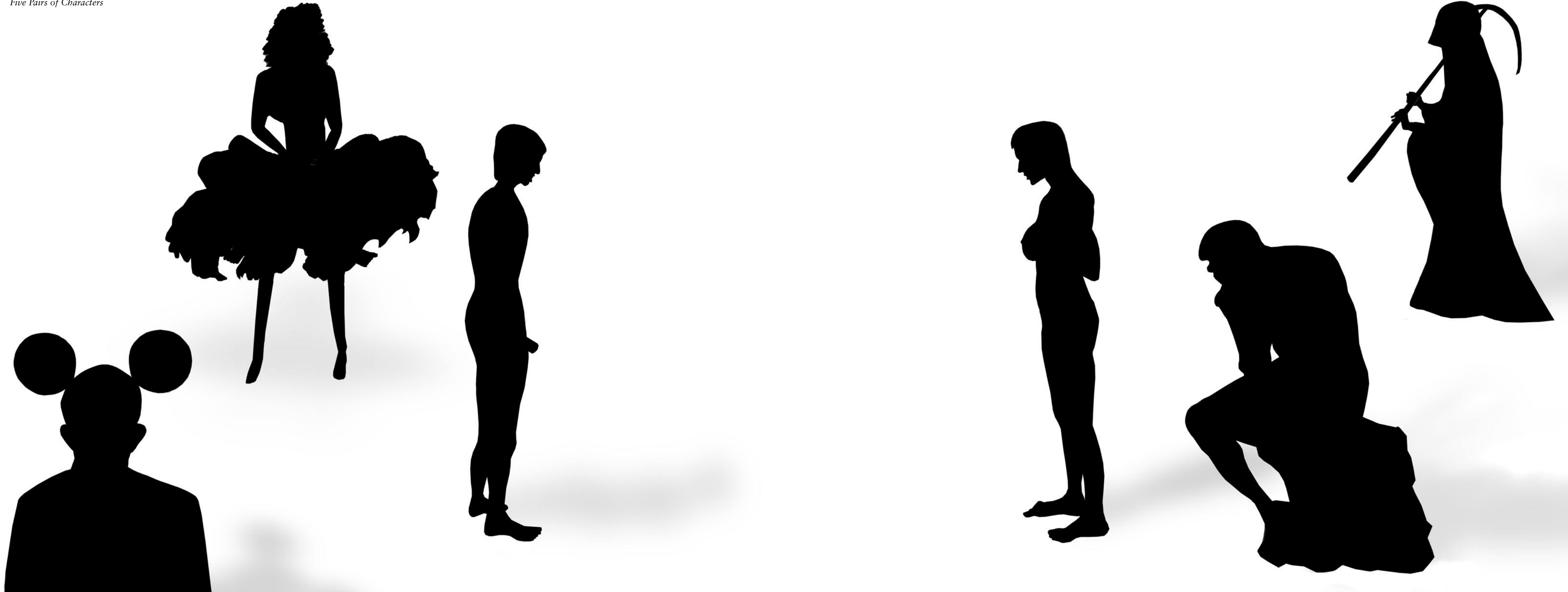
The symbol that opposite to intellectual human thinking meditation the best is relaxing animals. Thus, I illustrate a relaxing horse to create the surprise.

E. Illusion: Evil

At the end of the journey, we confront evil and death. To the majorities, we all love to be alive and death is harming, horrified, and sometimes outrageous. It indicates grief, mourning, and loss.

Truth: A pregnant Asian lady who is playing a flute

The opposite symbol of death is a kind, innocent, elegant, pregnant Asian woman who is playing a flute, which indicates that end is another beginning.







Stills from the sequence in “On Your Way – Blow Away the Myth of Illusion” (First version)



Stills from the sequence in “On Your Way – Blow Away the Myth of Illusion” (Second version)

1.2 Video Development

After deciding upon the metaphors and the drawing medium, I started to develop the video context. For the first version, I animated the five characters moving toward the viewer one by one in exactly the same motion on a vertical canvas. The visual experience was dry and boring.

For the second version, I modified the vertical canvas into a horizontal one in order to have more working space. I placed several new symbols, such as road and mountains which produced an identifiable horizon line; an apple tree and a snake which indicate the silhouette couple was Adam and Eve; some grasses, flowers, butterflies, leaves and snow which indicate changes of time. I also revised the color tones from black and white to four-color (green, red, yellow and blue) to separate the different sections. The visual experience was much richer than the previous version. However, the animation looked a little stiff and unnatural.

For the third version, I went back to black and white, placed more fog and other symbols such as dandelions, sun, and forest to better indicate the changes of time; redesigned the texture of the canvas, animated the characters and made them more blurry and transparent. To make the animation more natural and lively, I experimented with hundreds of particle emitters, separated the different part of the character into multiple layers and adjusted their shapes, color tones and location. Visually it was a big step moving toward to the final version.

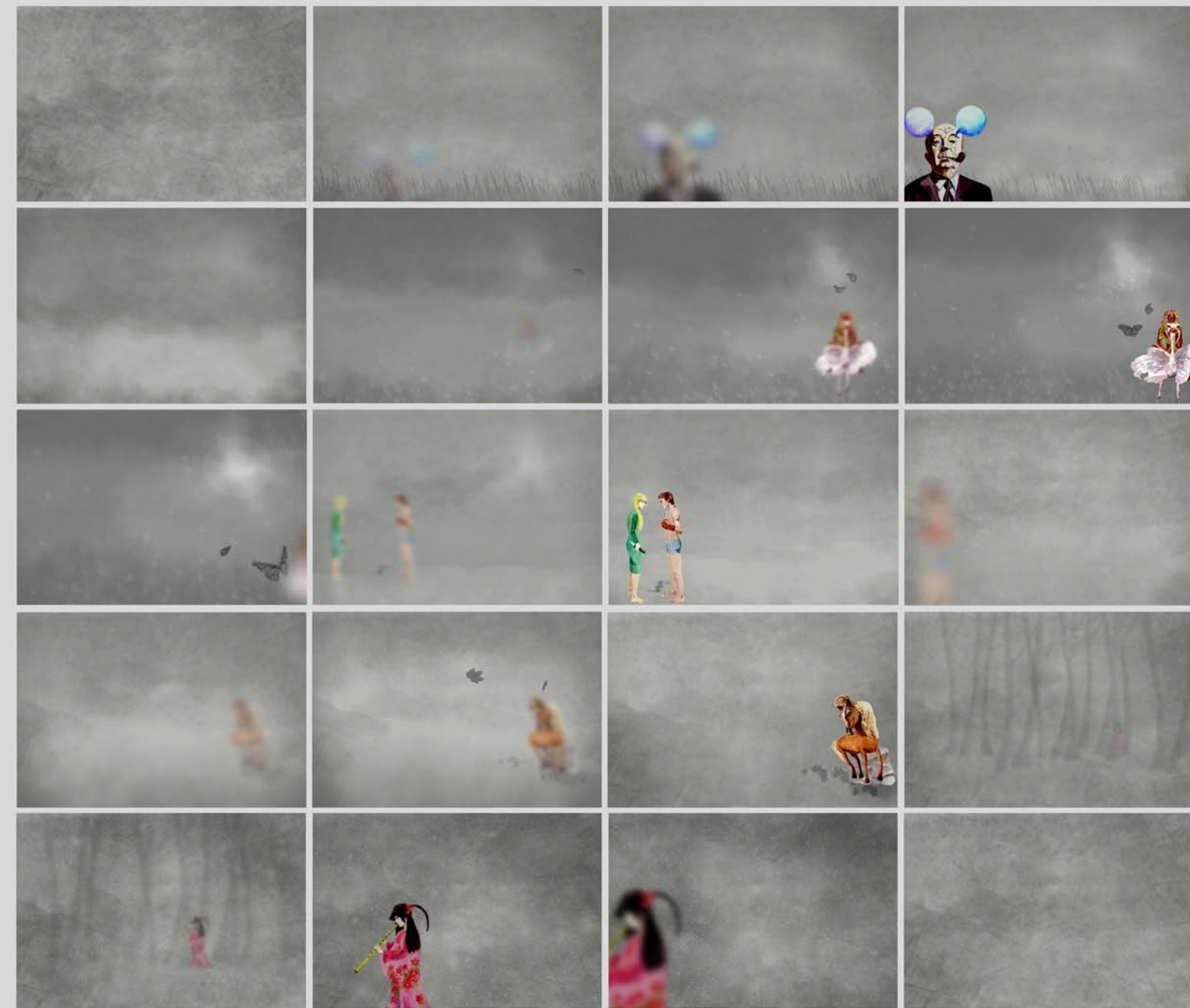
For the final version, I extended the video from 50 seconds to two and a half minutes to leave more space between each section. I also made the characters much more blurry, only clear for a second in order to create more mysterious atmosphere. Some other edits included: moved the characters lower on the canvas, updated all the motions of the character and environment, blurred and animated the canvas texture subtly. Compared with the preliminary version, the visual experience of the final version was much more compelling, mysterious and richer.

2. Sound Design

Similar to the visual design process, the sound design was also a consistent process. At first, I experimented with multiple specific sounds, such as footsteps coming forwards, Mickey Mouse humming softly, and Marilyn Monroe singing her signature song “I wanna be loved by you”. However, the sound was too heavy and a little misleading. For the second version, I focused on editing pure multiple sound of wind, the entire experience felt dry and not lively enough. For the third version, I kept wind sound, and added some ambiguous environmental sound as the background; the feedback I got was the sound felt a little spooky. For the final version, I minimized the animal sound, re-edited the environmental sound with the wind sound, in order to create a mysterious feeling.



Stills from the sequence in "On Your Way – Blow Away the Myth of Illusion" (Final version)



Stills from the sequence in "On Your Way – Blow Away the Myth of Illusion" (Final version)

Interactivity

Conceptually, my goal is to create an interface that allowed the viewers to breath, blow, and modify what they perceive on the canvas with both digital and analog methods. To make this tangible contact between the viewers and the context possible, the viewers are given the freedom to interact with the microphone by both certain cues and their own exploration. The physical action of blowing is a private and personal behavior; it requires a certain amount of concentration; the action of blowing away the fog and obstacles is a metaphor of dedication and devotion to discover the truth. For instance, if the viewer does not blow into the microphone, he/she can only perceives the dark shadow coming towards him/her on the canvas; as he/she starts to blow, the fog seems less visible, and the dark shadow becomes less ambiguous. As he/she blows harder, the fog gradually disappears and the colored detail character appears gradually, however in a blurry appearance. If he/she blows hard enough at certain times while the character comes close enough toward him/her on the screen, the fog disappears, the real appearance of the character become clear, and the viewer discover the “truth”; if the viewer stops blowing, the fog comes back and the character becomes dark black shadow again.

Technically, all the versions of the characters, the fog, environment and sound were rendered separately from Adobe After Effects and then turned into individual movie clip symbols in Macromedia Flash. The microphone captures the viewer’s breathing and blowing input as numerical data, and send them to Macromedia Flash.



Speaker

Speaker

Speaker

Speaker

Microphone

Computer
ProjectorComputer
Projector

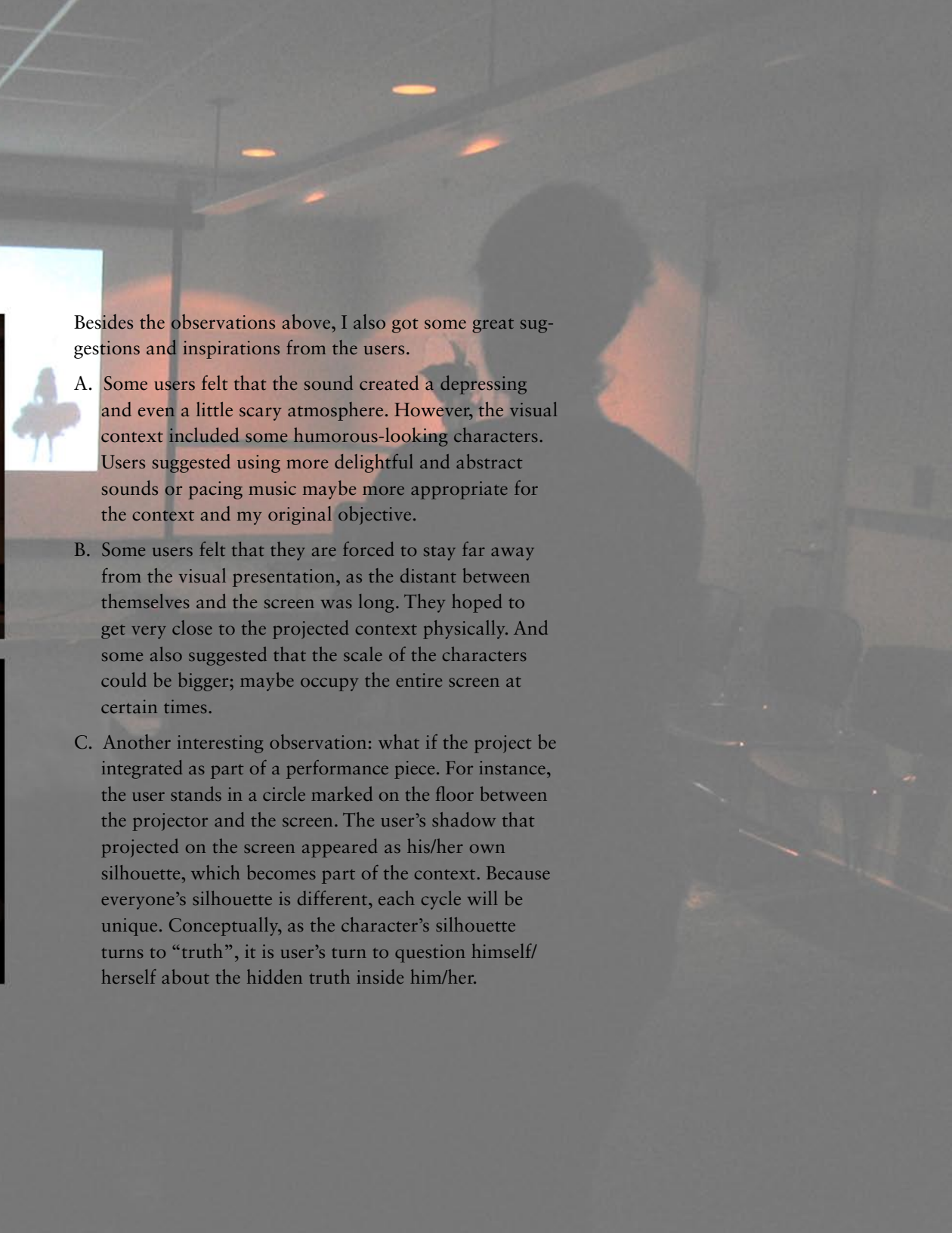


Final Installation

The final installation was installed and running for two days in a quiet, dark and private graduate studio at the Massachusetts College of Arts, Boston. The visual presentation was projected on a big screen. The microphone and a note with the words “On Your Way – Blow Away the Myth of Illusion” were placed on a small table which was fifteen feet away from the screen.

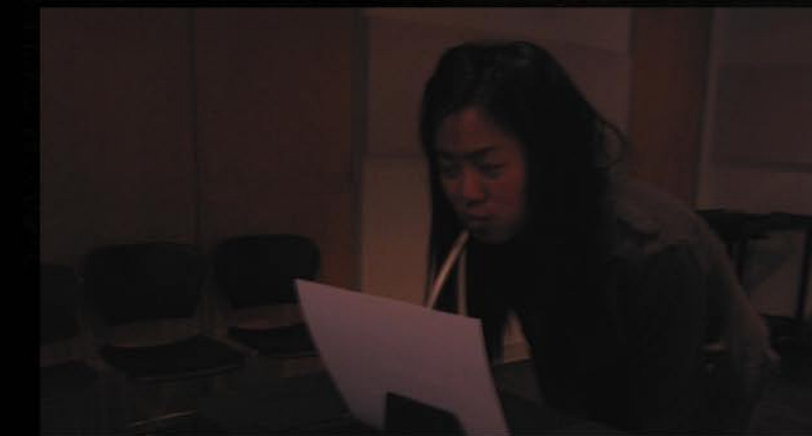
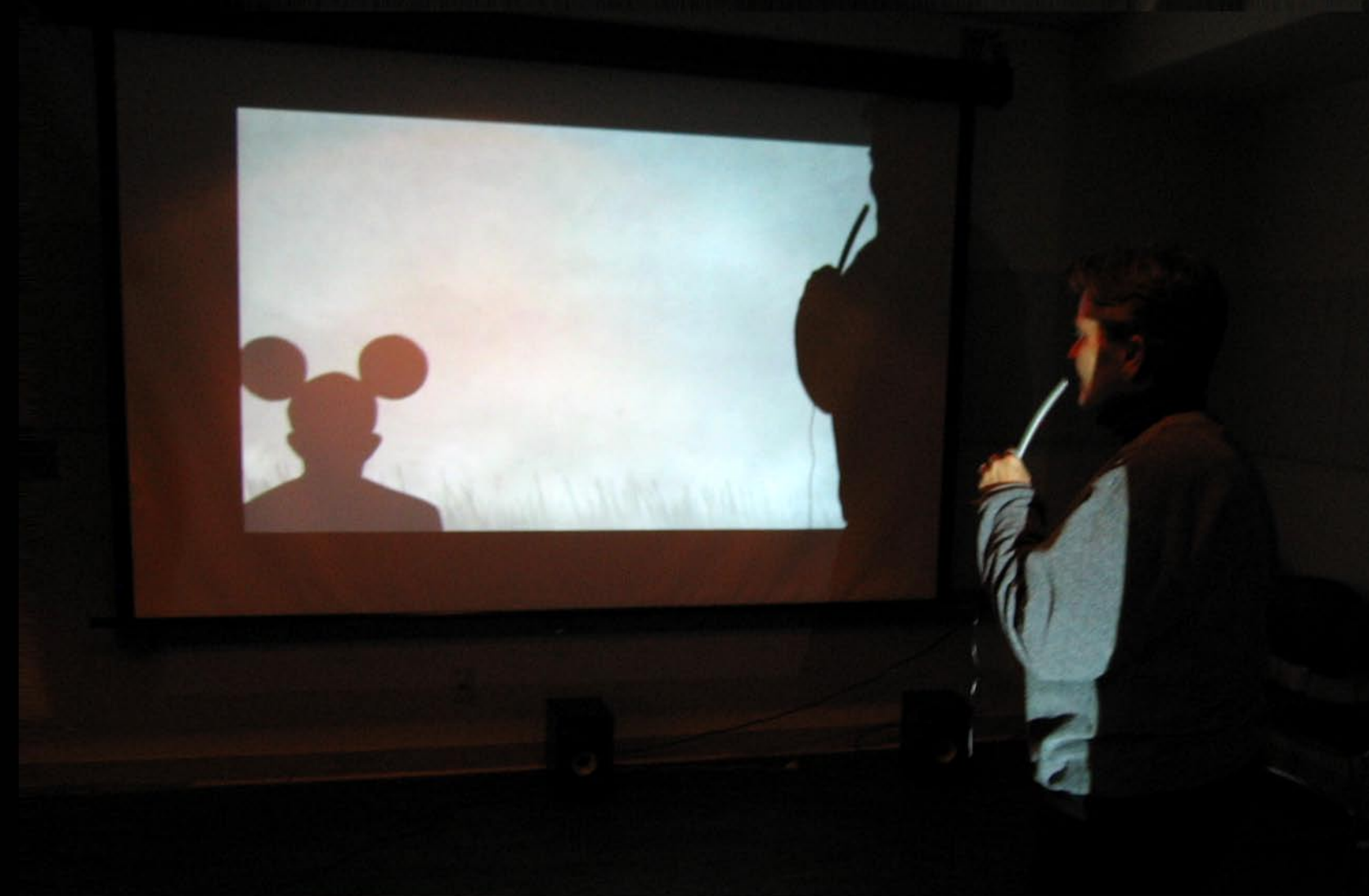
Overall, it was a valuable experience to bring the project to life. I observed many visitors using the system, from undergraduate students to faculty members. Following are some of my observations.

- A. Most users could recognize both the “illusion” and the “truth” versions of the five pairs of characters easily, and some of them also got the clue that the characters were ordered in a sequence with particular intention suggesting life.
- B. Users were able to explore the system without my instruction. During their interactive process, they were actively blowing into the microphone. And then, most of them would try to input different sounds with different volumes into the microphone, such as talking to the characters or making some noises.
- C. Users appeared deeply surprised once the “truth” of each character was revealed. To them it was a very unpredictable experience. Their desire to find out the “truth” towards each character was increased due to the fact that for each pair of the character, both the “Illusion” and “truth” versions are blurry for most of the time, and they are in focus and clear for merely one second.
- D. According to the feedback, I reached the original objective of creating an unpredictable and poetic experience by continuously engage user’s physical action. Most users understood that the project was a metaphor of journey of life, and they also got the conceptual thinking behind “illusion” and “truth” versions of the characters.



Besides the observations above, I also got some great suggestions and inspirations from the users.

- A. Some users felt that the sound created a depressing and even a little scary atmosphere. However, the visual context included some humorous-looking characters. Users suggested using more delightful and abstract sounds or pacing music maybe more appropriate for the context and my original objective.
- B. Some users felt that they are forced to stay far away from the visual presentation, as the distant between themselves and the screen was long. They hoped to get very close to the projected context physically. And some also suggested that the scale of the characters could be bigger; maybe occupy the entire screen at certain times.
- C. Another interesting observation: what if the project be integrated as part of a performance piece. For instance, the user stands in a circle marked on the floor between the projector and the screen. The user's shadow that projected on the screen appeared as his/her own silhouette, which becomes part of the context. Because everyone's silhouette is different, each cycle will be unique. Conceptually, as the character's silhouette turns to "truth", it is user's turn to question himself/herself about the hidden truth inside him/her.





05

Conclusion

The aim of art is to represent not the outward appearance of things, but their inward significance.

— *Aristotle*

Conclusion

Creating this thesis was a challenging and exciting journey. I explored multiple approaches to fulfill the goal of utilizing dynamic illusion as an effective and compelling communication strategy in the digital interactive environment. In “Live painting – Bamboo Garden”, I applied ambiguous structure, false perspectives in three-dimensional space and interactive behavior as a metaphor for the way we look at things, to challenge traditional art forms by creating immersive three-dimensional illusive experience. In “On your way – Blow Away the Myth of Illusion”, by taking journey of life as metaphor, and juxtaposing double meanings of multiple ambiguous silhouettes, I created a poetic and unpredictable environment that continuously engaged user’ blowing action. Both installations are supported by dozens of preliminary ideas, several iterative tests, continuous discussion with advisors, and feedback from the users.

1. What Are the Key Findings of My Thesis?

1.1 *Power of Effective Communication: Use Less, Gain More.*

Creators could achieve the goal of creating intuitive, rich, and meaningful experience by purifying their concepts; subtracting obvious elements; and designing simple, natural and simultaneous interactive behavior.

1.2 *The Basic Approaches of Managing Illusive and Exploratory Interactive System Experience Include:*

A. **Invoke participants’ curiosity by creating surprise.**

When designing dynamic interactive environment, it is important to acknowledge curiosity as the first key aspect that leads users’ motivation. My solutions to appeal to users’ sensory and emotional responses by creating surprise include: utilization of unpredictable, poetic and playful juxtapositions of concepts; usage of unique, ambiguous and intriguing visual forms and sound

elements; and simultaneous natural interactive behaviors. When the users' motivation is invoked, they are ready to passionately participate and interact with the system.

B. Continuously engage participants' concentration by encouraging their physical movement.

Once invoked participants' curiosity, it is important to continuously engage them by tapping into their existing interests and desires. Participants' physical interactive behavior should be translated fast enough to the context they perceive as instant feedback; their mental discoveries should be responsively reflected along the entire process of physical interaction simultaneously.

C. Usage of cinematic vocabulary.

Incorporating dynamic interactive video in the system can be particularly applicable when the participants interact with imaginary objects, scenes, or illusive environment. Motion, can be utilized as an indispensable approach to transform visual and audio elements, more importantly, it can inspire and guide participants' interactivity by evoking their cognitive and sensory responses.

1.3 Personal Experience Plays the Leading Role When the Users Interact with the System.

Different users coming from different backgrounds have different interpretations of the context, thus their emotional feedback towards the experiences will vary. However,

wherever they came from, the users should feel that both the emotional changes and the experiences are their own. The designer's role is to plan ahead and design the experience, not control and manipulate it.

2. What's in the Future?

Both "Live Painting – Bamboo Garden" and "On Your Way – Blow Away the Myth of Illusion" are fully functional hardware and software systems. Based on these two existing systems, the first possibility I intend to explore in the future is participatory installation in art galleries. One of my original intentions to create "Live painting – Bamboo garden" project was to encourage viewer's physical and multi-sensory participation as they enjoy paintings by bringing the prime ingredient of new media – interaction into traditional art domain. Building the installation in art galleries will be a great real life opportunity to challenge the viewer's role, and inspire them to rethink their relationships with the art works.

Another possibility is to exhibit both the two projects in the Optical Illusion section of Boston's Museum of Science. During the one-year internship I spent in The Museum of Science, I asked myself repeatedly how do the best exhibits reach the goal of education effectively. I found that the most successful exhibits demand physical interaction from the user such as rolling the balls, switching

the blocks or even jumping up and down, etc. Both my installations have the potential to attract a visitor's attention, stop them to interact physically, and experience the magic power of visual deception.

Last but not least, I would like to explore the possibility of collaborating with academic environments. With the open source approach, I can envision making both platforms available to students and other designers who are interested in the new media domain.

3. Final Thoughts

My projects focused on using dynamic illusion as indispensable approach to communicate in digital environment has taught me so much about the digital medium, interaction, and the creative process.

My reward comes not only from the final projects, but more importantly, the tangible experience of going the entire process, keeping an open mind to all the possibilities, and being persistent. I am so grateful to have this invaluable experience. I will continue to explore the vocabulary and role of dynamic illusion in the interactive environment after graduation.



Preliminary Thesis Project Explorations

Distorted Room

Dynamic Fashion

Shape Recognition

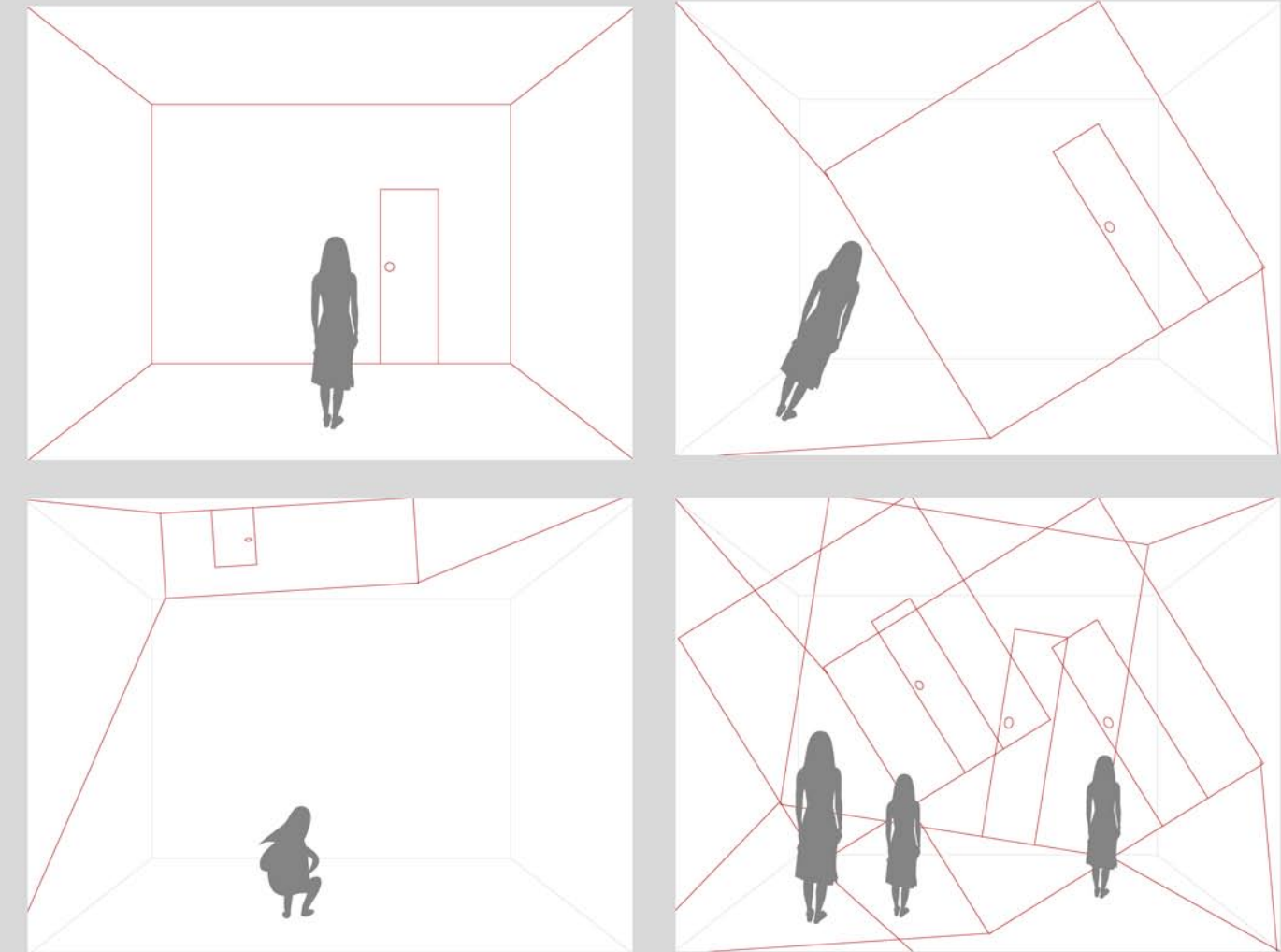
Multiple Perspectives

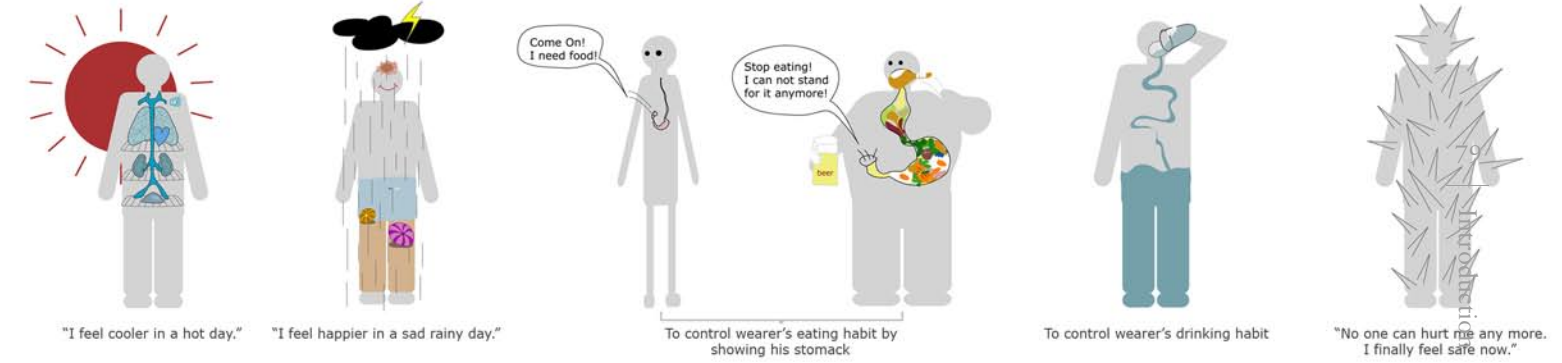
“Got You”

Love in Photoshop

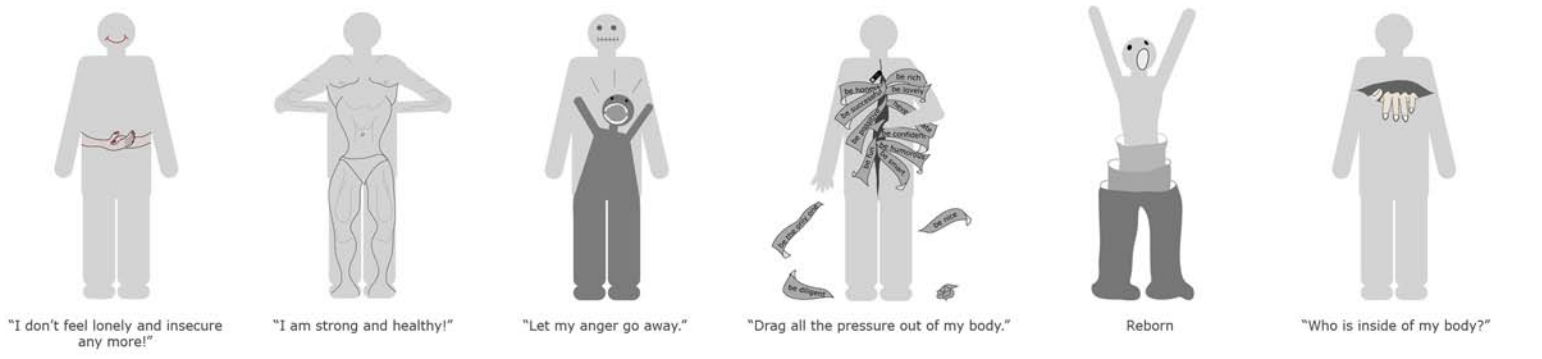
Distorted Room

With the intention of creating a playful and intriguing experience, I envisioned creating a virtual room that projected a scene with false perspectives in a physical space. The player's task is to push the door and get out of that virtual room. However, the virtual perspective is changing as the player moves, if the player turns to the right, the door moves to left; if the player jumps, the door moves to the ground. Ultimately, it is impossible for the player to finish the task based on his/her knowledge of correct perspectives.

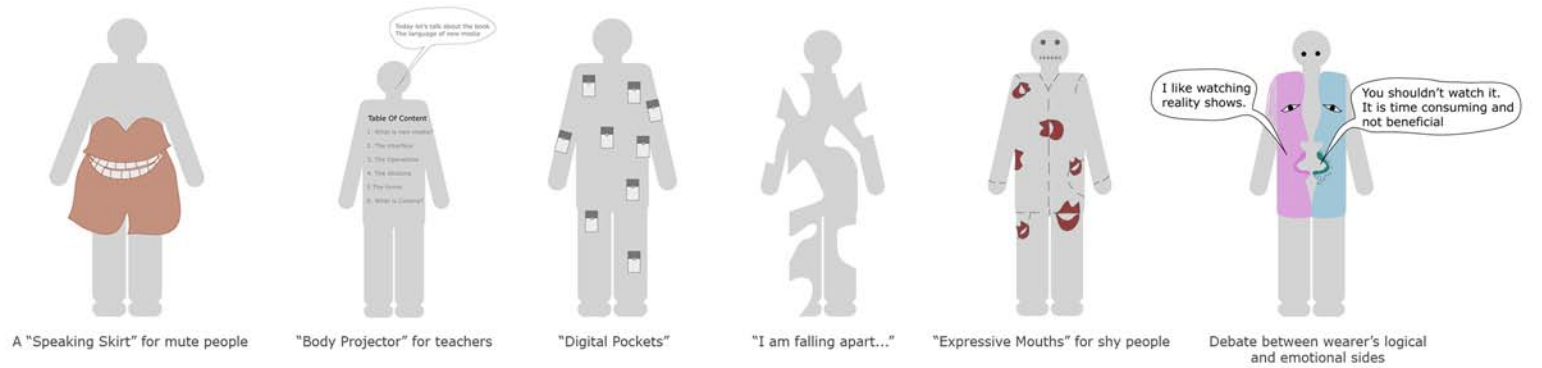




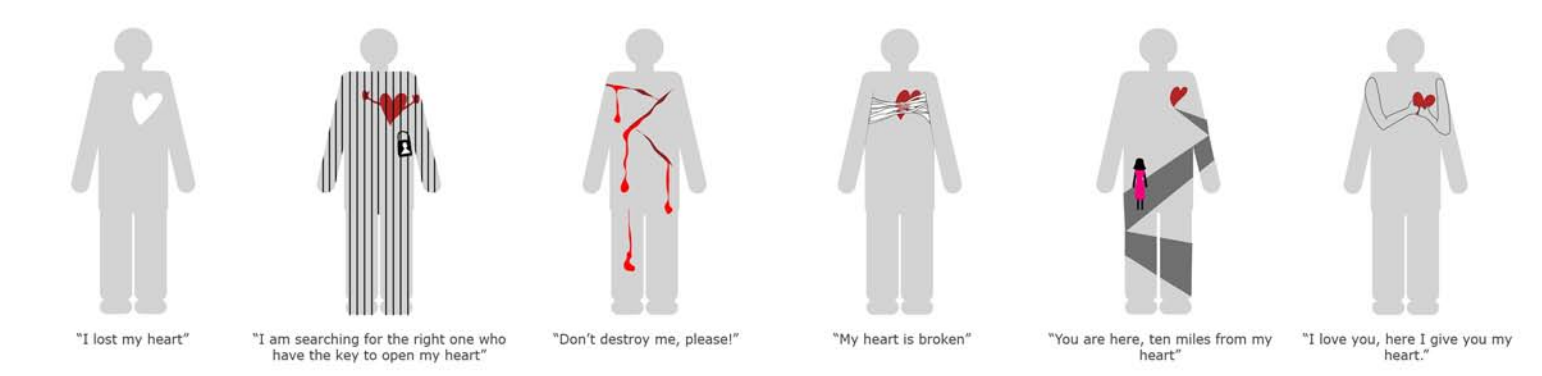
"I feel cooler in a hot day." "I feel happier in a sad rainy day." To control wearer's eating habit by showing his stomach To control wearer's drinking habit "No one can hurt me any more. I finally feel safe now."



"I don't feel lonely and insecure any more!" "I am strong and healthy!" "Let my anger go away." "Drag all the pressure out of my body." Reborn "Who is inside of my body?"



A "Speaking Skirt" for mute people "Body Projector" for teachers "Digital Pockets" "I am falling apart..." "Expressive Mouths" for shy people Debate between wearer's logical and emotional sides



"I lost my heart" "I am searching for the right one who have the key to open my heart" "Don't destroy me, please!" "My heart is broken" "You are here, ten miles from my heart" "I love you, here I give you my heart."

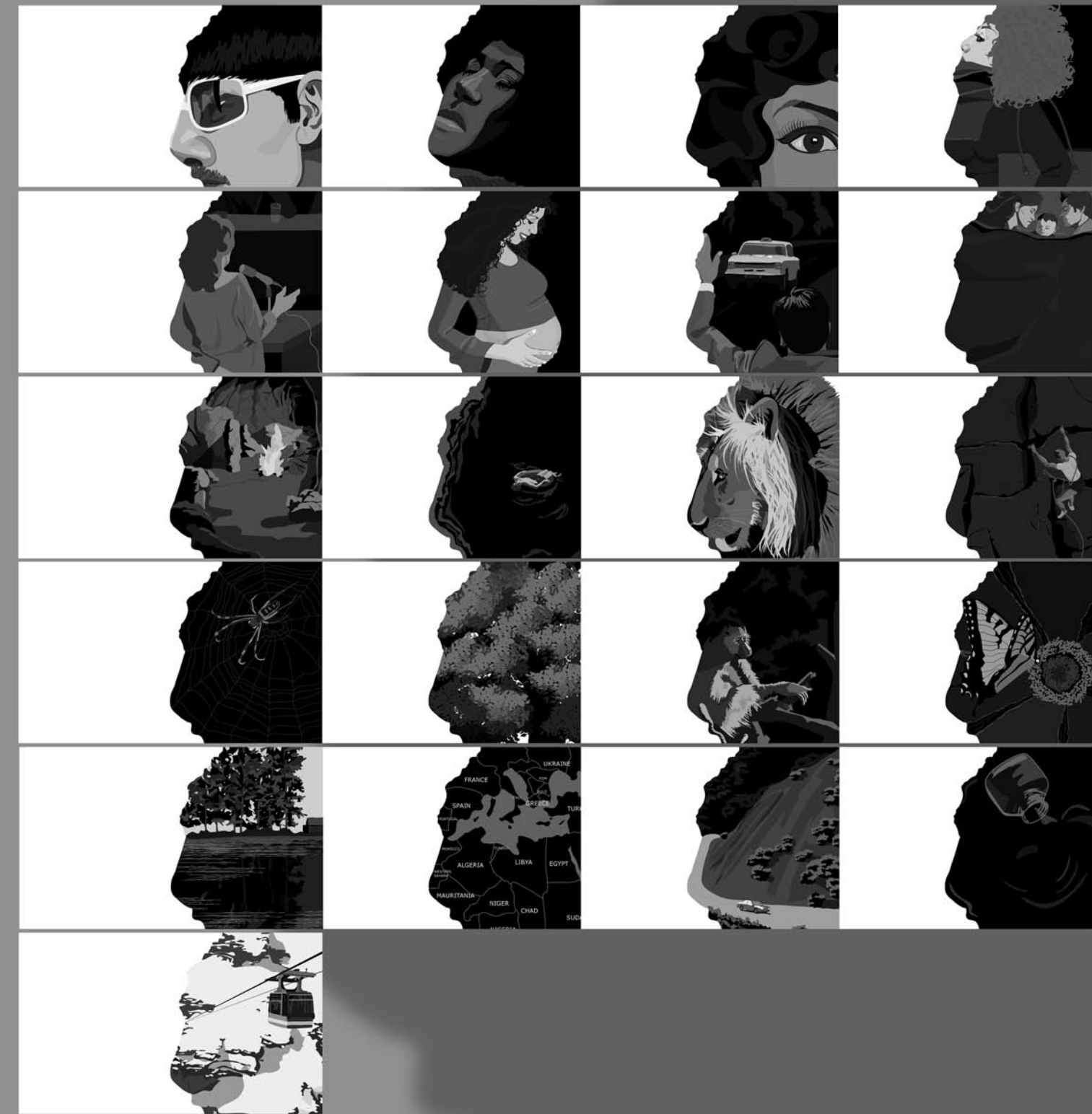
Dynamic Fashion

Multiple types of animals have “dynamic skin” which allows them to change their appearance such as color and pattern according to their need or the changes of the circumstances in order to survive. We human beings also have our “second skin” – clothes which attach to our body. The elements of clothing such as size, color and pattern not only reflect the wearer’s tastes, personalities, mood, and status in society, but also influence him/her in daily life. As new media designer, my intent was to rethink the role of clothing played in our daily life and explored the great potential of how clothing benefits the wearers by utilizing digital medium. I created dozens of conceptual prototypes for dynamic and interactive clothing in which visual elements such as color and pattern could be modified by mental, emotional, behavioral, and environmental factors.



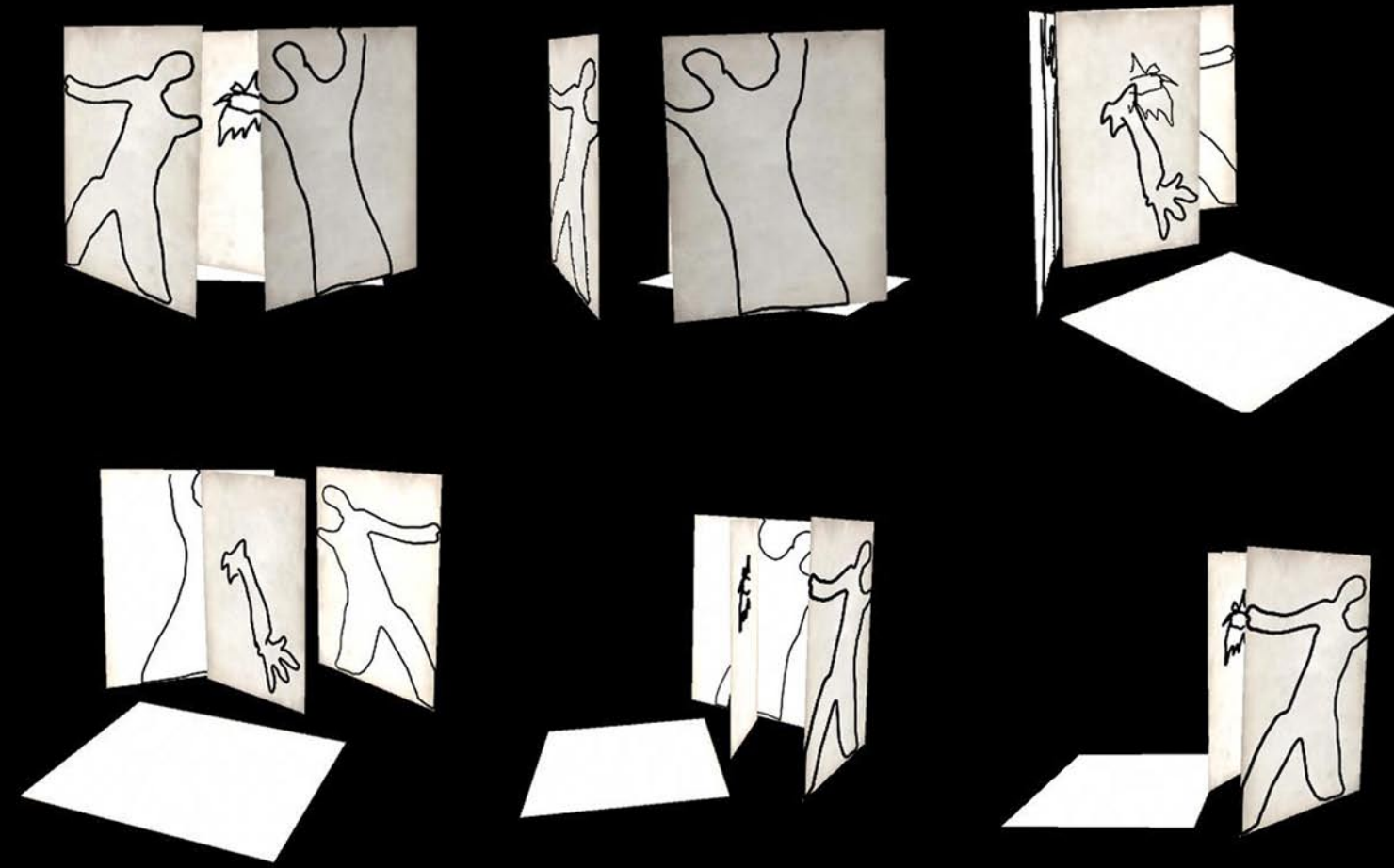
Shape Recognition

This was a form study I created to challenge the potential of the multiple meanings of a silhouette. My methodology was to create a silhouette, and then filled within different contents. Illusion occurs as the meaning between the indication of the silhouette and the specified content is different. For the first exercise, I illustrated a women figure's silhouette, and then filled out with seven different contents. For the second exercise, I chose a more abstract shape and filled out with twenty-one contents. It was a surprising experience to discover that a simple shape could have such many interpretations. This visual approach was the major inspiration for the case study "On Your Way – Blow Away the Myth of Illusion".



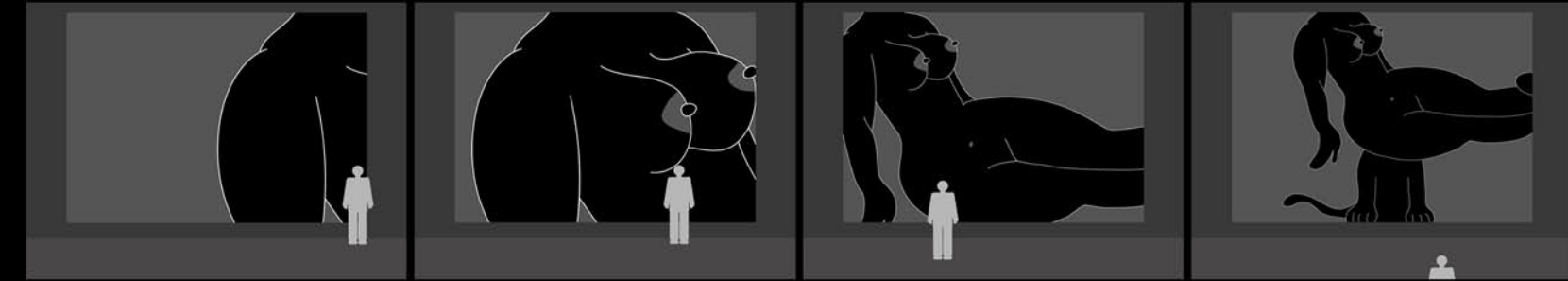
Multiple Perspectives

Emerging from the first case study “Live Painting – Bamboo Garden”, my concept was to create a narrative by using multiple perspectives that required the viewer’s physical movement. I envisioned creating a digital sculpture by hanging multiple digital screens in a physical space. The viewers can only perceive certain amount of context from different point of view.

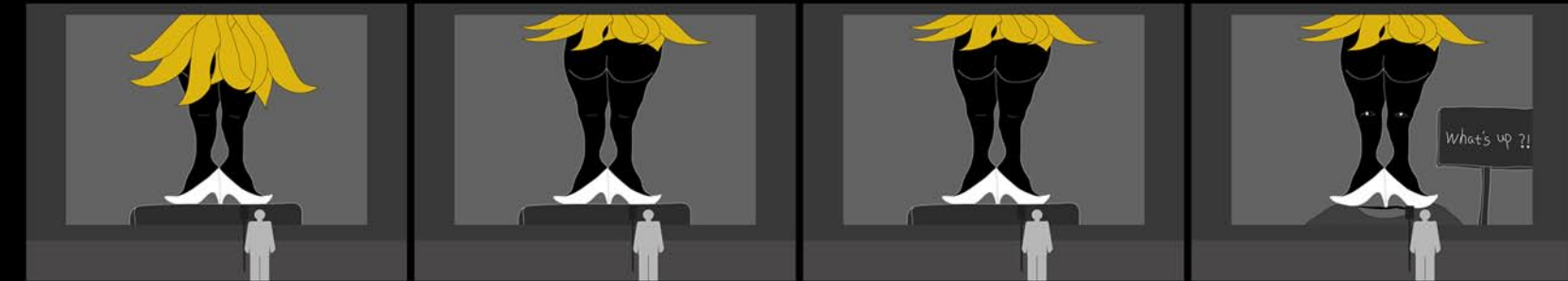


“Got You”

“Got You” was an installation concept focused on deceiving the viewer in a playful way that included three pieces. My intent was to create contexts that deceive the viewer visually. The viewer could only find out the truth by involving his/her physical actions such as moving or blowing.



A woman or a dog?



Skirt or a man?

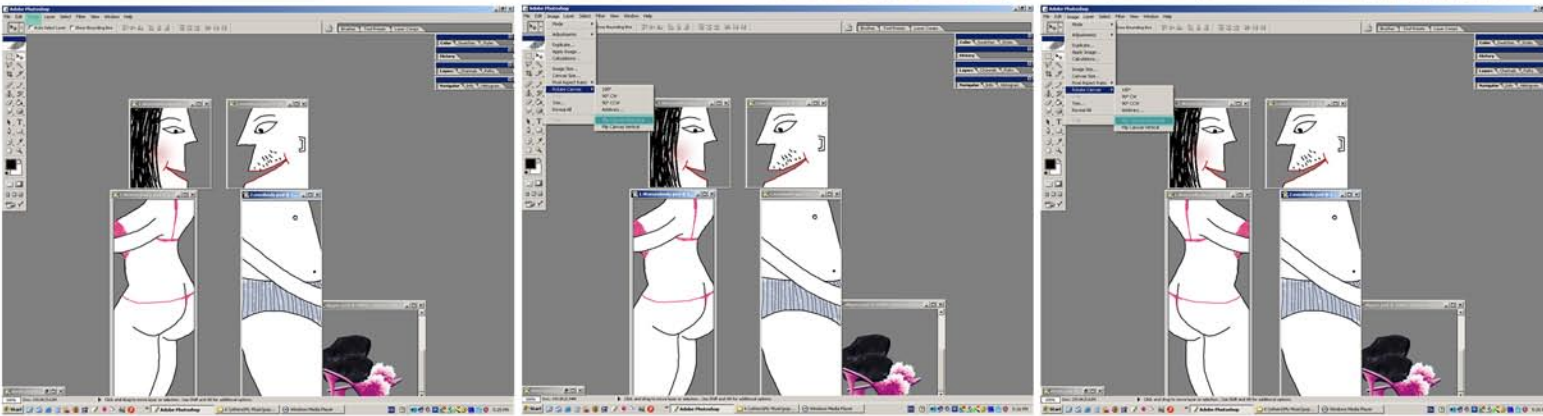
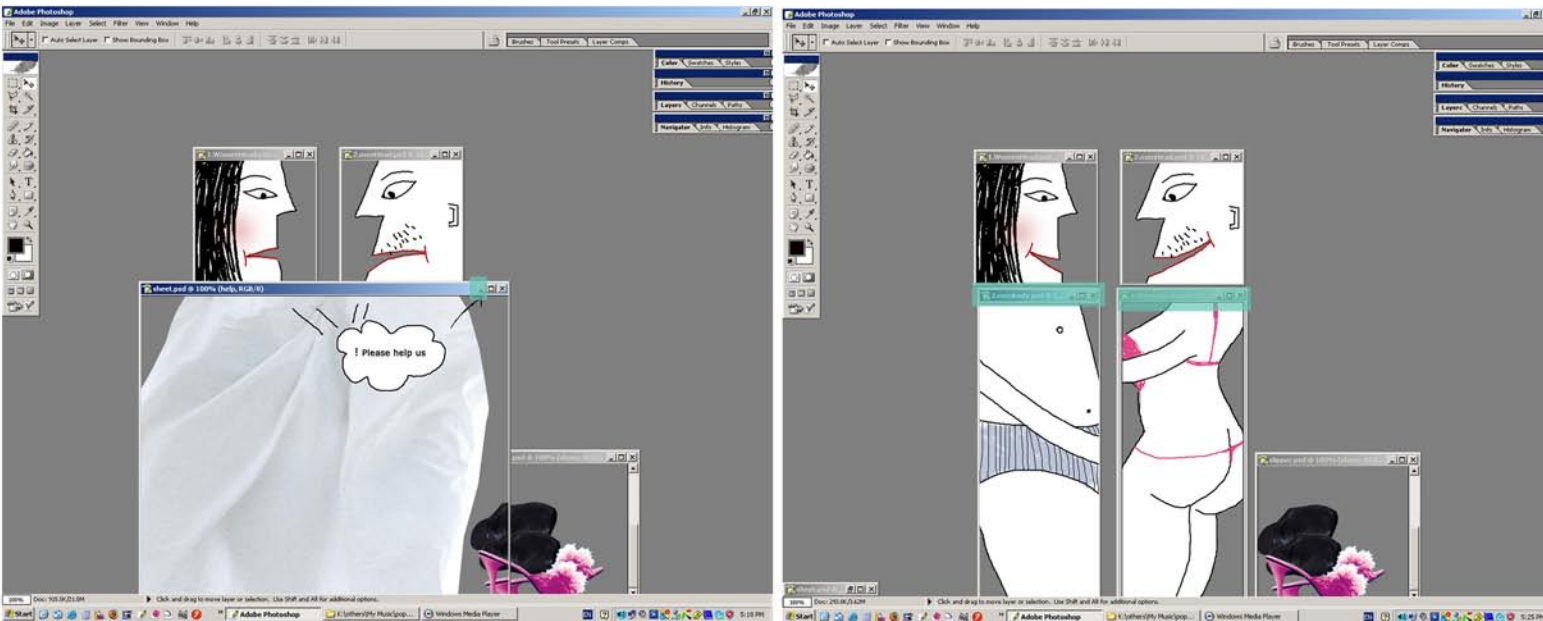


Porn or corn?

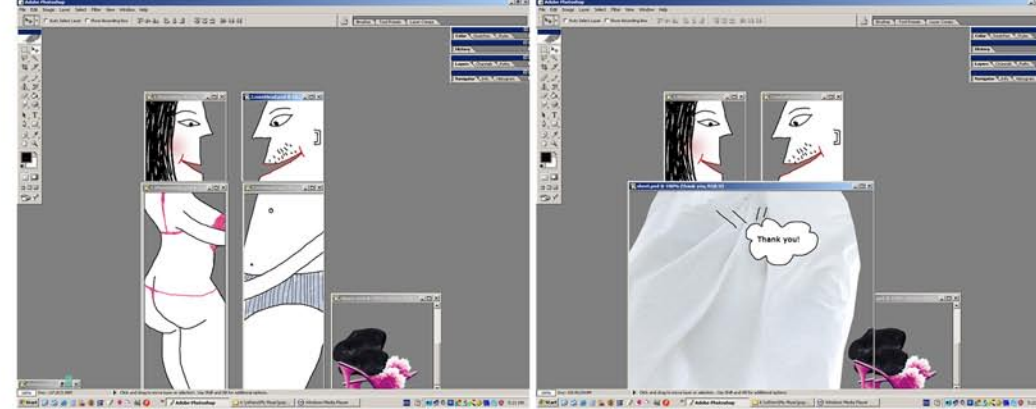
Relevant Past Projects

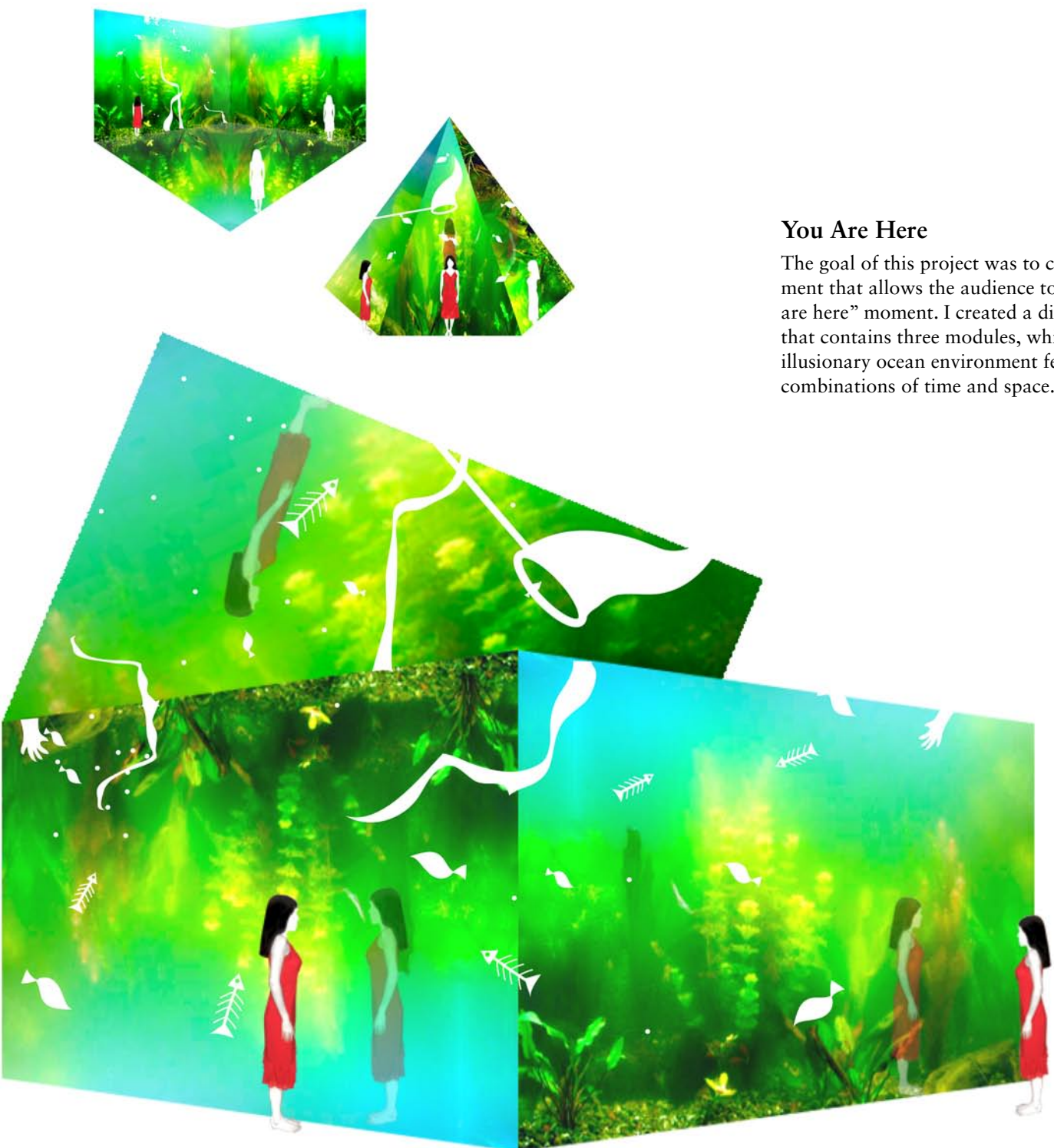
Here, I present some of the projects and ideas I completed during the past one and half years in DMI. All the projects serve as the foundation and the platform of my thesis studies.

- You Are Here
- Anticipating Running Machine
- My Board and Magic Board
- Light Workshop – Strength of Life
- My Album
- Media Star
- Art Map
- O's Journey
- Modern Anxiety
- Visualization of Sound



Love in Photoshop
This was a humorous interactive narrative I created to experiment with multiple windows. The user could see how the scenario continues by manipulating several screens in Adobe Photoshop.





You Are Here

The goal of this project was to create an environment that allows the audience to experience a “you are here” moment. I created a digital prototype that contains three modules, which produced an illusionary ocean environment featuring multiple combinations of time and space.



Anticipating Running Machine

My intent was to create a playful, enjoyable environment for users who work out in gymnasiums. As an anticipatory system, the running machine could anticipate the appropriate running intensity for different users by analyzing their physical condition and exercise history. The content projected on the screen in front of the machine was customized and modifiable by different users. For the first prototype, a runner could see her own images running at both the current and the previous speed. For the second prototype, a group of females who enjoy shopping compete with each other. The faster they run, the more fashion boutiques would “fly” into their shopping bags.



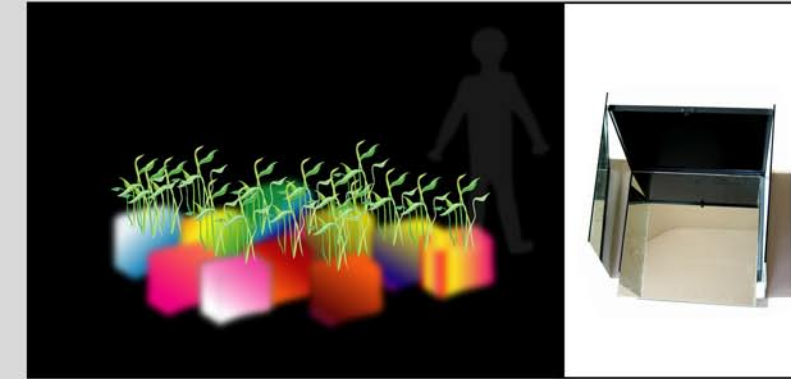
My Board

“My Board” was a prototype designed for assisting 6-year-old children to draw playfully through multiple ways by integrating it with different functionalities such as drawing, recording memory, documentation, learning and communication.



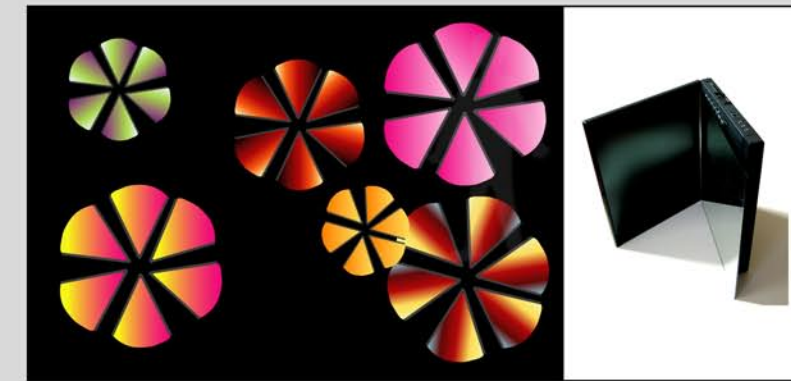
Magic Board

Based on the previous project, “My Board”, the “Magic Board” was a prototype design that provides the kids (age range from four to six) a platform for mark making, drawing basic shapes, and giving meaning to the shapes. The inspiration came from my own drawing experience; creativity, mental growth in children; and theory of ambiguous structure – the meaning of the shape is dependent upon the way you observe it and the environment to which it belongs.



Light Workshop – Strength of Life

With the intention of encouraging patients in the hospital to fight disease with positive attitude, I built two digital sculpture prototypes that used computer screens as a light source. For the first prototype, I made multiple light boxes by covering the notebooks with translucent materials, and then installed plants on each boxes.

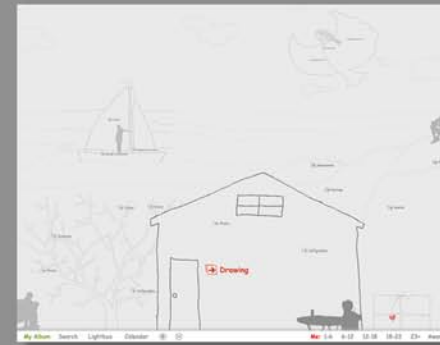
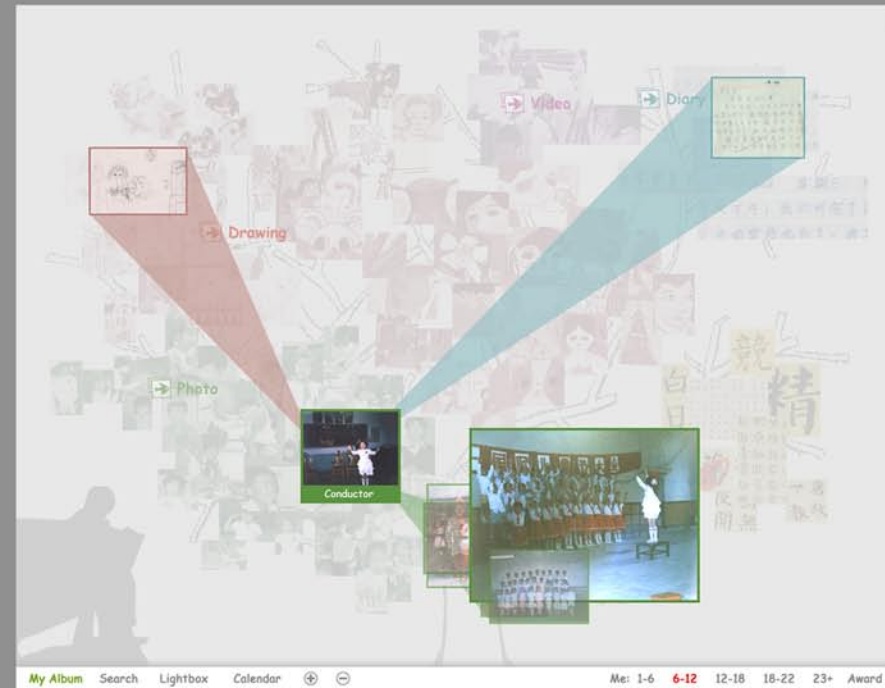


For the second prototype, I took notebook as metaphor of flower paddles and created the illusion of dancing flowers.



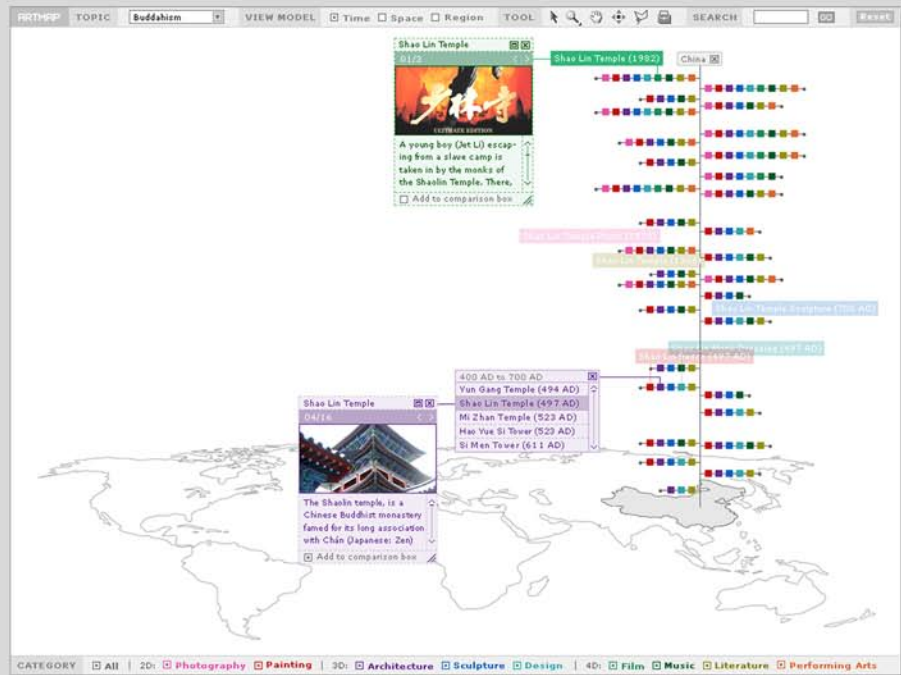
My Album

This was an interface designed for helping users build a photo album that holds their memory by collecting dynamic elements, such as photo, image, diary, text, video, and sound.



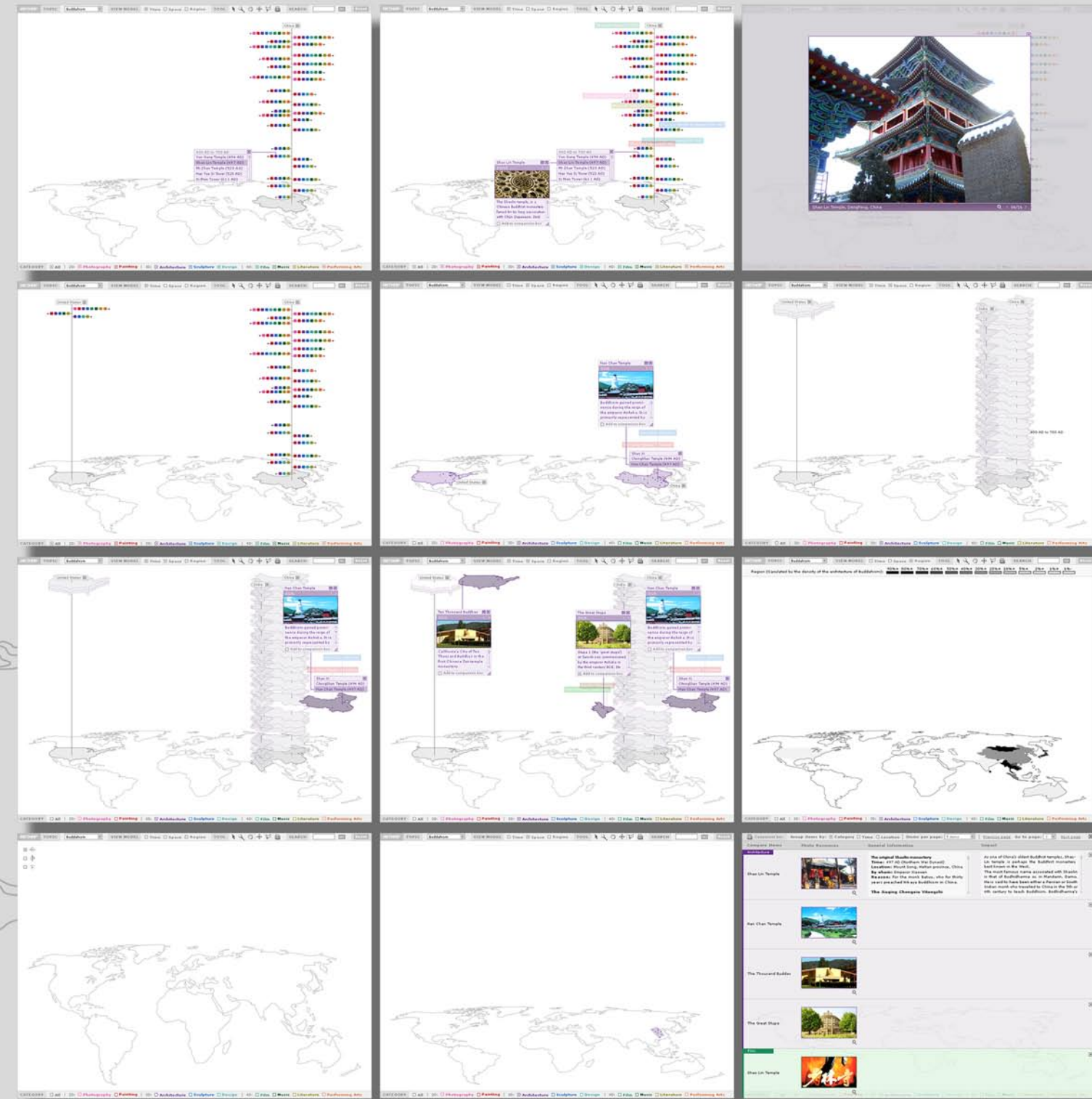
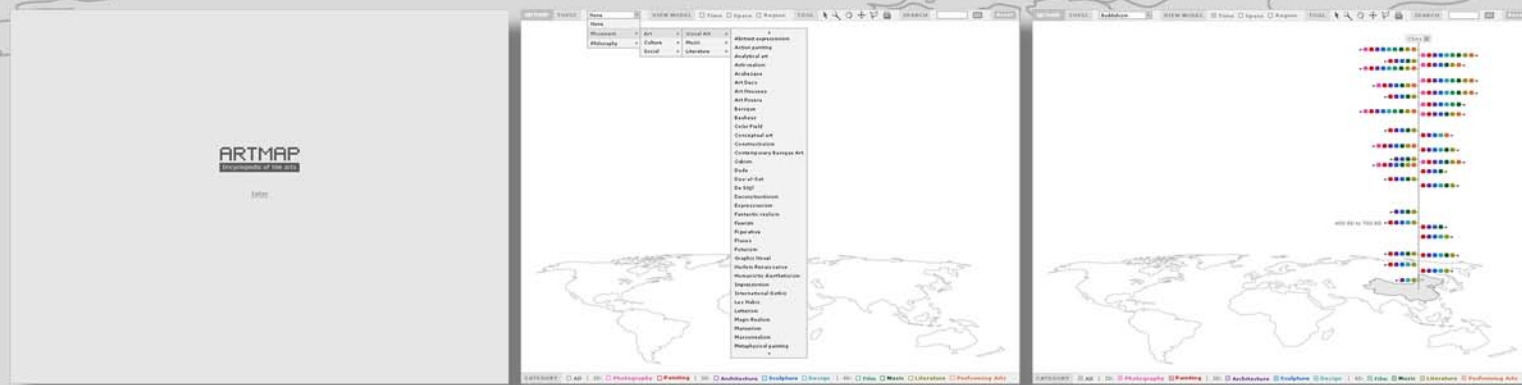
Media Star

As an encyclopedia of the new media objects, “Media Star” was a platform for designers to discuss new media objects from the following perspectives: purpose; quality; experience; interface; social, culture, art, science and philosophy impacts. For the interface design, I used constellations, stars and meteors as metaphors to organize large amounts of data in a playful way.



Art Map

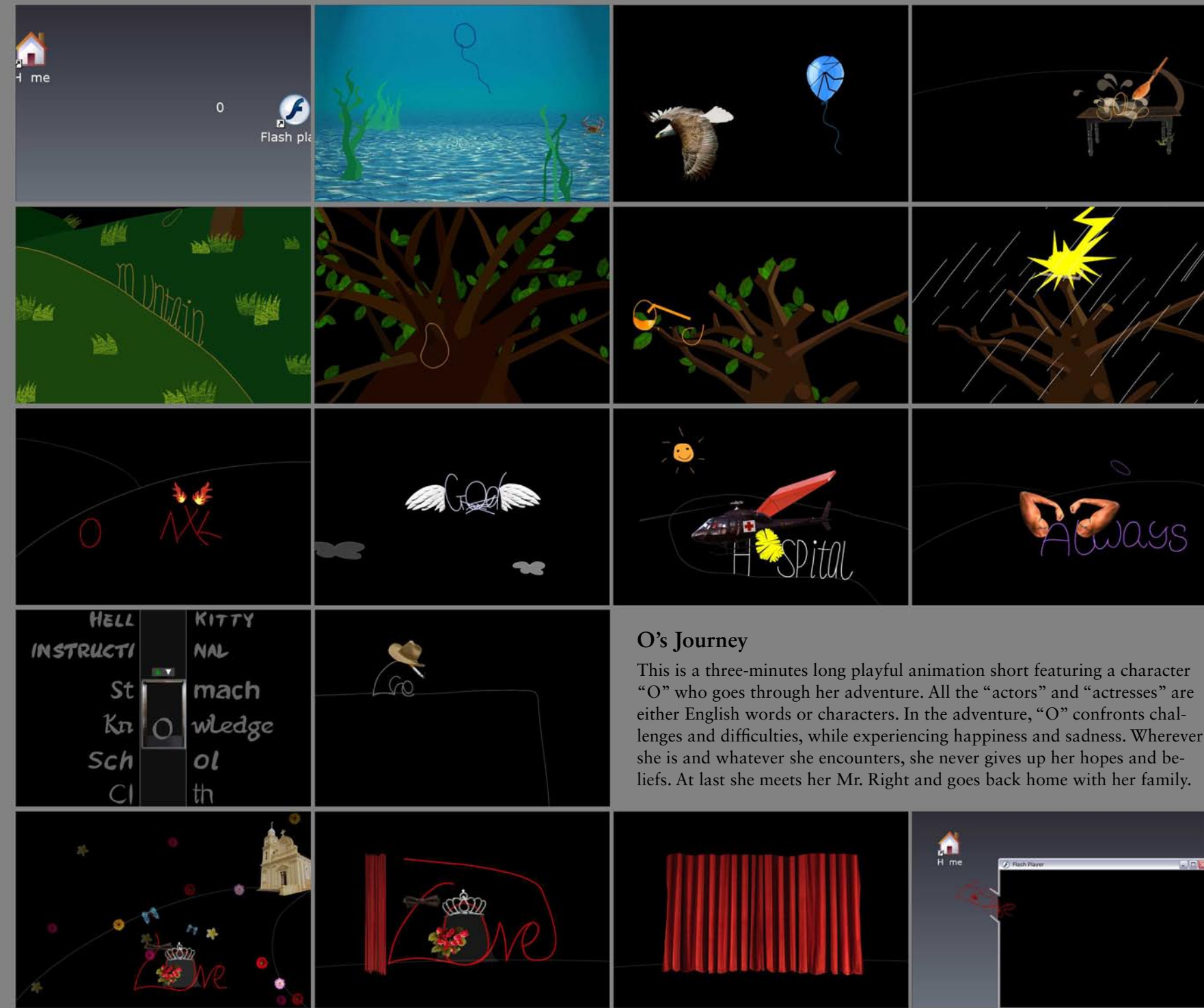
Targeting at all levels of researchers, “Art Map” is a dynamic digital holistic encyclopedia of the arts. Its purpose is to explore the wide range of interconnections of art world. The challenges of the project include: filtering complex data, structuring hierarchy clearly and efficiently; allowing users to experience the different cultures and art works through relation and contrast; representing the rich visual world of experience and measurement (dynamic, multidimensional) on the two-dimensional screen; developing an intuitive interactive design; understanding and represent both the importance of the whole and the interdependence of its parts; and challenging the traditional understanding of a map.





Modern Anxiety

This is a poetic montage video piece I created to represent the experience of being anxious when facing new technology.

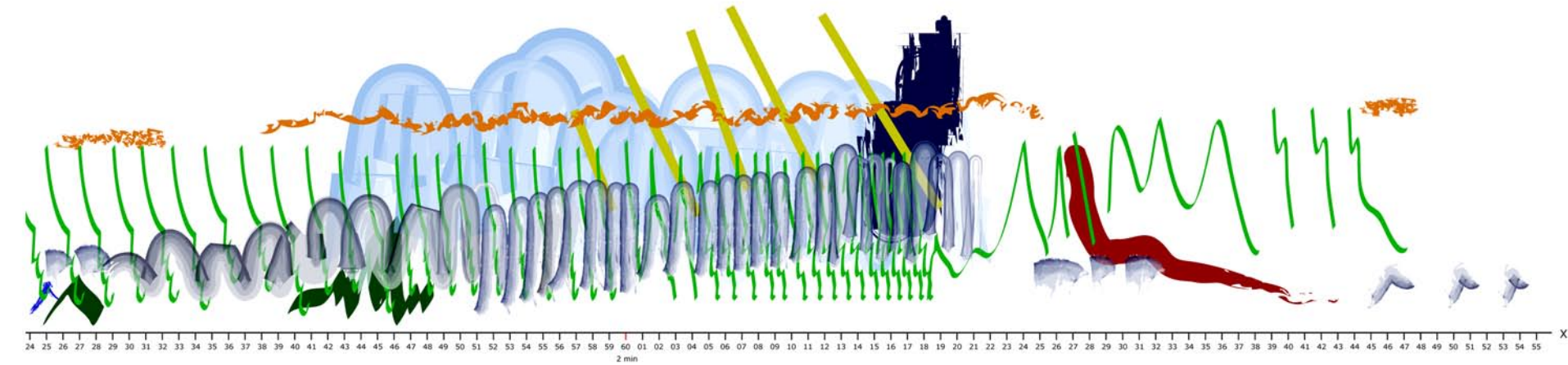
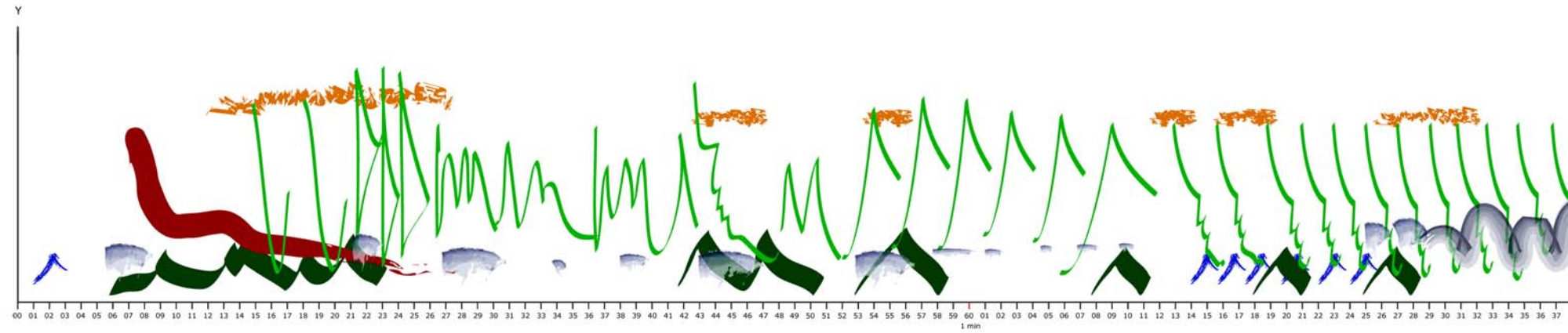


O's Journey

This is a three-minutes long playful animation short featuring a character "O" who goes through her adventure. All the "actors" and "actresses" are either English words or characters. In the adventure, "O" confronts challenges and difficulties, while experiencing happiness and sadness. Wherever she is and whatever she encounters, she never gives up her hopes and beliefs. At last she meets her Mr. Right and goes back home with her family.

Visualization of Sound

The goal of the project was to create visual representation of sound, pace and rhythm by utilizing music and cinematic vocabulary. I composed the sound piece by manipulating the sounds of bell, water, lightning and instruments. Then I analyzed the sequence by illustrating a diagram, and visualized the sequence by adding motion elements into my own paintings with multiple visual methods such as movement, transformation, transparency, grouping, contrasting and layering.



Lenth: 2' 55"

X: time

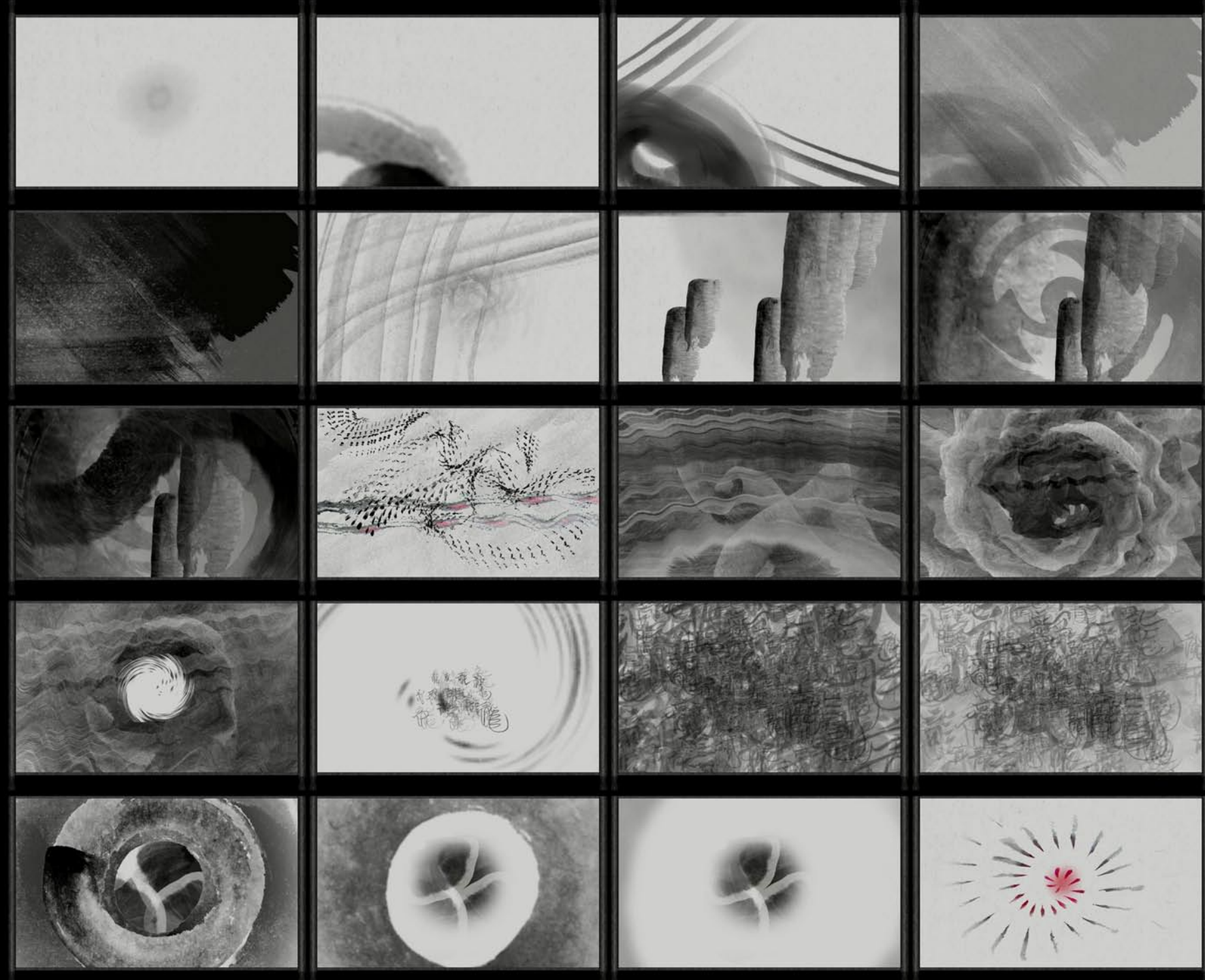
Y: relative frequency

GuZheng:

Water:

Bell:

Lightening:



Form follows function – that has been misunderstood. Form and function should be one, joined in a spiritual union.

— *Frank Lloyd Wright*

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2. Online Resources

René Magritte Museum: www.magrittemuseum.be

Istvan Orosz: www.utisz.net

Sandro Del Prete: www.del-prete.ch

Bill Plympton: www.plymptoons.com

Nam June Paik: www.paikstudios.com

Krzysztof Wodiczko: <http://architecture.mit.edu/people/profiles/prwodicz.html>

Paul Sermon: www.paulsermon.org

Bill Viola: www.billviola.com

David Small: www.davidsmall.com

Golan Levin: www.flong.com

Camille Utterback: www.camilleutterback.com

Han Hoogerbrugge: www.hoogerbrugge.com

ART + COM: www.artcom.de

Antenna Design: www.antennadesign.com

MIT Media Lab: www.media.mit.edu

UCLA Design and Media Art: www.dma.ucla.edu

Media Art Net: www.medienkunstnetz.de