

kate nazemi

through hand, through mind

*multi-sensory approaches to form,  
interaction and language through  
objects and dynamic media*



Thesis documentation submitted in partial fulfillment of the requirements for the degree of Master of Fine Arts and approved by the MFA Design Review Board of the Massachusetts College of Art.

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Jan Kubasiewicz  
Coordinator of Graduate Design Program  
Dynamic Media Institute  
Massachusetts College of Art

---

Joseph Quackenbush  
Assistant Professor  
Massachusetts College of Art

---

George Creamer  
Dean of Graduate and Continuing Education  
Massachusetts College of Art



There are many DMI faculty I wish to thank. Thank you to Jan, my devoted advisor. We've had many invigorating discussions over the years. I've learned so much from your teaching, and appreciate your candor and support. Thank you to Joe, a wonderful wordsmith and visual thinker. A special thanks to Gunta, whose teaching and course, *Design as Experience*, influenced the direction of this thesis. And to Brian, who always encouraged me to take the risk.

I was always touched by the continued support of MassArt faculty outside of DMI. Thank you to Fred for working with me tirelessly on my electronics and programming projects. And to George for his friendship and support.

This thesis is dedicated to my husband Jon, whose programming expertise and patience made this thesis possible, and to my uncle Will for his generosity and support. Thank you both so very much.



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## abstract

In order for design to communicate, it must relate content through the senses. By interacting with design – being able to handle, hear, see and change it – we arrive at our own understanding of it. In this way design leads to a form of knowledge that is affective, immediate, and visceral.

The focus of this thesis is on developing communication through the hand, the senses, and through the mind, simultaneously through sight, sound, touch and motion. This is made possible through the unique qualities found in objects and dynamic media.

An objects ability to communicate openly through synthesized communication channels is explored through structured interactive environments where physical responses are explored. The case studies put forth in this thesis explore this through the investigation of the concepts of form, interaction, and language.



## introduction

Spring 2000. I was living in Washington DC. My mother was in town for a visit, and we went for a tour of the modernist wing in the National Gallery. In front of us was a painting. It was brightly colored, an abstract collage with lots of texture. “Stuff” my mom called it. We stood and looked at it for a while. We conversed about use of texture, which included ephemera like seeds and sawdust I believe. As we inched closer and closer to the painting, it was clear that words were not enough. We needed to feel it, to absorb it through our skin, in order to experience it. We simultaneously reached out and touched the painting. It was during this moment of contact, that we had an immediate, somatic response – one that no longer required verbal language to communicate the experience. This memory reminds me of my desire to develop immediate and affective communication.

As new media concepts influence the direction of communication design, the questions: *What does the space where meaning is made look, sound, feel and move like? And, How are connections and relationships established in it?* beg a fresh approach.

This thesis investigates these questions by looking to the space of the physical and digital for answers. It is here where I discover communication that reflects the human condition – communication that is visual, aural, tactile, material, kinetic, temporal and interactive. These discoveries come from constructing sensory environments using objects and dynamic media.

This thesis is structured in three parts, beginning with this introduction and the questions that follow. The following section, *Theory of Objects*, details how objects communicate. An objects communicative qualities are then defined through researched examples. It also addresses a particular form of knowledge obtained from objects in interactive environments. The most comprehensive section, *Case Studies*, documents seven case studies through a discussion of form, interaction and language. An introduction to these concepts precedes each case study. Each concept category contains two or three case studies.

What are you investigating in your thesis?

*I'd like to further introduce you to my thesis with the following questions:*

The communicative potential of interactive objects and how they inform experience. Specifically, how objects deliver a poetic experience simultaneously through sight, sound, touch and motion. By objects, I mean something that was purposely built to allow individuals to intuitively examine an idea by physically interacting with it. In my work, media includes the study of sound and motion as they relate to form, interaction and language. Together, the qualities of objects and dynamic media create attentiveness to experiences had in hand and mind.

What about the interactive experience?

The user is very much a part of my investigation. My work can't live up to its potential unless participation, typically occurring in the hands and through gesture, takes place. Malcolm McCullough, professor of Architecture at Harvard University and author of *Abstracting Craft*, summarizes well why using our hands is important. Speaking of hand-held tools, he states that a tool "requires your participation, and for that reason it engages your imagination...it serves a specialization" In other words, a unique object whose form and function are specific to the content being communicated requires active involvement to create meaning. This is how a participant is engaged in my work, and is critical to understanding why interacting with objects can facilitate learning.

You describe your work as being concerned with the poetic. What does that mean?



There are two types of experiences that can be had with objects: the literal and the poetic. While the literal interpretation of an object is limited to a specific outcome (I use this hammer to place this nail into the wall), the poetic one, appeals to the broader human experience through a range of senses – sight, sound, touch, motion – thus increasing the likelihood that the experience will stick. In doing so, it leaves room for personal interpretation and reflection. Of course, this all depends on context and individual frame of mind. For example, you could have a poetic experience while hammering a nail into the wall if something about that activity afforded you the opportunity to transcend it (the cracks that form as a result of hammering remind me of a beautiful dry mud flat). An objective of this thesis is discovering the poetic qualities of objects and dynamic media that allow for individual exploration and learning to occur.

Can you give an example of the poetic?

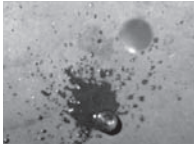
In my first semester I created a sculpture that, by pulling out the contents of a soft head made of leather, revealed the delicate and complicated process of giving voice to an internal thought. The raw and course texture of the materials being pulled out, together with subdued grumbling sounds, communicated the unrefined and muted voice directly in your hands. Thus allowing us to learn through the body what we couldn't through voice alone. (See case study *InsideOut* on page 65).

How did you get interested in objects and media?

I've always had a deep connection with objects. An object that can be touched and affected by me in real time and space gets my attention. Intuitive examination of an object allows me the space I want for my own interpretation. I feel this kind of direct and emotional involvement in life is critical to the development of society, especially at a time when indirect forms of communication are becoming the norm. In terms of investigating the expressive qualities of dynamic media, I am fascinated with the emotive qualities of sound used in combination with objects, and with the computers ability to absorb and respond to human stimulus.

What's the context for work like this?

Many terms are used to describe the integration of physical and digital. These include hybrid object, interactive sculpture, tangible bits, and TUI (tangible user interface). Many people of diverse educational backgrounds are involved in this work, from artists, designers, and architects, to philosophers, computer scientists, and engineers. Most of the work being done is very experimental and tends to assign special importance to the technical and interactive qualities over the aesthetic, emotional and symbolic meaning. I think this emphasis takes away from the humanity and emotionally powerful offerings of hybrid objects. Much less extensive research has been done into how objects and dynamic media function on a poetic level to facilitate personal exploration and learning. This is the focus of my case studies.



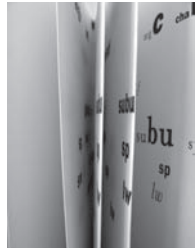
*icewatervapor*  
p. 41



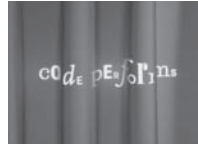
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# objects

The American Heritage Dictionary defines an object as “anything perceptible by one or more of the senses, especially something that can be seen and felt. Anything intelligible or perceptible by the human mind.”

Visible to the eye, audible to the ear, and touched by the hand, an object communicates in so many ways. In my work, communicative considerations such as size, shape, weight, scale, material, texture, time, motion, sound and interaction are the basis from which an object develops. An object can exist in physical space, for example a sculptural form like my leather head (p.65) and it can be something digital, for example dynamic words projected on material (p.83). The point being that the term “object” implies something that can be manipulated through immediate, intuitive, and process-oriented interaction. I use objects to communicate because they take advantage of all of our senses while engaging us physically and intellectually.

For centuries prior to the introduction of the most generalized object: the personal computer, people used specific physical objects to make, measure, predict, calculate, communicate and perform. Hiroshi Ishii writes, “Through grasping and manipulating these instruments, users of the past must have developed rich languages and cultures, which valued haptic interaction with real physical objects.” It’s ironic that today’s communication technologies are taking us in the opposite direction, for the largest benefit of these specific objects was the process oriented and intuitive examinations had through physical interactions.

It is in part due to my background in print design and sculpture, where physical form is emphasized, that I bring these core ideas to the study of dynamic media. However, it is with instinct and intuition that I began my investigation of physicality and materiality in dynamic media.

## ELEMENTS OF OBJECTS IN COMMUNICATION

The ways in which an object is perceived and experienced is determined by how certain design elements are used. As described through contextual example, the visual, aural, tactile, material, kinetic, temporal and interactive properties of objects are de-



*Visual*  
FT Marinetti  
*Zang Tumb Tumb*  
1989



*Aural*  
*Listening Post*  
Mark Hansen and Ben Rubin  
2004

scribed. This discussion is followed by a section on how objects communicate in ways that lead to a form of knowledge that is affective, immediate, and visceral.

### *Visual*

Using words and imagery to represent ideas through visual elements – color, tone, contrast, rhythm, scale – is perhaps best exemplified in the domain of graphic design. Here communication is mediated through discrete physical objects like a book, advertisement, or poster. Articulately produced through juxtaposition of word and image, these objects mediate content through visual elements.

I am fascinated with the idea of language as material, an investigation that began with the Futurists movement. In his poem *Zang Tumb Tumb* Marinetti explores the visual elements of weight, line, scale and position in typography. He objectifies language by creating a composition where words are valued for their visual and aural properties rather than syntactic. Here, Marinetti states that “Language was to be atomized, exposed of its roots, and recognized as a material event. Layout, scale, and visual-verbal juxtapositions were directly to evoke emotions rather than merely describe them.”

### *Aural*

The most profound experience I have ever had with sound came while working on my project *icewatervapor*. For months I hung small round ice forms from the ceiling and watched in silence as they slowly melted. It was an incredibly meditative experience. I observed the ice quietly, and it melted quietly. I recall the first time I paired a water drop with the note of C on the keyboard. The experience of seeing that drop of water actually look different when juxtaposed with sound was transformative. When just a single sound was added to the event, the water drop looked different: it was jellylike, had a thicker consistency, it was larger and heavier. This experience taught me the intense communicative impact sound has with an object. (for more on *icewatervapor* see p.41)

An objects ability to communicate through sound – through variations in tone, pitch, pattern and emotional range (elements explored in my work) is illustrated in *Listening Post* by Mark



*Tactile*  
Tod Machover  
*Toy Symphony: Music Shaper*  
2003



*Material*  
Ann Hamilton  
*Capacity of Absorbtion*  
1989

Hansen and Ben Rubin. Their installation is a visual and sonic response to the magnitude and immediacy of online communication. It explores simultaneity through vocalizations in varied pitch and tone that reflect change in the content of the electronic messages. Rich low tones slowly build and layer over time to lull the audience and create a somber and reflective mood. Overlapping sounds transform the virtual landscape into a multi-dimensional space. The composed sounds represent the rhythms associated with online communication – they are layered, they are present and absent, they come in waves and they crawl, they are singular, they are multiple, they form a pattern, they form a repetitive pattern.

### *Tactile*

Tangible qualities of objects make use of physical gestures like pushing, pulling, squeezing, pressing and so on. By using these physiological elements as vehicles of communication, objects relate experiences through the body. I came across a wonderful example of this in 2003 at the National Design Triennial show, *Inside Design Now*. Tod Machover of the MIT Media Lab is a composer of music. His group is devoted to making music tangible, as exemplified in the *Toy Symphony, Music Shaper* project. Here, hand held brightly colored embroidered balls stuffed with electronic sensors are the interface to sound – squeeze the ball and timbre, density and structure of sound changes. Through a simple squeeze, these complex musical concepts are experienced immediately and viscerally. Designed as an educational project to teach children about music, the tangible qualities of *Music Shaper* put children in the place of learning by doing.

### *Material*

Materials communicate through texture or quality of surface. Some qualities of material include the tangible: is the material smooth, coarse, prickly, woven? and the intangible: is the material reflective, flowing, responsive?

Every material has an emotional, aesthetic, and useful value. On the most basic level, materials and humans are both taken from the same substance called matter. Generally speaking, it is this implicit quality that connects us. More specifically, it is the qualities of materials that communicate on an emotional level. For example, the 14-foot-high megaphone in Ann Hamilton's

*Capacity of Absorption* installation is covered with twisted, hair-like flax, a natural and highly sensuous material. It's emotional value comes from the complex wrapping and textured surface created. A material also has an aesthetic value, in the sense that we make use of the fundamental properties of materials. In Hamilton's case, the flax material had great wrapping qualities.

### *Kinetic*

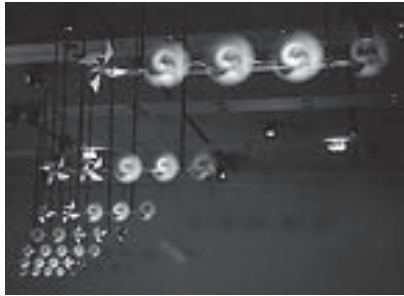
Objects can be in motion, repositioning in time and space to make new compositions and relationships. Viewers can also be in motion, repositioning in time and space to make new relationships to objects. These are two ways that objects can communicate through motion.

Hiroshi Ishii explores kinetic communication using objects seamlessly in what he terms "ambient displays". An ambient display is an object integrated in the environment that monitors information (he suggests natural information like weather) in the natural world through change in motion. An example of this is his project *Pinwheels*. The concept of this project is to use spinning pinwheels to represent the flow of digital information. Mounted to the ceiling, the pinwheels become part of the existing infrastructure and thus conduits of peripheral information. Here, a change in kinetic activity of the pinwheels represents a change in content.

### *Temporal*

An object's ability to communicate through time varies depending on whether it is fixed or dynamic. For example, a fixed form gives the illusion of time through visual elements like dynamic lines and varying weights. Or an object can be a dynamic, transforming before us with immediate and measurable results. Dynamic temporal qualities include the transformation of sound, volume, space, surface and so on, over time. A nice example of this is an installation of Ann Hamilton's that I experienced in 2004 at MassMOCA.

In her installation, *Corpus*, Ann Hamilton transformed the volume of the space with sound, light, and millions of sheets of translucent onionskin paper that fall from the ceiling over the course of the ten-month installation. The machines mounted



*Kinetic*  
Hiroshi Ishii  
*Pinwheels*  
1989



*Temporal*  
Ann Hamilton  
*Corpus*  
2004



*Interactive*  
Antenna Design  
*Cherry Blossoms*  
2003

to the ceiling both hold and release the paper move at the pace of breathing: they inhale to pick up and exhale to drop the paper from the stack. The experience of place is therefore ever changing as the quantity of paper left on the floor transforms over time. It is the temporal quality of change in volume that communicates the passage of time.

### *Interactive*

By engaging us through structured interactive environments where physical responses are explored, objects bring people into contact with the living world. After being introduced to Antenna Design's interactive installations early on in my thesis investigation, I realized the importance of understanding how human behavior influences the interactive experience. Antenna's interactive installations use objects in a way that is performative, imaginative, and lyrical. These qualities create new conceptual explorations and experiences significant to the discussion of object-based interfaces. Principals Masamichi Udagawa and Sigi Moeslinger, state that their philosophy is "to make the experience of technologically enhanced objects and environments more meaningful and exciting."

Antenna utilizes space, sometimes public, sometimes private, by pairing natural human behaviors, like walking, climbing, or breathing with unlikely outcomes, like growing flowers or human forms. In this way, they succeed in relating a technologically driven medium to more human and emotional experiences while addressing the exploratory process of the mind.

Commissioned by and shown as part of the Cooper Hewitt National Design Triennial "Inside Design Now", *Cherry Blossom* was a two story high projection screen installation that occupied the central staircase in the museum. As visitors traverse the stairs, petals float and cluster in relation to the number of people on the stairs, turning everyone into a performer. A greater number of people on the stairs generate more blossoms and therefore greater illumination. Over time the petals fade. And if the stairs are vacant, falling snow appears. Here we find a simple yet elegant metaphor for life: People's movement is a source of warmth and beauty bringing life to the flowers. [Masamichi Udagawa and Sigi Moeslinger]. This concept extends to the interactive realm because it is the user's performance that



signifies life, and the objects response that validates it. Here, we are working together to create this structure, the result of which impacts not only the person who participates physically, but the overall beautification of the public space. It creates interest in its ability to overcome resistance that resides partly with the object itself (as a database, it has its own set of rules) and partly with the audience addressed (our actions reshape the results). Thus establishing a relationship between observer and observed.

#### A DIFFERENT FORM OF KNOWLEDGE

What is it about the process of interacting with objects that leads to learning? How do we intentionally create an experience that leads to knowledge? How do we know if they “got it”? Interactive clues taken from human behavior (how people engage with things naturally) combined with an open and multi-sensorial explorative form like the object, assist in making process oriented, direct connections to ideas that allow for individual conclusion. Experiences that elicit a response rather than describing an event pave the way for the user to enter in and make discoveries. In this way, knowledge, attained through experience, is related to instinctual examination and exploration. The experience is visceral rather than analytical. It tends not to be measured quantitatively but rather qualitatively.

Some of the qualities of this explorative environment are few, if any, explicit rules; multiple paths for interaction, or ways to experience content; loosely defined results; and general ambiguity. This environment is different from one where a specific result is expected. Through manipulations in light, material, space and sound, the environment is designed to elicit an affective response, a response that leads to personal interpretation and reflection. The case studies in this thesis investigate how objects and dynamic media function on a this level to facilitate personal experience where no one interpretation or outcome is alike.

Finally, we learn and think in many different ways. Admittedly, object-based learning is not for everyone. Research shows that learning through examination and exploration is probably best suited for people who solve problems intuitively, have a strong

imaginative ability, and are good at seeing things from different perspectives (Kolb, D. A. (1984) *Experiential Learning*). Montessori Education, where hands on teaching method that engages all of the senses including movement is a good example of an educational environment where knowledge that is affective, immediate, and visceral is embraced. The theory being that skills and concrete knowledge gained in this way leads to later abstraction. This joy of learning, according to Montessori theory, is an innate part of any child; when properly guided and nurtured it results in a well-adjusted person who has a purpose and direction in his or her life. (Montessori Foundation)

### Case Studies

Over the past three years, the content for my work with objects has had to do with form, interaction and language. The following case studies investigate these areas.



# form

When I think of form, I think of the properties of material, visual, aural, dynamic and interactive form. Form exists as whole, and in parts. Fragmented form is interesting because by not revealing everything, it allows our mind to fill in the gaps. The material aspects of form can suggest humanity through visual clues of making and traces of wear and tear. Aural form is layered, immediate and evocative. The interactive form is beautiful because it allows us to construct feeling from it. Evoking mood from material, aural and interactive form through our experience of it is the focus of *IceWaterVapor* and *Lotus Flower*.

## MATERIAL FORM

Material form emphasizes artifact, appearance (or disappearance) and time. Through visual clues of making and traces of wear and tear, physical objects reflect humanity. Physical objects wear the effects of a process; physical evidence of their presence exists. Materials can be irregular, dirty, imperfect, polluted—they are as exposed as they are intimate. They can be simple and modest—as such they invite you to get close and touch. They can be complex and intimidating as well. They are vulnerable to natural elements. This is apparent in skin discoloration, fading, rusting, bruising, cracking, wrinkling, and so on. These visual and tactile aspects aid our understanding of our own humanity. This is another way of looking at the world, one in which these flaws can lead one to a more expressive and higher understanding of things. I am trying to construct this experience with the following two projects.

Materials are vulnerable to human use as well. Time and labor spent making things in the material world can be seen in the resulting surface or skin. Take for example the ceramist, who manipulates a clump of clay until a desired form is achieved. The form is then put through a process of firing and glazing until the final outcome is achieved, let's say it's a bowl. The skin of the bowl reveals, through visual and tactile properties, the ceramist's presence, and the visual impressions of her process. Many times, the bowls' surface wears the unintended marks from the process as well. These are seen as adding value and worth to the bowl. Going further, say the ceramist decided to make revisions to the final form of the bowl. To do so, she would most likely layer the new over the old. This process changes both the physical



and tangible nature of the bowl. Through sight and touch we can investigate these changes, and therefore make connections to the bowls' maker. We, as receivers of the bowl, can openly and intuitively investigate the ceramists' process because we can see and feel it ourselves. This type of investigation is possible because the process is made visible through the form.

These thoughts on form stayed with me when I began investigating the properties of new media. Always wanting to find the space between the digital and the physical in order to keep the serendipitous nature of physical things, I began to investigate the hybrid digital and physical form: How do they relate? How do they influence each other? What properties of the digital influence the physical and the physical to the digital? Is their relationship always stable?

#### AURAL FORM

Because things digital are programmed, they can be quite predictable. This got me thinking about ways to use a hybrid object to communicate the unpredictable, or something impermanent. I am talking about things that undergo, and show the effects of, an unpredictable process, things open to wear and tear, to change. I know of these in the material world. I want to come to an understanding of them in the digital. This is where my investigation of the aural form fits in. Sound is invisible, yet, has a materiality of its own expressed in complex layers and textures. Juxtaposing material and aural form transforms communication because together they foster a higher sensorial experience. Because digital sound is modular, experimenting with it allowed me to investigate chance operations. *IceWaterVapor* and *Lotus Flower* demonstrate my investigation of unexpected juxtapositions of sound and material by allowing the elements to unfold randomly and naturally.





# icewatervapor

Course: Independent Study

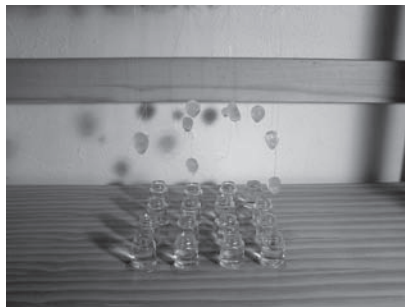
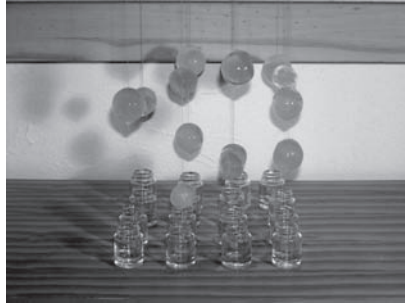
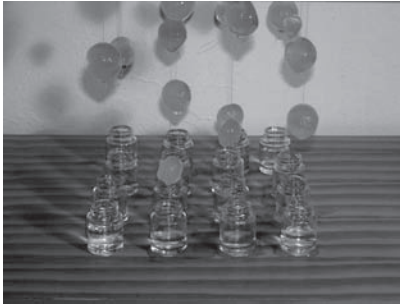
Advisor: Joe Quackenbush

Connecting the physical with the digital through an imperfect and unpredictable process is what got me thinking about how a natural process could influence a digital event over time. Through a series of form studies, this project investigates the temporary, yet for a time intimate collaboration between the transformation of ice and sound. Here, ice, an organic object, is the independent variable. Sound, in this case digital, is the variable that can be controlled. This project seeks to create an environment for contemplation and personal reflection by exploring the natural cycle of ice to water to vapor while transforming these events into ethereal sound. A prototype for the installation demonstrates how melting ice triggers a symphony of sounds to be heard. When all the ice has melted we are left with the composition of sound it created, demonstrating that while one form is impermanent (ice) another form (sound) can capture the memory of it and endure. [large close up images of ice forms on string melting]

## FORM

Explorations into how form could create an explorative space for visual-aural juxtapositions began with the intense study of ice. This study investigated the behavior of ice over time, methods of suspending ice forms on mono filament, size and space of installation, and variety of vessels for collecting water droplets.

I began by observing a variety of ice forms: from photographs of icicles (it was fall, so I could not observe these in nature), to a diversity of shapes and sizes found in ice cube trays: from perfect cubes to small spheres. I made many ice molds as well, but these proved too difficult to extract the ice from after. The final ice form ended up a small sphere measuring  $1\frac{1}{4}$  inches in diameter. This shape was chosen for its soft, vague and delicate properties and efficient reproduction (due to a convenient mold which produced twelve ice forms at a time). The size became the most important variable, as I needed something light enough that could continuously cling to the mono filament wire as it melted. [see image of mold, wire]. Once the mold was filled with water, I laid long pieces of mono filament across and taped it to



Initial experiments at home revealed that the ice forms stayed attached to the monofilament while they melted.

the outer edge of the bottom tray and covered it with the top tray. Once frozen, I divided all the spheres and tied two knots in the bottom of the wire. Amazingly, this held the ice in place as it melted. The total melting time in 68 degrees took about 3 hours, which was perfect for the limited time of the installation.

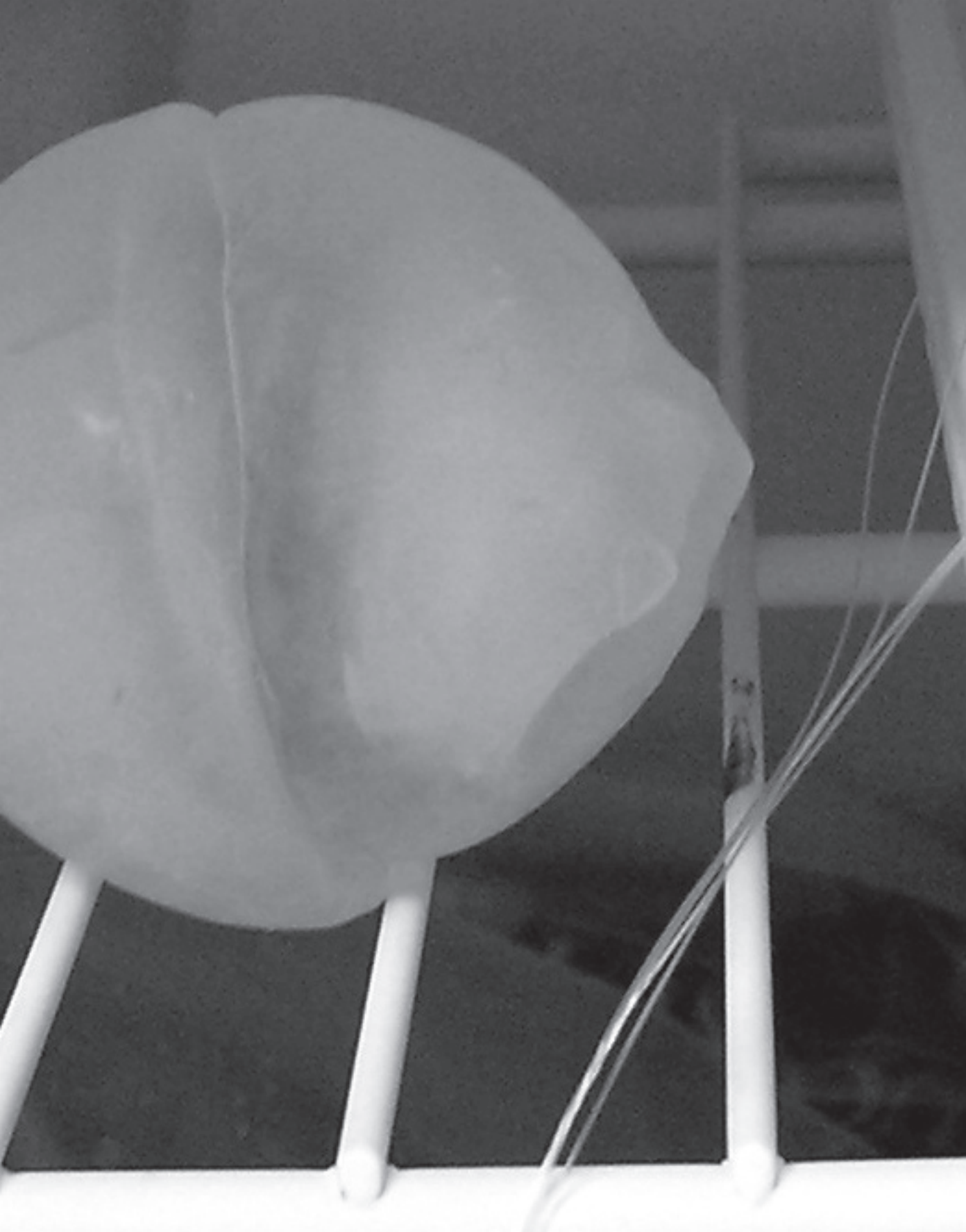
A matrix of 20 suspended ice forms with 20 vessels underneath was determined as a good starting point for the body of the installation. [see image of installation matrix]. This layout was small enough to be considered intimate yet provided enough space for viewer's to walk around. The ice forms were hung at different lengths and sizes adding rhythm and diversity not only visually, but to the symphonic sound component as well. Once installed I quickly learned that the lip of the vessels was too small to catch the water drops because it could not accommodate for the amount of sway that occurred due to air currents in the room. This problem was addressed in the next iteration of the project (see Lotus Flower case study).

## SOUND

For months I worked with ice in silence. It was an incredibly meditative experience. I watched it quietly, and it melted quietly. After a while, I tried using a variety of substrate materials between the droplets and the vessels and listened, but little if anything audible transpired. Then I remembered the question that brought me to this project in the first place: How can an organic event influence a digital event over time?

Connecting the physical to the digital through sound was a great discovery. I recall the first time I paired a water drop with a note on the keyboard. The experience of seeing that drop of water actually look different when juxtaposed with sound was transformative. When just a single sound was added to the event, the water drop looked different: it was jellylike, had a thicker consistency, it was larger and heavier. It was at this point that I realized the potential for not just one sound, but how a symphony of sounds could create a contemplative environment and draw awareness to visual-aural relationships in a physical-digital event.

A sound schematic was developed from this matrix of hanging ice, where the position of ice determines each note played.

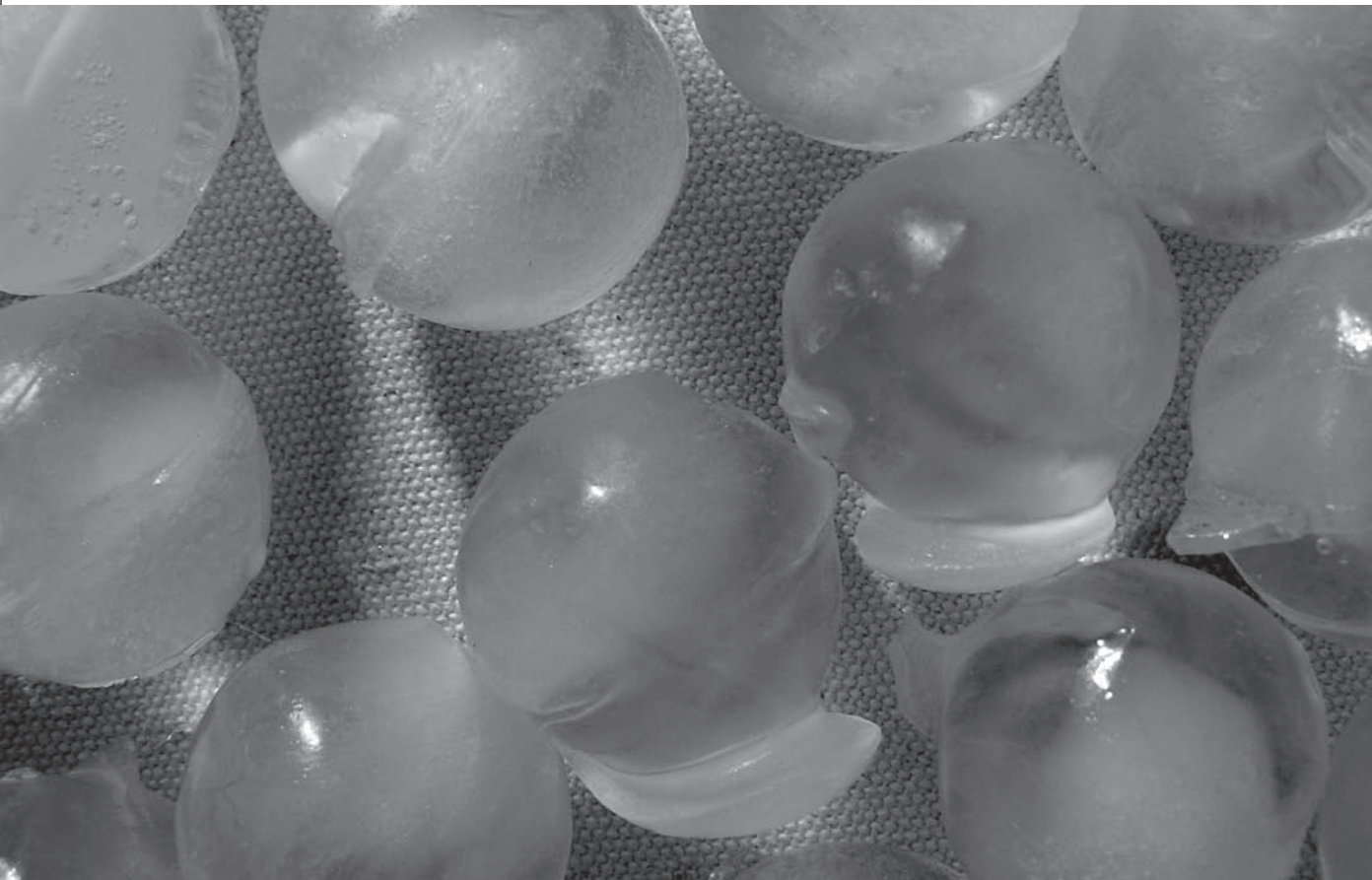






Position of container determines note.

C Chord (C, G, E)  
1= low octave  
2=middle octave  
3= high octave







# lotus flower

Course: Independent Study

Advisors: Teresa Marrin Nakra, Fred Wolfink

Not long after I created the prototype Ice-Water-Vapor: A Landscape of Sound Internal, I began working on Lotus Flower, the next iteration. Here, I investigate a more complex and responsive sound system while working out major electronic and programmatic issues.

Private thought is often not something designers choose to explore since we are more often in the business of verifiable external communication. Building on Ice-Water-Vapor: A Landscape of Sound, this project –through the investigation of physical form and the pattern of sound – seeks to create awareness of the knowing or quiet mind (characterized by consciousness of self) through contrast with the thinking or surface mind (characterized by daily thoughts or “chatter”). The concept for this project comes from a belief in Wabi-sabi, a vague term used to describe an aesthetic sensibility and appreciation of things modest, imperfect and transient.

## OVERVIEW

Completed in May 2005, Lotus Flower is a fully functional prototype. The flower is made of book cloth with piezo sensors embedded under five of its petals. [see image of both flower and piezo's under petals]. Round ice forms hang above the flower [see image]. As the ice melts, small water droplets hit the petals triggering sounds to be played. Over time, the pattern of sound transforms from meditative sounds (Tibetan singing bowls) to agitated sounds (Synthesized bell tones slowed down to hear artifacts). This contrast parallels two distinct characterizations of thought and intends to create an environment for contemplation.

## FLOWER DESIGN

Initial testing to determine sensing capabilities of water droplets on the piezo yielded the need for a substrate material between the water and the piezo sensor. The material needed to be very light and also water-resistant. Because the sensitivity of the piezo only allowed one drop to be detected at a time (drops became undetectable once a pool of water formed on top of the

piezo) I needed a material that could bend to allow the water to drain off. This is when the flower form was fully realized. A lotus flower was chosen as a symbol of achievement and enlightenment. It is a common symbol in eastern meditation. Using wire and cloth tape, I attached each piezo to the underside of the petals. The piezo senses best when the connection to the substrate material is not flush but rather uneven. This allows the material to flex when a water drop hits and thus help to trigger the piezo.

### SOUND DESIGN

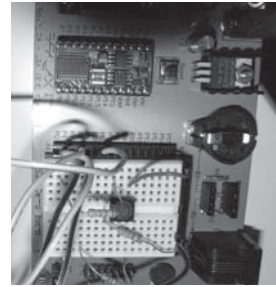
Two contrasting types of sound are heard. For each category of sound, there are five different sound samples that may be triggered. A time line in MaxMSP, the software environment used to interface with the sensors, determines when each category of sound is heard. When each sample is heard within each category depends on individual water drops. The first sound category represents the knowing/quiet mind. There are five sound samples in this category. The sound samples are Tibetan singing bowls, commonly used in meditation practice. These sounds can be characterized as quiet, restful, simplified, pure, analog, natural, focused and personal. The second category of sound represents the surface, thinking mind. There are five sound samples in this category. The samples are synthesized bell tones that have been slowed down and distorted to hear artifacts. These sounds can be characterized as loud, noisy, chatter-like, distorted, agitated, synthetic, general, and public. The piece continues until all of the ice has melted.

### ELECTRONICS AND PROGRAMMING

Round ice forms hang above the petals. As the ice melts, it sends drops to the petals that trigger sounds to be heard. The sensor then sends a signal through the amplifier to the basic stamp. The basic stamp then sends serial data to the computer and into MaxMSP. Max then reads the data and assigns a sound to be played based on a timing element. [see flow chart] MaxMSP was determined to be the best software environment to build in because it was designed for use with sound, and offered extended programming capabilities beyond the proof of concept phase. Rather than sending midi, we decided to send serial data coming in from the basic stamp [see diagram]. Since I was only



(1) Amplifier



(2) Basic Stamp

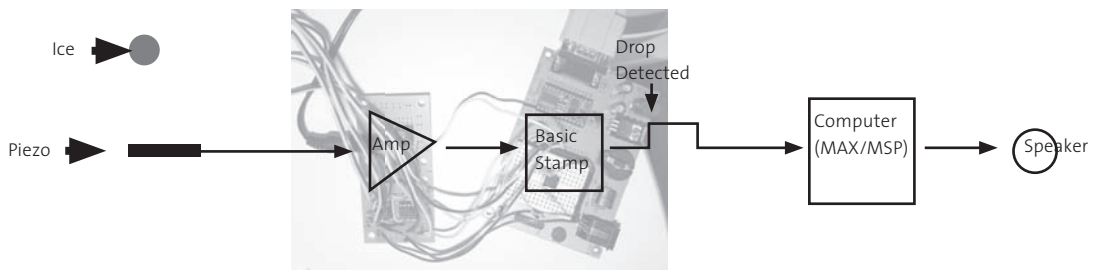
using five outputs, the stamp worked out great. The program we used in PBasic essentially checks the state (open/closed) of the switches [see code]. If one gets closed (drop detected by piezo), it sends the serial data to Max and continues checking. It does so in an infinite loop. Max is set up to receive serial data from the basic stamp. [see code] A bit-shifting formula is used to decode five switch states from the basic stamp. These switch states are connected to ten samples in Max. Each time a switch is closed, a bang button activates a sample. The timer element determines what category of sound is heard and when. It works with a ratio of about 70% Tibetan singing bowls, 30% synthesized bell tones.

#### THE USER EXPERIENCE

Not unlike the first iteration, sound and visual form worked together to give the user a space for contemplation and personal reflection. In this case, a single object, the flower, serves as the single visual focal point for contemplation. The ice, sound, time, and space are intended to move the viewer to a heightened place of awareness not unlike the one I experienced while creating this experience.

(1) Amplifier. Using 3 dual amplifiers I am able to send voltages from the piezos to the basic stamp. There are 5 piezo elements and therefore 5 outputs to the stamp. One leg of the piezo is attached to the input of the amplifier, the other is attached to ground. The resistor is there to set the gain. The amplifier is powered by 5volts.

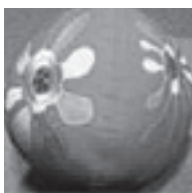
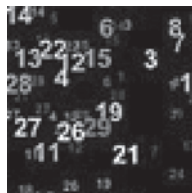
(2) The Basic stamp receives the output of the amplifier in pins 1-5. It sends serial data to the computer into MaxMSP.





## interaction

Human response to interactive objects lies at the core of all my work. The following two case studies, *Progress through Process* and *Process Revealed*, specifically explore the concept of fluent interaction: how natural or automatic interaction with objects allows the user to explore and investigate an idea. Here, I am particularly interested in how fluent physical behavior – riding a bicycle, turning a crank, or waving your hand – can be used to modify an interactive system. These projects explore a reciprocal relationship between user and system where the generation and modification of content only results from user interaction. Fluent physical behaviors are used as the mechanisms of interaction because they are open and direct and as such are thought to foster enduring individual experiences. These projects also examine how the relationship between human and object creates an expanded vocabulary of what participation and experience are to communication design.



Images of interactive work represented in the art archive.

# progress through process

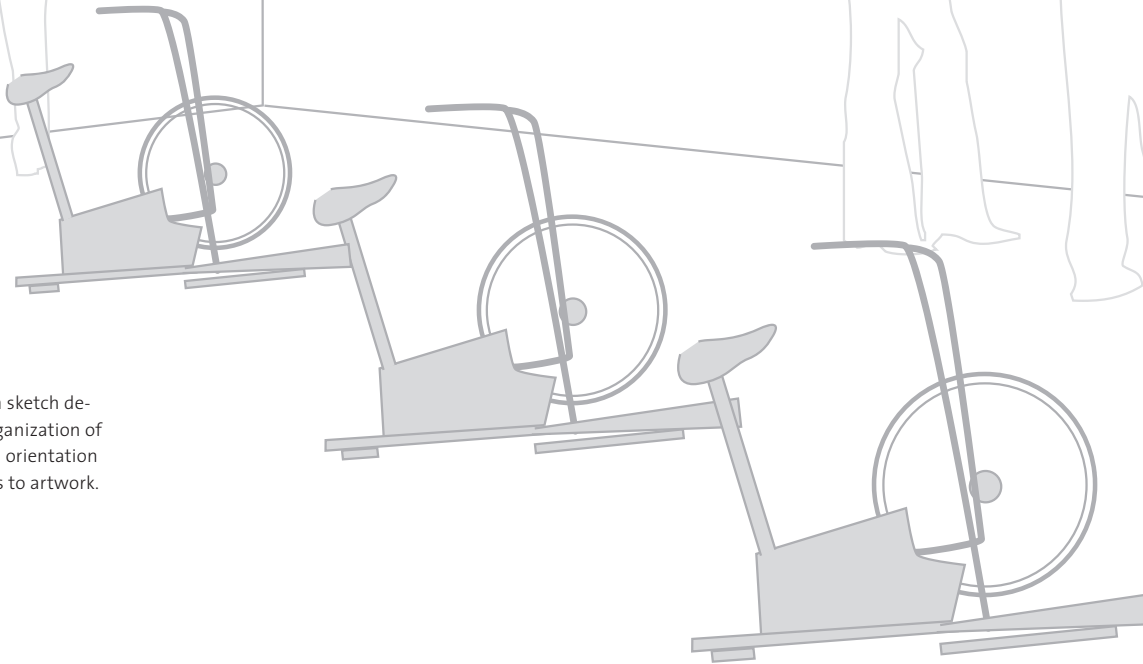
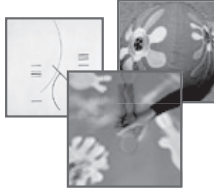
Course: Major Studio

Advisor: Brian Lucid

To contextualize new media art and design in a digital archive requires the integration of distinct languages of media, and an awareness of the intersection of people, place and technology. With a surge of interest in human relationships and experiences with digital media, a growing number of artists have turned to creating interactive installations. While e-space works well to disseminate this art, it does not work well in framing it, or allowing for more authentic representations of the interactive and physically based content it delivers. In this sense, archiving digital art can be improved when interactivity takes place outside of the traditional screen environment. [close up images abstract of a few items in the archive]

Completed in May 2004, Progress through Process is a conceptual prototype that explores ways viewing and interacting with an archive of interactive installations through physical input and digital output. The goal of this object-based interface is to explore physical and tacit ability as tools for exploration and learning. I wanted something that involved viewers physically in a relationship with the collaborative and temporal nature of the art. I also wanted a simple, intuitive and fluid user relationship with technology—a relief from traditional graphical user interfaces. The form of the archive follows the function of its contents, and therefore has gestural, material and interactive qualities. These qualities are woven into the following principals: archive will function under a state of mutual influence between system and visitor, real-time interaction, variability, and reflexivity. The premise for creating a more body-oriented interface is based on the notion that greater physical activity will move this archive into more interesting and complex places.

The archive is powered by pedaling three stationary bicycles where the amount of content and viewing time are dependent on the amount of power generated by cycling. This relationship suggests the temporality (due to technology and the unique location of many installations) and the collaborative nature of interactive installations. [see diagram where breakdown of cycling/viewing time is illustrated] The three bicycles, placed next to each other in a gym-like format, face a wall where the



Exhibition sketch detailing organization of space and orientation of bicycles to artwork.





archived content is projected. This placement is intended to remind people of their familiarity with stationary bikes so they might be more likely to use them in this new situation. [see diagram of room] The bikes are made of bare aluminum, and are extremely minimal and sturdy (similar to 1950s machine-made models). This open design makes reference to the exposure of self during the collaborative action of riding the bike in public, and, the exposure and vulnerability of installation art.

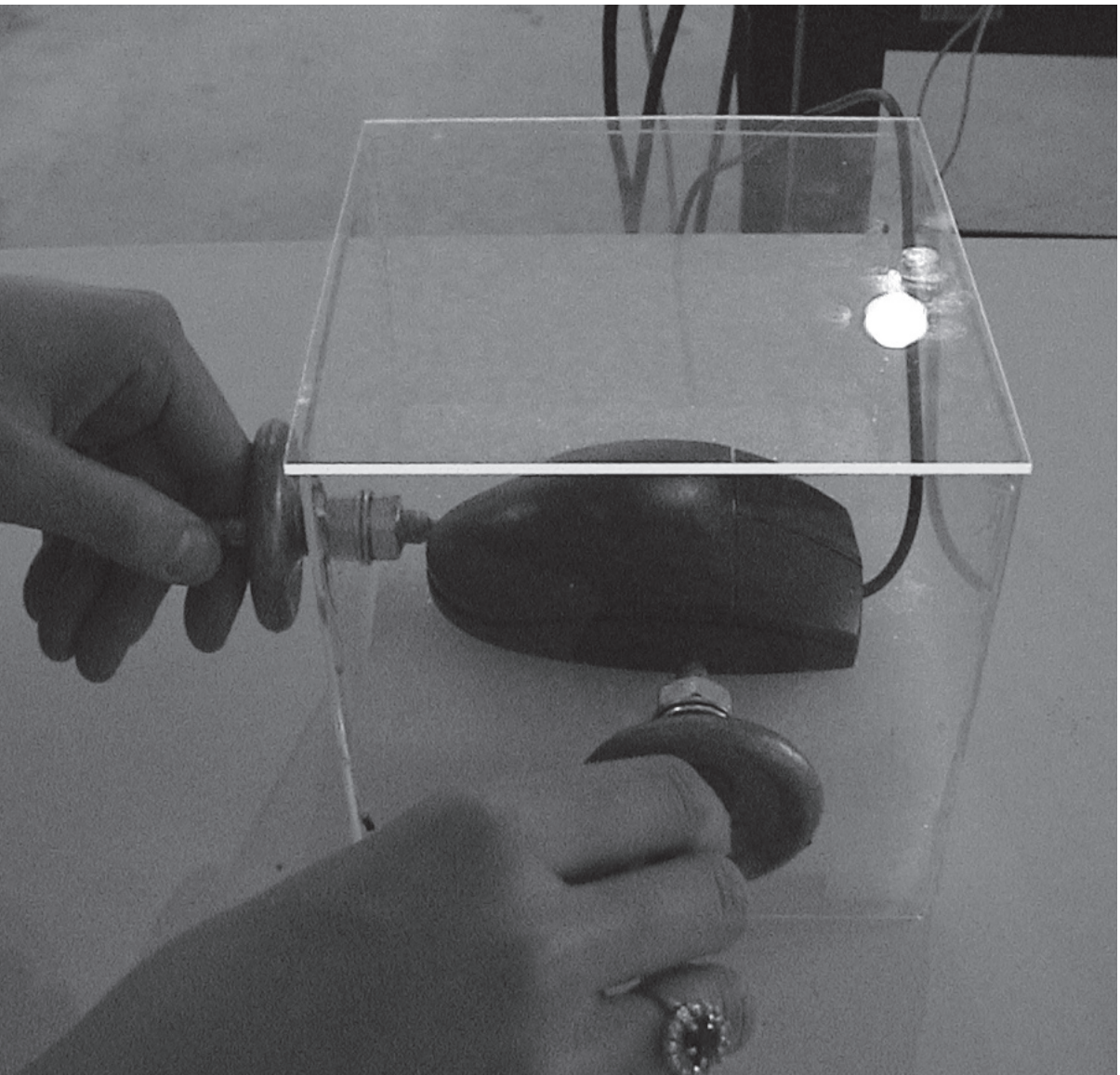
Once content is generated, it is grouped into conceptual categories (time and place for example) and clustered into sections on the wall. [see diagram]. Here, artwork can be explored with the touch of a hand. This tactile way of exploring the archive underscores critical human connectivity with interactive installations.

Using projection, the degree of light in content signifies time spent generating it. Here, an important relationship between time to view work and time spent generating work forms where work dims until power is restored to the archive through cycling.

This project is about interactivity, where access to content and meaning are created in collaboration with others. Interaction is both predictable – spend enough time with the system and you will figure its rules out – and unpredictable – certain representations of art in the database unexpectedly unfold.

#### THE USER EXPERIENCE

The collaborative quality of the user experience comes from group cycling. The riding creates social interaction by allowing the users to discover content in real time, real space, and with real people. The number of people cycling determines user interaction with one another. For example, when the maximum number of people are cycling, the maximum amount of content is generated and available for interaction. This decreases when fewer than three people use the bikes (see diagram with percentages). In this way, the user's experience of the material is directly connected to the user's experience with others. Group cycling also influences data in the archive. Here, the amount of time cycling determines the amount of time available to view and interact with the art. This collaborative riding experience is a metaphor for the collaborative and temporary nature of interactive art.



# process revealed

Course: Major Studio

Advisor: Jan Kubasiewicz

Art relegated to the museum space removes it from the scope of community life by placing it high up on a pedestal. The separation of art from object, environment, and daily experience – the detachment from place, time and creator – challenges the viewers' ability to more fully experience a piece of art. During the fall of 2003, this belief influenced my decision to take a painting and turn it into something dynamic that reveals the creative process over time. I chose to document my process of painting over a two-week period and pair these visualizations with an input object that demanded greater work from the participant to construct meaning. The manifestation of this concept is a virtual painting supported by a database of images and movie clips with two cranks serving as the input object. This content is then projected onto a blank canvas, which, only through human interaction, reveals the process of creating the painting backwards, forwards and in between. The visualizations are paired with two fully operational cranks that serve to reveal the creative process captured over time (two cranks requiring much more work and skill than a mouse).

By revealing more details in the process of painting, the viewer is made more aware of the artist's raw material, making the artwork more available to form a relationship vis-à-vis the viewer's experience. This project seeks to engage the participant further by allowing them to physically control what they are seeing, when they are seeing it, and how they are seeing it.

## DATABASE

The database is derived from a photographic and cinematic journal documenting every moment in the painting process leading up to the finished painting. The content of the database includes all of the things that led to or existed with the concept and construction of the painting visualized in movie clips, music clips, voice clips, and still images. [see image] It is multi-linear and fluid where the user is the author who is positioned to make choices about revealing the process behind the painting. In doing so, I am trying to bring the universal experience of the creative process into the everyday experience.

## THE POETICS OF THE OBJECT

Two cranks, x and y, serve as the tools to reveal the creative process (x=construction and y=concept) captured over time. The cranks were intentionally left unfinished and crude to emphasize their mechanical qualities. They are fitted over a mouse, which was housed in a transparent Plexiglas box (see previous page). Each turn of the crank triggers the movement of the projection (backwards/down deconstructs while forwards/up constructs) Since the tempo of creative process is non-linear and sporadic, jumping from point to point is a function of this database. The faster the crank is turned, the faster your experience of the creative process is. If you use only crank x, you just get the construction phase. If you use only crank y, you get the concept phase. If you use both at the same time, you travel diagonally through intersecting all sorts of things. However, if you use crank x or crank y and pause (a metaphor for contemplation), for a moment on a drawing for example then you are delivered, or rewarded with a web of ideas associated with that point in time. So, from the example above, if you paused on Point B, you would be taken to Point A and all of the associated points. The crank need not be used here, for the content will be delivered to the user automatically. Or, the cranks can be used to navigate up/down or back/forth to take you somewhere else. If the cranks are left alone for a long period of time (say 5 minutes), then the projection turns into abstract gobs of paint, suggesting that is it peoples interaction that brings life to the painting.

## THE USER EXPERIENCE

Due to their immediate, tactile, and process-oriented qualities, two cranks, about the size of a faucet knob, were chosen as a way to experience the content. In this way they are sympathetic to the user's need to move through time in order to explore the documented painting process. Making use of our physical ability to grasp and rotate, the cranks can be used to modify and influence content. It is precisely this physicality and rigorous motion that helps to keep us attentive to the situation: It actively involves us in the process of revealing something that is usually kept private like the creative process.

#### FURTHER WORK

I would like to explore a variety of ways the viewer could experience the painting over time. For instance, the viewer might be able to rotate the painting to get a different perspective, just as you would during certain points in the creative process. At other points, the user may be confronted with seeing themselves viewing a part in the painting (perhaps a part that is most personal to the author.) I would create this moment by adding another hidden camera behind the projector which would capture live images of the user interacting with the painting and project them at the most intimate of moments. The scale of the information will change as well. For instance, when the user pauses on a point concerning the environment I painted in, the projections will become full scale and cover all four walls, to immerse the user in my environment.





## language

It is the sensuousness of speech and the visual and acoustic qualities of words that capture my imagination. Therefore, identifying and exploring the multi-sensory and expressive qualities of language – sight, sound, touch, rhythm, repetition, scale, speed and movement, and their relationship to each other – became important to my thesis investigation early on. Beginning with my first case study, *InsideOut*, I explore the expressive qualities of speech that foster a direct and unmediated sensorial experience of voice experienced through texture. In the tradition of sound poetry, my final, and most comprehensive case studies *Expressive Code* and *Code Performs* examine the sight–sound juxtapositions of words that are the interactive and communicative qualities celebrating the theatrical expressions of the human speech.







## insideout

Course: Design as Experience

Advisor: Gunta Kaza

Digital information in tangible form puts knowledge transfer into the receivers' hand by forming a direct relationship with the receiver. This method also appeals to multiple senses. InsideOut is a prototype for an installation that investigates language through simultaneous engagement with textural objects and associated sounds.

### OVERVIEW


Completed in December 2003, InsideOut is a preliminary case study investigating language – in the form of texture, sound and interactivity – by using a physical object as an interface. This piece aims to talk about the gap between internal and external language through interactions where participants waded through sound by pulling out textured materials from a series of larger than life-size heads. The action of pulling is a metaphor for forcefully stimulating the externalization of an internal language. The texture of materials signifies the tone of internal content.

The project began in response to the word “tropos” (a greek word that means—to bring out from within). Initially, several three-dimensional small-scale models of heads with a variety of materials coming out of their mouths were made. These initial small-scale models evolved into two final representations of life-size heads, which were sewn, stuffed, sanded and mounted on to armatures. Two non-verbal expressions were chosen (squeak and mumble) with corresponding textures (soft and sprightly branches, and course rope, respectively). Manipulation of these materials, through the action of pulling, initiated sounds and allowed participants to experience language through the body.

### OBJECT

Many physical materials have an emotional value due in part to our organic similarity to them – we are both taken from matter – and, to the personal life experiences we bring to them. They also have an aesthetic value – in the sense that we make use of the fundamental properties of materials. And, of course, materials also have a useful value. InsideOut examines this



The image shows a close-up of a dark, heavily textured surface, likely a book cover or a piece of heavy fabric. The texture is fibrous and uneven. In the upper right corner, a small, light-colored, cylindrical object, possibly a pen or pencil, is resting on the surface. The lighting is soft, highlighting the texture of the material.

*the focus of this interface is to form an emotional relationship between the object, media and the user, through texture and sound, where the user's action stimulates an esoteric response of sound.*

phenomenon through poetic form: the inherent qualities of leather used to make the heads – protective, tough, opaque – make reference to our own skin. The raw, twisted, and coarse qualities inherent in rope felt in our hands connects us to the rough and coarse quality of sounds heard. The focus of this type of interface is on forming an emotional relationship between the object, media and the user, where the user's action stimulates an esoteric response of sound. The form of the object is so vague and fragmented – mounting only the head on white armatures that blend into the background, the heads are disembodied, suggesting a disconnect in the content that follows – that interaction with them allows for a great number of individual interpretations. The heads and sounds heard are meant to let your mind fill in the gaps. This not only determines the level of interactivity, but, the degree to which the experience is received or understood.

## SOUND

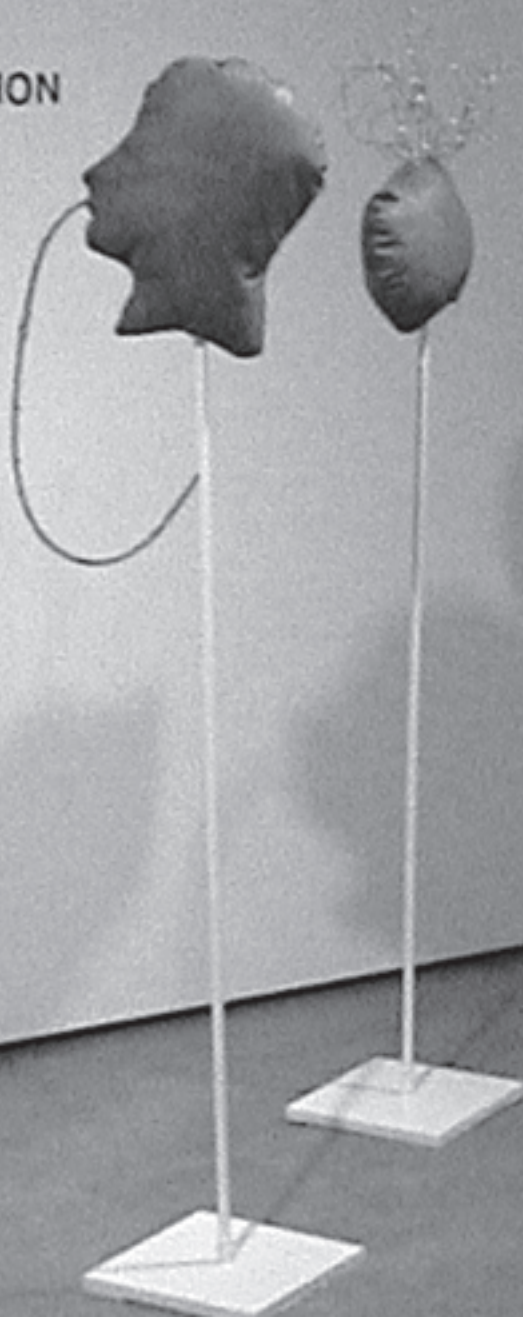
Connecting the physical to the digital through sound was a great discovery. Sound is integrated with texture to communicate the abstract and emotional tone of each head. Here, fragments of speech rather than intelligible speech convey the abstract and complicated nature of a premature language. Human voice was digitally recorded and paired with the action of pulling out materials from the heads. In theory, pitch and tone corresponded to rate of pulling and could be manipulated according to the user's interactions over time. In this context, the user's interaction with sound creates an

explorative environment for individual interpretation and personal reflection.

## USER EXPERIENCE

Experience is shaped by context, user interaction and the user's ability to form an attachment to the object. Critical to creating an experience is the creator's ability to define what type of experience they wish others to have. In my work, this is shaped by (and it may not be until the making is well under way) the semiotics and poetics of an object: it's material, form, aesthetic, symbolic and emotional value and how they relate to environment. For example, while I wanted the user's experience with the heads to convey a sense of conflict between an internal and external language, I wanted to do so in a light-hearted and whimsical way. This is what led me to take parts of common things – rope, twigs, leather – stuff them into the mouth of a head, and juxtapose with unintelligible fragments of spoken word. These relationships are specifically designed to be unusual. By appealing to your curiosity (Why are twigs coming out of that head's mouth? What are the strange sounds I hear?) I hope to capture your imagination and bring you into the experience. Once there, the user must be curious and comfortable enough to interact with the objects. In order to have a simultaneous engagement with textural objects and sound, users must pull out the contents found in the heads. Depending on how fast and hard the forceful action of pulling occurred, alterations in pitch and tone of grumbles and groans were heard.

COMMUNICATION



```
um.c #include int main (int argc, char *argv[]) { int i; int sum = 0; for (i = 0; i <= 100; i++) sum += i * i; printf ("The sum from 0 .. 100 is %d\n", sum);}sum.s
```

# expressive code

Course: Major Studio

Advisor: Jan Kubasiewicz

Who are the makers in the digital world, and what is their form? Since physical objects are more likely to reveal the process of making done by the hand, I wanted to investigate the process of making in a digital environment to find visual clues of making. The question—where does this take place—led me to investigate the programmer's role in making. What happens in the process of programming and its visual result, code, is quite interesting. Take for example the programmer's process of making a change. When the programmer changes something, it is usually an act of replacement—substituting one word for another that works, and commenting—a process of inserting notes only to be interpreted by another programmer. These changes are a part of the creative process, yet have no visual residue in the final outcome. Thus users are confronted with the results, such as an interface to a software program, that bear little human evidence of the process of making that went into it. It is this kind of thinking that led me to consider ways of revealing the humanity behind the code.

I am not a programmer, so for me the programming language is esoteric, it feels cold, and it is a silent language. But the language is composed of words, and in the world of poetry, words have a voice. I looked at a variety of programming languages and began reading (sometimes performing) lines of code: `int SUBU arg!` (treated typographically in book). Line after line I read these strange words out loud: loud, low, excited, slow, high, quiet. I was enamored with how expressive (and funny) the words were. It was this expressive potential found right in the language of code that began my journey of transforming code from a silent fixed language into one that is tactile, sculptural, phonetic, dynamic, and performative.

## OVERVIEW

Expressive Code is a gesture driven object-based interface and printed book. It is my largest case study contributing to the development of my final thesis project: *Code Performs* (not sure of title). With Expressive Code, both print and interactive domains are examined: the interface allows participants to explore the visual and aural elements of code through a touch screen, while

the book provides a historical foundation for learning various interpretations of the programming language C. The book is an analytical examination of the transformation of the scientific language of code to the poetic interpretation of code. The interface was developed in flash and runs on a touch screen monitor. Participants, presented with a continuous left to right flow of code, are encouraged to explore the poetry through touch. Interactive specifics are discussed later under the heading “Relationships.” Together, these methods blend the nonlinear, dynamic and unique explorative attributes of interactive media with the linear, static, and analytic properties of the printed book for a complete multi-sensory experience.

Each method of representation rigorously investigates various levels in, and representations of, a programming language in order to relate it to the broader context of human experience and learning. This is observed in the following ways: 1. Translation – code to computer, fixed language of science to the fluid language of poetry, visual to sound; 2. Relationships – size, weight, value, contrast, rhythm, space, and 3. User Experience.

#### CONCEPT: TRANSLATION

Digital code is the requisite material used by scientists to process information and produce results, and now by artists who use it as a creative tool. Here, we find a link between two seemingly disparate disciplines. But the connection goes deeper than shared material and the challenge is how to communicate it across the linguistic divide. Where artists and scientists differ in their unique forms of language, they are alike in their approaches to creativity. For example, the artist and the scientist are curious investigators of the unknown. As Leonard Shlain states “while the scientist demonstrates that A equals B or that X is the same as Y, artists often choose signs, symbols and allegories to equate a painterly image with a feature of experience. Both of these techniques reveal previously hidden relationships.” (20, Shlain, *Art and Physics*).

To translate is to transform. This process is one of conversion for the purposes of learning and understanding, and takes on many





*faint text*

**subu**

**subu**

*f*

**sp**

**sp**

**sp**

**su bu**

**sw**

**lw**

**lw**

**sp**

*lw*

**lw**

forms. In one sense, to translate is to express in another language precisely the original sense. In another, to translate is to “convey from one form or style to another” (American Heritage Dictionary). In accordance with this definition, Expressive Code uses the processes of translation to identify and communicate unique connections between the diverse languages of science and art.

#### CODE TO COMPUTER

What do the many expressions of code look like (or even sound like)? What connects the process of translation from human thought down to the interpretation of binary code by the microprocessor? Where does one expression begin and another end?

Given the relative secrecy that code operates in (its activity is invisible to most computer users), the search for answers suggests both an analytical and creative approach.

Beginning analytically, code is expressed in several distinct forms before being interpreted by the microprocessor. Take for example the following line from the highest-level language of code:

```
sum.c #include int main (int argc, char *argv [])
```

These characters represent the first step in transforming the programmer’s instructions into specific tasks the computer can perform—in this case, to count from 0 to 100. Curiously, high-level language is considered closest in relationship to human linguistic communication.

Before high-level language can be interpreted by the microprocessor though, it is reduced to assembly language through the substitution of mnemonics and operational commands:

```
sum.s .text .align 2 .globl main .ent main 2 main: subu $sp, 32 sw $31, 20($sp)
```

This translation is silent, private and exact. Finally, assembly language is reduced to binary code, called machine language.

```

sum.s .text .align 2 .globl main
.ent main 2 main: subu $sp, 32
sw $31, 20($sp) sd $4, 32($sp)
sw $0, 24($sp) sw $0, 28($sp)
loop: lw $14, 28($sp) mul $15,
$14, $14 lw $24, 24($sp)] addu
$25, $24, $15 sw $25, 24($sp)
addu $8, $14, 1 sw $8, 28($sp)
ble $8, 100, loop la $4, str lw $5,
24($sp) jal printf move $2, $0 lw
$31, 20($sp) addu $sp, 32 j $31
.end main-120.data .align 0 str:
asciiz "The sum from 0 .. 100 is

```

This lowest level language has the smallest vocabulary, yet is largest in volume:

```
00100111101111011111111111110000010101111011111100000000001
01001010111110100100000000000010000010101111010010100
0000000010010010101111010
```

And to think that this three step transformation takes place in the blink of an eye and in complete silence! (code courtesy of Professor James Larus, The University of Wisconsin)

Perhaps well understood by the computer programmer, the degrees of abstraction apparent in the translation of code make this language difficult to understand. Therefore, code remains elusive to the many who depend on it for creative work. It is with this assumption that the search to convey code in more approachable forms begins.

#### LANGUAGE OF SCIENCE TO LANGUAGE OF POETRY

One of the best ways to understand something better is by breaking it down into smaller, more manageable parts. A visual language offers countless creative ways to express complex information, and is where the transformation of code from a language of science to a language of poetry starts.

The expressive and communicative potential of this traditionally silent and purely computational material begins with the isolation of unique letter combinations from each line of code:

```
sum.c #include int main (int argc, char *argv [])
sum.c #include int main (int argc, char *argv [])
```

This process of isolation, when applied to the entire programming language, detaches code from its original sense and creates a reduced vocabulary subject to a new set of parameters and a different kind of analysis. Code, in its new context, is freed from a silent and fixed form, and transformed into a rhythmic array of visual language:

```
sum.c #include int main (int argc, char *argv [])
```

ent

subu

sp

lw

loop la  
jal printf

str

The parameters that govern this visual language originate with the Avant-garde artists of the 1920s who pioneered the reduction and restructuring of language to form new relationships to space and time, and thus new ways to perceive and create meaning. Of particular influence are the concrete poets “who reduced words to their elements of letters (to see) syllables (to hear)” (Concrete Poetry: A World View). This approach to language came from a belief that accepted grammatical-syntactical standards were inadequate to express certain ideas of the time. It is in this sense that the transformation of code from a scientific to a poetic language makes a historical connection to the Avant-garde artists.

#### VISUAL TO SOUND

When we read we give voice to the world of words. Tapping into multiple layers of perception, phonetic poetry (a subcategory of concrete poetry) explores this combination of sound and visuals through the juxtaposition of sound and typography. Here, it is the expressive aural and visual communication channels that transform the scientific language of code into its new poetic form: int SUBU arg! (treated typographically in book). This new poetic form not only takes on the properties of phonetic poetry (letters are seen and syllables are heard), it also transforms code from 2d to 3d by considering each word as an immediate and tactile object that responds to human interaction. It is this union between sight, sound, object and touch that creates an explorative environment to experience the emotive qualities found in the poetics of code.

#### CONCEPT: RELATIONSHIPS

To relate is to connect. Expressive Code fuses traditional formal elements in design: scale, contrast, rhythm and space, with properties of dynamic media: modularity, variability, and time, to make clear visual and aural connections between content and form. In unison with the poetic language of code, this creates an environment to explore and experience these unique relationships through physical manipulation. In keeping with the properties of an explorative environment, Expressive Code has no explicit rules, allows users multiple paths for interaction and is generally ambiguous.

ent

subu

sp

lw

jal  
pr  
int  
Lopla

stR



Integral to Expressive Code is the typographic scale of code. Here, distinctions in typographic size distinguish inactive typography—small type flowing from left to right—from active typography—that, when touched, scales in relation to the volume of the word heard. Here, the following relationship between scale and sound are formed: the larger the word, the louder the pronunciation. Another relationship between scale and sound is found in the rate of word flow: the larger the word, the slower it moves from left to right. These variations in typographic scale and sound create contrast and rhythm in the interactive environment. It is within this environment that poetry is created and new expressive relationships are realized.

Adding to this sense of contrast and rhythm are the vocal expressions of the two typefaces chosen: Mrs. Eaves and Franklin Gothic. The voice of words set in Mrs. Eaves (a feminine typeface) is female, while Franklin Gothic (a masculine typeface) is male. Within each voice, alterations in volume range from high to low depending on speed. Here, relationships between dynamism and sound are how the poetry is created. Assigning voice to code is paramount to what brought me to this piece in the first place: my need to reveal the humanity behind code. While typography is a great visual expression of voice, it is only in combination with human voice that gives rise to a phonetic performance.



Space and time are also explored through the developing user relationship within the interactive environment. Through the touch of a hand, changes in size, content organization, and time are investigated. The fluid gestures of a hand allow participant the freedom of isolating certain words and re-organizing them within the given space. Although typography streams across the composition continuously, the system can also be paused to allow a more thorough investigation of the poetry.

#### THE USER EXPERIENCE

Allowing participants to intuitively examine code as poetry through interactions leading not to specific results, but rather to individual explorations is the interactive objective of *Expressive Code*. Interacting with programming code through touch directly relates to expressing the humanity of code. Here, guiding principals of intuition and nuance lead the way to investigating



the poetic representation of code, where natural physiologic considerations like touch, pressure and object manipulation work in creating poetry.

#### REFLECTION

*Expressive Code* was a featured exhibition in the Boston 2005 CyberArts Festival and the 2005 Language of Dynamic Media Show. These two shows provided me with great feedback which influenced my final project, a revised version of *Expressive Code*, called *Code Performs*.

At first, I was ill prepared for the feelings I had while observing others interact with my work. It was incredibly intimidating. All I could think about was how terrible the project must be. But, I the warm reception I received helped mitigate my unease.

Overall, people seemed to understand the conceptual thinking behind the project, which was very rewarding. I think people found the transformation of a programming language into sound poetry to be intriguing. Many people found humor in the project (the way the strange words were pronounced), which made me feel good.

Right away though, I recognized people struggling to interact with the streaming words. It was clear I really confused people by not revealing any interactive tips. Only through individual demonstration did interaction make sense. Therefore, one of my goals in developing *Code Performs* was to create a transparent interface – one that encourages self-directed exploration – one that could be easily understood and explored through independent interaction.

Although I kept the interface physical by using a touch screen, I still felt that the project did not fully reflect the high degree of humanity I sought in my previous work. I think this had mostly to do with the screen-based environment the project was in. Thus, another goal of *Code Performs* was to better integrate materiality into the interface.

The overall exhibit lacked cohesiveness. The environment was not designed to evoke the kind of poetic response I was hoping

for. The code words needed to sing, yet, they were drowned out by competing noise and such a small visual field to interact with them in. By placing the book next to the screen, rather than integrating it interestingly into the space, I did little to entice people to read it. Another goal of *Code Performs* then is to make better use of the book form by transforming it into a sculptural object that communicates content more openly and clearly while for fully occupying the exhibit space.

The essence of sound poetry is found through live performance. I was left wanting to further explore this through the expressive qualities of speech and more sophisticated typography and interaction. These are the primary investigations in *Code Performs*.

*Expressive Code* was included in the American Institute of Graphic Arts, Boston 2005 Best of New England Juried Show, the American Institute of Graphic Arts Best of New England On the Road Show, and exhibited at the American Institute of Graphic Arts 2005 National Design Conference.