Investigating Being Present Through Motion: Connecting Body With Sound and Position

Katarina Hoeger

University of Maine, katarina.hoeger@maine.edu

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INVESTIGATING BEING PRESENT THROUGH MOTION:
CONNECTING BODY WITH SOUND AND POSITION

By
Katarina Folani Hoeger
B.S. Harvey Mudd College, May 2013
M.S. College of William & Mary, May 2015

A THESIS
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Fine Arts
(in Intermedia)

The Graduate School
The University of Maine
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Advisory Committee:
N.B. Aldrich, MFA, Adjunct Assistant Professor of Intermedia, Advisor
Jon Ippolito, MFA, Professor of New Media
Sheridan Kelley Adams, MFA, Adjunct Assistant Professor of Intermedia
Alicia Champlin, MFA
The impact our physical presence can be overlooked easily in everyday life. Monitoring a visitor’s motion can help bring attention to some of the unavoidable conditions of being physically present in a space. This paper details the creation of an installation in which a participant could examine the impacts of their physical presence. The participant’s motions within a boundary were amplified sonically. The boundary was broken into quadrants. The participant’s quadrant also helped determine the base pitch of the corresponding sounds. The amount of visual change the motion caused within a quadrant from a bird’s eye view determined how much the base pitch was modified.

Participants encountering such a system responded in different ways. A few participants chose to ignore the system. Some avoided the system. Others observed others within the system. Others moved, exploring how their motions changed their sonic experience of existing in the space. The last group moved but with the intention of being able to explicitly understand the inner workings of the space and gain control of the system.

Through physical motion, this work provided an alternative understanding of being present and part of the system in the gallery space.
DEDICATION

To the idea of a society where we each understand how our actions impact ourselves, our communities, and our environments.
ACKNOWLEDGEMENTS

My success with this thesis was only possible due to the many individuals who supported me and contributed to my thesis development in tangible ways.

My thesis committee members have been invaluable resources during the formation and execution of my thesis. Thank you, N.B. Aldrich, for being a reliable, detail oriented, knowledgeable, and overall trustworthy adviser who gives clear feedback and has as extensive experience as anyone you mentor could hope in electronic and sound arts. Thank you, Jon Ippolito, for your wealth of art world, creative coding, and gallery knowledge, your example of how to be an academic artist and educator, and your insightful commentary. Thank you, Sheridan Kelley Adams, for your consistent support and thoughtful feedback. Your insights into how to successfully complete a thesis and how to work with the visual and practicalities of wrangling a technically challenging art thesis are appreciated. Thank you, Alicia Champlin, for the many meetings where you helped me overcome both the conceptual and technical challenges I faced while working with the new-to-me coding language of Max/MSP. The resources and knowledge you shared from your current work as an artist using creative coding as a medium and your insight from your years in the Intermedia program have made me grateful that I had this opportunity to learn from you.

Without the Intermedia program itself, this thesis would not have been written. I posthumously thank Dr. Owen F. Smith, the former Intermedia program director, for giving me an opportunity to strive for an MFA despite lacking prior formal training in the arts. Thank you to Dr. Susan L. Smith, the Intermedia program’s current director, for providing a space for Intermedia students to learn and providing opportunities for growth.

I extend a special thank you to the Intermedia MFA fund and the Graduate Student Government for providing funding that made my thesis work possible. Without the Intermedia fund, I would not have been able to afford much of the hardware I had on extended loan for the duration of the Spring term. Without funding from the Graduate
Student Government, I would not have had the opportunity to set my thesis installation up in a private space with little interference from outside sources. Having a private installation space gave me insights into which external influences had large effects on the sounds produced by my thesis prototype’s technological rig.

My housemates, Steve Norton and Adam Paul deserve a special thanks for their support. Steve Norton provided sound editing expertise. Both Adam Paul and Steve Norton lent me gear and books, were participants in my works, and provided me with feedback as recent Intermedia graduates and emerging artists.

I thank Stephen Kostusyk for allowing me use of his camera. Many of the included documentation pictures were taken using his equipment.

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The process of installing and documenting work in Lord Hall Gallery was extensive. Armando Garma-Fernández, Rochelle Lawrence, Nick Pike, Frances Soctomah, and James Winters receive special thanks for helping me install my installation in Lord Hall Gallery. I extend special thanks to Walter Greenleaf and Jon Ippolito for letting me film them inside the gallery. Thank you to Sven Hoeger and James Winters for the photos they provided of participants interacting with my work. Heidi Raphaela Alamosa, Sonja Birthisel, Adele Drake, Michelle Fidler, Walter Greenleaf, Rebecca Krupke, Nate, Raj, Avinash Rude, Lizzy Younce, and Ehsan Tabatabaie were kind enough to either tell me about their explorations of the installation or let me observe their explorations. Avinash Rude receives thanks for assisting me in breaking down my installation in Lord Hall.
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CHAPTER 1
INTRODUCTION

1.1 Research Goals

With my thesis project, I create a participatory installation space. Inside this space, a visitor’s participation impacts a system. The ways in which visitors interact with the work constitute an incomplete collection of possible interactions between the visitor and the system. With my thesis, I explore what happens when a visitor enters this participatory installation space. My study has two components. First, creating an installation space predicated on encouraging participants to explore existing in this space and the impacts of their physical existence in it through motion and sound? Secondly, when participants engage with the installation, how do their individual modes of inhabiting the space affect the system?

1.2 Terminology

1.2.1 Audience

When I refer to audience with respect to an interactive installation I mean anyone who may visit the work. I design the work for and am interested in the interactions of anyone who may stumble across this work’s path. I am currently interested in understanding the broader engagements individuals make with interactive installations.

1.2.2 Algorithm

In the world of computers and new media art, an algorithm is a “sequence of simple instructions that a computer can execute to accomplish a given task.”\textsuperscript{1} A computer can run an algorithm on an organized set of data to complete a task.\textsuperscript{2}

1.2.3 Embodiment

Artist and scholar Nathaniel Stern continuously mentions exploring embodiment through interactive installation work, in his book, *Interactive Art and Embodiment: The Implicit Body as Performance*. The dictionary declares that to embody is to “give a body to” or “to make concrete and perceptible.” Philosopher Andy Clark discusses a theory of cognition called “embodied, active cognition.” It requires focusing on “real-world, real time” behaviors, allowing for independent interactions and not relying solely on centralized decision making, and spreading out computational activities over space and time. Therefore, when Stern discusses embodiment with relation to interactive installation arts, it seems likely that focusing on the real-time interactions, the individual decision makings, and spatial and time dependent experience, focusing on being present and the relations and dynamics that being physically present imposes, is key to the experience of interactive art installations. He writes,

Embodiment is a continuously emergent and active relation. It is our materialization and articulation, both as they occur, and are about to occur. Embodiment is moving-thinking-feeling, it is the bodys potential to vary, it is the bodys relations to the outside.

1.2.4 Engage

When an individual engages with a work, the work has either drawn this individual’s attention or has induced the individual to participate with it. An individual who engages with the work is actively considering the work, responding to it, or being manipulated by it.

6. Clark, p.81-82.
1.2.5 Installation

Installations are works of art that are experienced through entering into the work, not just passing by the work.\(^9\) Installations are works of art that use the space in which they are displayed and create an experience that the visitor must encounter spatially.\(^10\)

1.2.6 Instrument

A very broad definition of an instrument, given by the influential twentieth century composer Edgard Varèse states that if any noise can be a component of music, then anything that makes noise can be defined as an instrument.\(^11\) A more conservative answer to the question of what makes an instrument states that an instrument is device that a practiced user can manipulate into returning predictable responses.\(^12\) With an instrument, an action performed under identical circumstances will yield the same output as the same action performed the same way before that.\(^13\)

1.2.7 Interactive Work

Nathaniel Stern defines an interactive work, with respect to interactive, technology dependent installations as work which requires the “physical activity of a viewer-participant in order to fully realize a technology generated and process-based work.”\(^14\) From his perspective, an interactive work is a “‘work’ where the ‘work of the art’ is the movement of the viewer - and the affection and reflection thereabouts.”\(^15\) For my purposes, an interactive work is completed by the response of the audience member who engages with it. Through engaging with interactive work, an audience member is provided an opportunity to participate in a scenario that “enhance[s], disrupt[s] and alter[s]

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15. Stern, p. 5.
experience and action in ways that call attention to our varied relationships” to the
components of our physical and social environments.\textsuperscript{16} Interactive art helps us
re-contextualize an experience and create new associations inherent to the experience.

1.2.8 Involuntary Participation

When an individual encounters an artwork without knowing so, and engages without
being aware of doing so, this participant is an involuntary participant.\textsuperscript{17} In a truly public
space without any expectations of running into art, this participant is completely unaware.
In the case of visiting a gallery, a more frequent gallery viewer might realize that presence
may lead to involuntary participation in certain participatory or interactive artworks. The
gallery visitor has not agreed to participate in the work, but has agreed to take part in the
gallery experience, which the participation is a portion of.

1.2.9 New Media

New Media art relies on “the processing of information via the computer and all that
implies and entails.”\textsuperscript{18}

1.2.10 Open Systems Art

Open systems art is any art that “continuously interacts with its environment and
surroundings.”\textsuperscript{19} This means that outside influences can enter the system.

1.2.11 Participant

For my purposes, a participant is an audience member whose actions are influenced by
a work of art or whose actions influence the work. Participants contribute to the artistic
outcomes or understanding of a work. Participants engage with a work.

\textsuperscript{17} Pablo Helguera, \textit{Education for Socially Engaged Art: A Materials and Techniques Handbook} (New York,
\textsuperscript{18} N.B. Aldrich, Thesis Draft Revisions Comments to Katarina Hoeger, August 30, 2022.
1.2.12 Personal Artistic Practice

Cig Harvey introduced the concept of a personal artistic practice as any portions of her artistic practice that are not meant for public consumption at large.\textsuperscript{20} When I refer to a personal artistic practice, I use her description.

1.2.13 Technological Rig

The physical objects that make up the installation, in their proper orientation. The speakers, the computer, the wires, the floor, the spacing between everything are what Stern refers to as a ‘technological rig.’ He indicates this be a set, stage, or art installation that ‘produces a space’ that may ‘invite performance.’

1.2.14 Sonification

Stated simply, sonification is “the auditory representation of data.”\textsuperscript{21} Sonification can be used to create a new understanding of the analyzed data.\textsuperscript{22}

1.2.15 Sound Installation

Sound installations are installations that use sound as a medium - that is, they situate sound in space.\textsuperscript{23} Juliane Rebentisch, a philosopher and art historian, describes sound installations by stating “there is only sound in space. And this sound knows neither beginning nor end and hence no dynamism and no dramaturgy of development.”\textsuperscript{24} Sound installations use sound as a medium of artistic exploration, but in a way that allows, as often attributed to Cage, sounds “to be themselves.”\textsuperscript{25} The sounds in an installation exist in time and space, are elevated through the installation, but are not necessarily relegated to being musical sound.

\textsuperscript{20} Cig Harvey, (lecture, University of Maine, Orono, ME, USA, September 17, 2019).
\textsuperscript{21} Weibel, \textit{Sound Art, Sound as a Medium of Art}, p.491.
\textsuperscript{22} Weibel, p.491.
\textsuperscript{24} Rebentisch, \textit{Aesthetics of Installation Art}, p.211.
\textsuperscript{25} Weibel, \textit{Sound Art, Sound as a Medium of Art}, p.67.
Sound installations have met “twentieth-century Western music” goals by allowing for

1. New instruments, custom-made devices, for which the distinctions between musical and nonmusical instruments, and between musical and nonmusical sounds, no longer apply.  
   - Weibel, 2019

2. Incorporation of sounds, tones, noise, and silence of the environment. All audible phenomena are accepted as musical material.

3. Disappearance of performer and composer.

4. Investigation of new compositional techniques

5. Autonomy of sounds.

6. Spatialization and objectivization. The trajectory of the liberation of sound runs from the tape machine to the sound sculpture, from the audio object to the audio space.

7. Emancipation of the listener (following Anton Webern’s emancipation of the break and John Cage’s emancipation of the silence). The recipient becomes a participant.

   - Weibel, 2019

### 1.2.16 Spatialization

Varèse thought of music as “as bodies of intelligent sounds moving freely in space.” In a book comparing Japanese aesthetic traditions with Western ones, philosopher and academic Yuriko Saito notes that “designing a spatial composition that is experientially satisfying requires not only a sophisticated aesthetic sensitivity and skills but also the

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27. Weibel, p.67.
31. Weibel, p.68.
32. Weibel, p.17.
ability to imagine how the experience unfolds for its user, recipient, or viewer. As installations “organize the exhibition space at hand,” spatialization is a major component. When sound is spatialized, it shifts the listener-visitor’s attention between sound and space.

1.2.17 System

Biologist Ludwig von Bertalanffy defined a system as a ‘complex of components in interaction.’ A system contains organized “materials, energy, and information.” An artist who works with systems examines the individual components, the connections between them, if and how components enter and exist the system, and the motivations for exchange over connections in the system.

1.3 Historical Context

1.3.1 Timeline of Relevant Historical Events

In the last century and a half, the western world’s understanding of music and sound has changed dramatically. Inspired by the Industrial Revolution around the turn of the twentieth century, a group of Italian artists called the Futurists set out to use the aesthetics of the machines. In 1913, the Futurist Luigi Russolo, created an instrument called the intonarumori. The intonarumori, or noise intonators in English, along with his manifesto L’arte dei rumori (The Art of Noise) were the introduction of noise sounds, the sounds produced by industrial machinery, into the world of western music. Prior to 1932, the composer Edgard Varèse furthered the idea of which sounds could be used in music.

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34. Rebentisch, Aesthetics of Installation Art, p.141.
37. Shanken, p.115.
38. Shanken, p.115.
through his works, composing with any sounds and declaring music to be “son organisé,” or organized sound.\textsuperscript{42} In his 1957, during the lecture \textit{Experimental Music} at Vassar, John Cage introduced the idea to a larger audience in the Western music world that sounds can be allowed to be sounds, acknowledged as significant without being specifically made into musical sounds or organized.\textsuperscript{43} Shortly after this, in 1958 at the Phillips Pavilion at Brussels World’s Fair, Varèse premiered an early examples of spatial music, “Poème Electronique,” a composition that unfolded across spread out loudspeakers.\textsuperscript{44} This progression of intellectual leaps leads to the sound installations of today.

J. M. Jacquard built a loom controlled by punch cards at the turn of the nineteenth century. This inspired Charles Babbage create to create a data processing machine that ran off of punch cards that he called “the Analytical Engine” in 1833.\textsuperscript{45} In 1890, the U.S. Census Bureau adopted Herman Hollerith’s electric tabulating machine, and with the growth of and acquisition of this business, International Business Machines Corporation, or IBM was formed in 1924.\textsuperscript{46} Konrad Zuse began to build a computer that used punched tape to control computer programs in 1936.\textsuperscript{47} In the same year, Alan Turing wrote a paper detailing what computing machines were capable of.\textsuperscript{48}

These discoveries led to the computing landscape of the current day, with new media objects composed of “graphics, moving images, sounds, shapes, spaces, and texts,” where the objects “have become computable; that is, they comprise simply another set of computer data.”\textsuperscript{49} New media art can be considered art that utilizes “technologies and media of the moment”, and is created using new media objects.\textsuperscript{50} Lev Manovich, a modern

\textsuperscript{42} Weibel, \textit{Sound Art, Sound as a Medium of Art}, p.15-17.
\textsuperscript{44} Weibel, \textit{Sound Art, Sound as a Medium of Art}, p. 16 - 17.
\textsuperscript{45} Manovich, \textit{The Language of New Media}, p. 21.
\textsuperscript{46} Manovich, p. 24.
\textsuperscript{47} Manovich, p. 25.
\textsuperscript{48} Manovich, p. 24.
\textsuperscript{49} Manovich, p.20.
\textsuperscript{50} Stern, \textit{Interactive Art and Embodiment: The Implicit Body as Performance}, p. 7.
day creative academic with an interest in new media, compiled a list of principles most new media objects adhere to.

- The first principle is that “new media objects . . . are composed of digital code; they are numerical representations.” This allows the objects to be described in equation form and manipulated algorithmically. This allows for the digital speeding up and slowing down of a sound file.

- New media objects are modular. Modular objects can be reconfigured easily and combined into larger conglomerations, yielding more opportunities. Modularity allows for situations where a coder can use a pre-written function, say a function that is built to play back a sound file, without needing to write the entire function from assembly code.

- New media objects can be automated or include automation. As an example, a new media object, such a command to play a sound file, can be automatically created given certain an event triggers the code to start the automated process of playing the sound file.

- New media objects are variable. One sound file can be swapped out for another. Colors can be replaced automatically. Content can be chosen out of a database, treated differently depending on a use case, customized to a situation, specifically selected, or linked to other content.

- New media objects can be transcoded, that is, changed into another format. For example, a sound file stored in one format, for example a .wav file, can be converted.

51. Manovich, *The Language of New Media*, p.27.
52. Manovich, p.27.
54. Manovich, p.32.
55. Manovich, p.36.
to another, say a .mp3 file, making the file accessible on machines that might not have been able to access the data of the first file type.

As new media objects, interactive installations require participants to engage with them in order to “fully realize a technology generated and process based work.”

1.3.2 Relevant Theory

To understand interactive installations, a visitor needs to move through them, think through moving, and feel all the while, a phenomena that artist and professor Nathaniel Stern calls ‘moving-thinking-feeling.’ Interactive artists are not concerned with their visitors exploring a situation mentally in the gallery. Instead, interactive artists are interested in creating works understood through a body, a body with its own agency, moving through the work. It is important that an interactive artist very clearly isolates the relations under exploration and clearly amplifies or brings them to attention through the process of the work. Andy Clark agrees that interacting with and manipulating our environments is an important part of thinking and postulates that the boundaries of cognition are less defined than residing in the fleshy matter of our brains. The writings of both Stern and Clark support an argument for using the entire body and surroundings, to make the experience one that helps encourage the participant to engage in different modes of thinking. Stern, Clark, and Saito all thread arguments throughout their writing that support the idea that western society emphasizes visuality and that visuality is often equated with intellect. However, vision is always felt in conjunction with other senses. Saito states that a reliance on vision keeps individuals from fully engaging in a

59. Stern, p.4.
60. Stern, p.56.
64. Clark, Being There: Putting Brain, Body, and World Together Again, p.46.
space. She also emphasizes that creating a temporal order to an experience, determining how the experience unfolds for the participant, and delineating the boundaries of different part of the experience is important in creating a satisfying experience for a participant.\(^67\)

If we wish to engage the body, and do not want to rely too heavily on visuals, it is practical to rely on another sense, such as sound. The Boulez-Stockhausen school encouraged the free use of sounds, whether the sounds would be deemed musical or not.\(^68\) In particular, an interactive sound installation such as “Motion: Connecting Body with Sound and Position” challenges the idea of performer and composer, utilizes all the sounds in the space as materials for sound art, and incorporates the spatialization of sound in the experience.\(^69\) However, sound can be considered difficult to work with in the gallery setting.\(^70\) Works containing sound dominate the gallery’s audio space and can be perceived from all parts of a gallery, bleeding into the experiences of every other work in a gallery. If there are two works containing sound happening simultaneously, they each become part of the experience of the other. Additionally, sound requires extensive physical infrastructure to set up, much of which is bulky, and can detract from a visitor’s experience in a gallery and affect their reception to the experiences. Lastly, sound work cannot just be taken in at a glance, but demands the time of the visitor to garner appreciation.\(^71\) Interactive sound work not only demands the visitor’s time, but the visitor’s participation to be appreciable. An interactive sound installation that anyone can walk up to and create sounds with removes the need for a skilled performer, making the creation of sounds accessible to everyone.\(^72\)

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68. Weibel, \textit{Sound Art, Sound as a Medium of Art}, p.66.
69. Weibel, p.67-68.
70. Celant, \textit{Art or Sound: From the Multilingual to the Multisensory}, p.392.
71. Celant, p.392.
CHAPTER 2
ARTIST’S BACKGROUND

We each have multi-faceted identities that are shaped by our experiences and influence the decisions we make. What parts of my identity likely influenced my thesis work?

2.1 Artist

Depending on the situation, art has historically been seen as skilled craft, embellishment, creating fantasy experiences, play, creating order, as extending senses, as expressing the artist’s self, and more.\(^1\) Making art is often part discovery, craftsmanship, thought experiment, and a vehicle towards creating experiences with others. As Dissanayake writes, “artistic behavior shapes and/or embellishes everyday reality with the intention of constructing or manifesting (or recognizing) what is considered to be another “level” from quotidian practical life.”\(^2\) In other words, as an artist, I aim to take the everyday and enhance it. I do so by creating - sometimes adding a sonic touch, sometimes adding extra visuals, sometimes through instructions or designing an experience that influences those who partake in the experience into engaging in ways they are unlikely to without external influence. Many of my works are temporary. Many require participation.

2.2 Buddhist

Growing up Buddhist has shaped my approach to life and my world view. Therefore it affects the work I make and the approaches I take while making it. I do not necessarily set out to create Buddhism inspired work, but by nature of having a specific world view, my work reflects some of these traits. My choices, and how I choose to explore meaning in my

2. Dissanayake, p.401.
work, will be shaped by the religious beliefs that create part of the foundation of my worldview.³

As a Nichiren Daishonin Buddhist, my worldview is shaped by a few strong beliefs. I believe that every individual and organism has the capacity to attain enlightenment.⁴ Therefore, each individual and organism should be treated respectfully and taken seriously. With my work, I try not to create situations that take away from how the individuals and organisms that come into contact with it are treated.

I also believe in “the principle of the mutually inclusive relationship of a single moment of life and all phenomena… Life at each moment encompasses the body and mind and the self and environment of all sentient beings in the Ten Worlds as well as all insentient beings in the three thousand realms, including plants, sky, earth, and even the minutest particles of dust.”⁵ At any time, you can look at the current moment, containing yourself and everything around you in it, connected through the juxtaposition of existing together, and connected through the relations between each entity existing in this space and time. It is all connected. My work often focuses on the instance of the present, of being in a specific moment, because life itself can be viewed in this instance of the present. The work often focuses on totally encompassing body, mind, self, surroundings, and the entire system around it. My work with “Motion: Connecting Body with Sound and Position” focuses on the present, and the relations that exist in it. The participants use their bodies as well as their minds, bringing some of the existing relations in the space to attention. Experiencing life as a system and paying attention to the present have been emphasized through the work.

The experiences an audience member has with my works are just a microcosm of life as a whole. In life, you have yourself, your thoughts, your body, and your surroundings,

⁵. Committee, p.3.
wherever you go. You are part of a system, wherever you are. A visitor is experiencing my work as part of a larger system. The larger system contains other visitors, the encompassing gallery infrastructure, any nearby organisms, other works, and the like. A visitor walks in with personal belongings and internal thoughts. The work needs to be able to be considered simultaneously with its physical surroundings, the internal thoughts of the visitor, and the rest of the organisms and circumstances that influence a visitor’s perception. All of the relations that exist in the moments that the visitor experiences the work are a subset of that visitor’s life experiences.

I cannot anticipate every cause and the effect possible within the work. Nor can I isolate a visitor’s experience so that the visitor only experiences certain causes alone, certain effects alone, or certain pairs of causes and effects alone, without experiencing each other cause and effect possible in the system. However, in all scenarios, once one takes action, there is an effect. Some effects are visible right away. Some build up over time. I wanted my work to show and model this – “Motion: Connecting Body with Sound and Position” brings immediate effects to life for the participant. In this work, certain causes, motions, are highlighted through the effect of sound. Motion is not isolated from other causes, such as speaking, that might occur simultaneously. Effects are not isolated from other effects that might happen at the same time, such as the sounds from a nearby installation entering into the soundscape of “Motion: Connecting Body with Sound and Position”. I can heighten a visitor’s experience of certain causes and effects, of the interplay between certain relations existing in the installation space. There is an interplay between the possible causes and effects, the causes and effects I intend to be examined are highlighted, but all, the modified and the preexisting coexist to make the experience of the work.
2.3 Coder

I took a required course on coding course for freshmen at Harvey Mudd College during my undergraduate college experience. I struggled, went through the motions, and passed by doing, not by understanding. All through undergrad, I was shown how coding was useful, given opportunities to use it, but never really considered myself proficient. At the time, I would only turn to code if I was required to for educational or work purposes.

Then, I went to graduate school, nominally in the computer science department at the College of William & Mary. While studying Operations Research, I truly needed to code. I went from understanding that code is useful if you need to perform multiple operations at once, if you need to perform many operations quickly, or if you need a set of directions followed very precisely to learning to use these to create mathematical solutions to problems for real or imagined clients. By the time I left graduate school, I could use code to time traffic lights so that the average driver waits for the least amount of time at a traffic light or ship sneakers and jackets between warehouses and stores in the most cost, time, or fuel saving routes and schedules. I could write functional code for very specific use cases when prompted, but did not yet have the confidence to figure out if code could help in a situation and sit down and write code to use as a tool to provide a solution.

Due to my interest in music and mathematics, I became a regular at Music Community Lab’s hackathon series, Monthly Music Hackathon NYC. While attending, volunteering, and eventually running the events, I was exposed to the world of creative coding, usually with music or sound. Creative coding became the vehicle through which my coding improved and my confidence grew. I began to start projects, just to explore. I would start projects, not sure where they were going or if I could complete them, but just try. I began to teach others to code and to try creating with their computers. Through these experiences I became a coder.

If I start to approach a problem or situation, and ask myself, can I make this process faster? Can I make it more efficient? Can I get it to trigger on its own? Can I make it
customizable to individuals or situations? Can I get this to repeat itself indefinitely? Can this timing be variable but consistent? Can all of these things happen at once? Any of these questions lead me to consider using code as a tool.

The process of coding itself is akin to making art. I may start out with a set goal, but if I am not trying to produce a product, I let the code and goal morph. I do a little, see what happens, and then take the next step. The process of coding is, appropriately, similarly iterative like the process of creating the art.

2.4 Dancer

I took ballet lessons for years. In ballet lessons you often move in a coordinated group.

We moved our bodies as a whole with respect to one another, sometimes performing the same actions, at others performing different ones. We moved ourselves while keeping track of different parts of the stage and our orientation to the audience. We moved with the music or with the silence. We moved, assuming there would be an audience some day, and that our minute movements, our facial expressions, and our coordination mattered.

We reached for perfection. Most got closer to the ideal than me. But while looking in the mirror and seeing my movements made me feel imperfect compared to my classmates, moving still brought me joy.

I joined social dance. There were no mirrors, no audiences. Just another person on the other side of a partnered connection to dance with, and groups of people dancing around you, and music. There was joy in the movement, and freedom to the movement. There was joy in the connection between dance partners and with the music. There was joy connecting with myself while dancing again. There was a way to spread the joy, the acceptance, the belonging to others. It was through being welcoming and dancing with the spirit of joy and acceptance.

My work itself is not about dance. But dance is one experience that taught me the wonder of creating with others. It also is one way I learned about existing as more than
just a brain, and existing as a body in the world, not just a set of thoughts. Through “Motion: Connecting Body with Sound and Position”, I set up a technological rig that only allows for a complete artistic experience if there is significant visual change in the area hosting the rig, often when a participant enters the installation space. The work is not completed by me, the artist who created the technological rig, alone. It is created through a temporary artist - participant partnership. The experience provides an opportunity for others to appreciate or consider their presences through their motions.

2.5 Human

I was born into a society. There are a set of social norms under which I was raised and expectations I have been held to. There is a history that influences the rules I follow as a member of this society. These rules and expectations all affect my actions and influence my decisions.

I was born with a varied cultural background, none of it mainstream American. I am the child of an immigrant, and have some experiences unique to first generation Americans. I am the child of a non-native English speaker and this has influenced my actions and decisions. I am the grandchild of a grandmother who told stories about growing up working as a sharecropper after school and during the summer. I am the child of a woman who lived through the Newark race riots. I am the child of a father who grew up in a Germany devastated by war. I grew up non-Christian in a Christian majority country. These are parts of my identity. I did not chose them. They all affect my understanding of situations, my approaches to problem solving, my actions, and my decisions.

I am a cook, a diver, a reader, a tree grower, and a walker. These are aspects of my personality I chose. They influence my decisions and actions too. Our initial circumstances matter but our choices matter too.

My circumstances lead me to ask, “can this be done together with others?” I sometimes ask “Where am I now in opinion, progression, or physical location compared to others?” I
wonder “Am I alone, and if so, why?” If I believe the why is reasonable, I will stay, but I will wonder “Where is my body? Is it well? Will it remain safe?” All of these questions boil down to the idea of knowing where I am, with respect to society and the world, so that I can continue to live life to the fullest.

### 2.6 Mathematician

For roughly one-fifth of my academic life up until now I focused on mathematics. I focused on finding and recognizing patterns. I focused on modeling connections and relations. I focused on outlining situations clearly, defining scope, approximating solutions, and providing guidance and efficient answers. I focused on organizing, classifying, and defining parts of our human existence based on a method for interpreting the world built up over thousands of years by a multitude of people. I learned about the strengths of such a system, but also the ways it can become confusing, off-putting, or used nefariously.

Studying mathematics reinforced that there are multiple ways to approach situations. Many mathematical concepts can be proven in multiple manners. There may be an approach that is faster, or one that is more efficient, or one that is exceedingly clever, or a way that solves multiple problems at once. There may be a solution that is more intuitive. There may be an approach that is most enjoyable. These are lessons that hold true for more than just solving mathematical problems.

Then, consider the mathematical theorems and proofs learned. It is true that to alternately color each country in a map a different color so that no two countries of the same color touch, one needs 4 colors.\(^6\) It is true that there are 17 symmetry groups that can be used to create wallpaper patterns using one initial unit.\(^7\) It is true that if there is a situation to be optimized that can be completely defined by a set of linear equations that

form a convex region, the optimal solution will lie at one of the corner points of the convex
region.\textsuperscript{8}

The results of theorems and proofs can be used internally within Science, Technology,
Engineering, and Mathematics (STEM), the social sciences, business, or more to create
practical results. Successful proofs can be used to create further proofs or to develop
procedures used when building buildings, reduce shipping times, analyzing blood work, and
more. The lessons learned through the study of proofs can also be applied to the creation
of art. Math may not always be the first solution one thinks of, but over the years many
intelligent people have contributed to our mathematical knowledge. Sometimes, if you can
use the tool already built or a fact that has been proven, it makes sense to use the
mathematical knowledge you can. Learning mathematics teaches a system of problem
solving, one that can be used in math, or as an approach across different areas of life.

2.7 Musician

I enjoyed making sounds with my friends. I soon learned about the pleasure I could
bring to others by carrying a tune well.

I learned to listen to the sounds around me, to the sounds from my flute, to the sounds
of other players. I learned that the world is rarely quiet. People may say it is silent, but if
goes to an anechoic chamber and makes no purposeful noise, one still cannot escape
sounds.\textsuperscript{9} We often count “unintentional sounds” as part of silence, the nondescript and
continuous sounds produced that exist naturally in environments but can fade easily in
mind because they do not seem intentionally produced.\textsuperscript{10}

When musical groups rehearse well together, and perform well for an audience, there is
a certain feeling of contentment in the air. The audience is happy, the musicians are


\textsuperscript{10} Cage, p. 13.
bonded through their successes. I learned to love making music with others, creating with others, and to privilege it over creating alone.
CHAPTER 3
CONDUCTING RESEARCH

My researching has taken three forms. I have conducted a literature and contextual review, to understand the historical and conceptual underpinnings of my work. Learning about what other artists have created and reviewing some theory has helped me form my work. Another form my research has taken has been practice-based. I learn during the creation of each project. The last form of research I have worked with is through the observation of the interactions of the audience with my works.

3.1 Historical Context and Contextual Review

One part of my research process involves learning about what past artists have done. Knowing the history that has made the work possible, some of the prevailing thoughts that support my work or its precursors, and understanding what other artists have done before is a form of research. This research has been partially discussed in Section 1.3 and will be further discussed in Section 5. The process of learning about the related historical context is one expected to continue for a lifetime.

3.2 Creating Works

As I create, I research. Throughout this program, I have completed many projects, many of which are explained in the Portfolio 4. Different part of the creation process lead to various insights.

While my creative process varies for each project, creating a work is a drawn out process. I typically complete the following steps, somewhat in this order.

1. Idea

2. Plan
3. Mock-Up

4. Build

5. Test

6. Deploy

7. Tweak

With most projects, the process of creating is not linear. I might switch from 1. \(\rightarrow\) 2. \(\rightarrow\) 3. \(\rightarrow\) 2. \(\rightarrow\) 3. \(\rightarrow\) 4. \(\rightarrow\) 2. \(\rightarrow\) \ldots. I may have a basic idea, but once I go to execute it, I realize that it cannot be pulled off without further planning, more testing, or the like. The stages are often not well defined.

For a brief example of the repetition of steps, consider when I was building “Constructing Beginnings”, a portfolio work explained in Chapter 4.3. I had recently bought a couple dozen speaker drivers, and had planned to have the sounds for constructing beginnings play out from at least 3 of them. However, while I had plans, I did not yet realize they were incomplete. I had never used speaker drivers, and did not realize I would need to attach TRS cables to them, or that they work best with amplification, and that to send out three different channels of sound I would need to figure out how to route audio signals. I would overcome one hurdle, then realize the next. As there were time constraints, I never did overcome all of them as originally planned. Instead, I would build a mock-up, test it, build further, and then return to planning. Were there different ways I could accomplish my physical goal of having three sounds playing simultaneously while being spatialized and being able to hide the source of the sounds? Eventually I realized that mp3 players could be just as easily hidden as speaker drivers, and apart from the amplification issue, solved all other issues. I decided to attempt natural amplification, and the PVC pipes were added. Through trial and error and time constraints, “Constructing Beginnings” took its final form.
While these steps have been discussed using “Constructing Beginnings”, in the Chapter 6 these will be discussed in more detail with respect to “Motion: Connecting Body with Sound and Position”.

3.2.1 Idea(s)

I write down artistic ideas that come to me in one of many notebooks. Some ideas get acted upon. Others just sit in the notebook, potentially to be acted upon in the future. Others will be written down again, in a slightly modified form. Writing the idea down helps me move on past continuously ruminating on the idea without progressing. I think about if I am really interested in the idea. If I think it is feasible? If it either something very tempting or something small, I start it.

In the case of “Constructing Beginnings”, the idea was simple. Have three physical sound sources, and figure out how to have different sounds coming from the three simultaneously.

3.2.2 Plan

After choosing an idea, I make a plan. I think of what’s the easiest way to start. Maybe it is to learn a bit about the project. Maybe it is to follow a tutorial. Maybe it is to just try the project. So long as the startup cost and risk are low, I just try to start a small part of the project. Just starting leads me into the mock-up stage.

In the case of “Constructing Beginnings”, I decided to buy cheap speaker drivers and started synthesizing sounds.

3.2.3 Mock-up, Build, Test

The mock-up stage is when I try different methods of making the project work. I might draw a layout, then start putting objects in the places indicated in the layout. If I am working with code, I start writing very terrible code that does some small part of what I
need. If I am working with math, I might start with diagrams or equations, ones that will invariably be shown to be wrong later.

Building is similar to mock-up. Building is once I have completed enough mock-ups to understand what I think my requirements will be. Building is just creating either a step or a partial step of my final project using materials I think are final materials. Testing is once I have either a mock-up or a build, and see if this step of the project is functional in the overall plan.

In the case of “Constructing Beginnings”, I took the set of speaker drivers and soldered electrical wires and TRS cables onto them. Then, I tested the drivers by trying to play sound, and realized that I needed a TRS cable. Then, I soldered on a TRS cable, and realized that the speaker drivers are not amplified.

3.2.4 Deploy and Tweak

Once each of the sections has been tested, and everything has been built together, the project can be deployed. Deployment can mean it is live and functional on the web. It can mean it is in a gallery. It can mean that it becomes a ring tone for phones. Whatever it means, deploy just means that is accessible at large to an audience outside of one composed of people who helped me. If possible, the project will be tweaked after deployment. In the case of a website, small changes can happen after deployment. In the case of a gallery installation, small changes, such as changing the volume of sound in the gallery, can happen after deployment. In the case of pre-fabricated and distributed items, tweaking is no longer possible once the product is constructed and with distributors or consumers.

3.3 Interaction and Observation of Interactions

The last form of research is the research involved in interacting with the work. In the case of “Motion: Connecting Body with Sound and Position”, this means understanding what it is like to be inside of the work. It means understanding what it leads me to do, and
how I act within it. It also means observing others in the system when I can, or unofficially collecting stories. From what I experience, see, and hear, I try to understand the overall reception the work gets, what it communicates to an audience, and what the audience might be learning from it.
CHAPTER 4
RESEARCH THROUGH CREATING WORKS: PORTFOLIO

Creating the projects in this portfolio exemplify ideas, skills, and experiences I find pivotal in my thesis journey. Not all of these projects were executed successfully. Some are small in scope. There is no underlying theme tying all of these works together neatly.

Each selected work has shaped my time in the MFA and has been part of the research process leading to my thesis explorations. These works helped me conceptualize my initial thesis direction. Later, they helped me inform the artistic direction of my thesis, the execution of my thesis project, “Motion: Connecting Body with Sound and Position”, and the writing of this document.

4.1 “Parabolic”, Fall 2019

Blindfold, Cables, Chair, Custom Code Generated Sound File, Headphones, Laptop, Lights, Table
37 seconds

An overview of “Parabolic”

In the Fall 2019 iteration of “Parabolic”, a visitor enters a room. The room is lit in red light. Inside the room is a table and chair. The table has an old laptop on it hooked up to headphones. There is also an instruction sheet and a blindfold.

The instructions guide the listener to place the headphones on, press play to start a sound file, and blindfold themselves. Then, the listener hears minimal sound, the sounds of one note on a flute, being panned around the head of the listener.

Audience Response to “Parabolic”

The audience responded strongly to the ambiance created through the physical presentation of “Parabolic”. The lights, wires, and blindfold made participants feel
unnerved. One audience member mentioned that she felt like she was being held hostage. The large selection of technology involved in this project’s instantiation contributed to hostile feel. The minimal audio, combined with its low volume playback, made for an experience where much of the audience could not hear the sound. The audience that could hear the sound was not able to perceive its shifting points of origin. All participants walked away having thought of the sound as a side note, not the main purpose of the work. Removing the sense of sight with a blindfold did not lead participants into paying more attention to the sounds. Instead, it distracted away from the sounds. The feel of the blindfold and the knowledge that they are now sitting vulnerably, in a room, with their ears and eyes covered, distracted participants.
General takeaways from “Parabolic”

When working with sound, it is important to pay attention to a work’s physical presentation. If you have strong visual elements, or elements unnecessary to the presentation of the idea, the work can easily become more about the elements surrounding the work than the work itself. All presentation design decisions should be made in a way to support the concept being explored.

For sound work, playing the sound back over a visible computer distracts the participants. Playing back low volume sounds on headphones may make it easier for those with the most sensitive ears to hear differences in the origin points of sounds, but everyone else cannot hear the sounds or their motions. While headphones are portable and make for easily distributed work, if the experience relies on someone using an unfamiliar electronic device to listen to work do not rely on them being able to control the device in a skilled manner. Think through the delivery of the piece thoroughly before claiming to make it, and make sure that you can present at least a minimal version that works well before presenting anything.

Relevance of “Parabolic” to Thesis Explorations

However, “Parabolic” was a pivotal experience in learning about the need to create installations that entice participants to pay attention to sounds.

For “Motion: Connecting Body with Sound and Position”, if the technological rig is more distracting than the sound is engaging, the work becomes less about position, sound, and the inclusion of the participant and more about the installation’s physical manifestation. This supported my decision to construct a visually minimal technological rig for “Motion: Connecting Body with Sound and Position”.

More Resources & Additional Documentation

Use headphones to listen to the sounds the audience listens to in “Parabolic” on SoundCloud: https://soundcloud.com/katarina-hoeger/parabolic. See the CSound code
used to generate the sound file for “Parabolic” at https://www.katarinahoeger.com/mfa-thesis/code.

4.2 “I Don’t Like Him”, Fall 2019

Video
23 minutes 21 seconds
projected on a 4’ x 2.25’ transparent white sheet

Figure 4.2: Writing the end letter.

An overview of “I Don’t Like Him”

“I Don’t Like Him” is a video experience. In the fall of 2019 it had a showing in a makeshift movie theater assembled out of furniture scavanged from the host academic building. The installation was composed of a sheet suspended between empty cabinets, a projector, speakers, and a set of comfortable chairs dragged from various places in the building.

The video itself begins with me chatting to the image of a friend who appears in my dorm bathroom mirror. I bring up the topic of men, romantic interests, in my life. The video then cuts to a still image symbolizing areas of my life at the time that remind me of...
the friend whose image appears. Then the video transitions to a view of me writing to one of the mentioned men. As the video progresses, it shifts between still images and footage of me writing to the mentioned men. Some of the thoughts and words associated with the men are depicted in the frames.

**Audience and “I Don’t Like Him”**

The audience of “I Don’t Like Him” is fed a narrative. They receive visuals and audio in a carefully curated order, and are only expected to passively take in the presented materials. The audience is invited into a personal musing.

**General Takeaways from “I Don’t Like Him”**

“I Don’t Like Him” is extremely personal in content. It is filled with personal symbology. While circuitous in narrative, it maintained linear content delivery. There is a rawness and vulnerability to much of the content. This rawness becomes the hook for an audience member’s attention.

**Relevance of “I Don’t Like Him” to Thesis Explorations**

Creating “I Don’t Like Him” was an important step in my future MFA work and thesis explorations. It helped me determine that creating work that focuses solely on a truly personal topic feels unnatural and pointless beyond catharsis to me. The topic may be taking up a substantial amount of my mental space, but it is not necessarily meaningful to the audience because of its personal specificity. Therefore, with my thesis exploration, I set out to avoid symbolism that makes intuiting the purpose of my work impossible.

**More Resources & Additional Documentation**

“I Don’t Like Him” is hosted on Vimeo at: [https://vimeo.com/726357919](https://vimeo.com/726357919). Further photo documentation of the work can be found in Appendix B.1.
An overview of “Constructing Beginnings”

A visitor is welcomed into “Constructing Beginnings” by loud sounds and fairy lights leading up a flight of stairs to the exhibit. Once the visitor reaches the top of the stairs, the visitor is presented with a variety of options. There are three areas with assemblages of pipe, cinder blocks, and sand that the visitor can choose to approach. A title and wall text are also spread out along the wall and can be approached and read. There is a seating area off to the side, providing a full view of the work. The visitor must choose what to approach first and in which order to traverse the installation.

A unique sound wells from within the pipes of each of the three structures. One broadcasts the beginnings of stories told in the fashion of fairy tales. Another emits sounds
recorded in various places I frequented during the new beginning that came with starting a MFA program in Maine. The third assemblage of pipes has the beginnings of stories encoded as musical sound welling from its depths. All three sound files play back simultaneously and continuously.

**Audience and “Constructing Beginnings”**

The lack of a clear start and the repetitive nature of the sound files allowed the audience to construct their own beginnings to their experiences of “Constructing Beginnings”. Audience members engage with the work by placing their ears next to different pipes and making tracks in the sand.

**General Takeaways from “Constructing Beginnings”**

The careful creation of an inviting space for visitors to enter in addition to the construction of a sound delivery system many had not heard before entices visitors to listen to the sounds. Sound was filtered by the pipes, and while audible from further away, it became easier for the audience to pick out different sounds the closer they got to the pipes. This allows sounds to be audible to visitors while allowing all visitors to control how loud and how clear they want their experiences to be by approaching the distinct sound sources. The sound came out of physical sculptures, spread out throughout the room. The all sounds were audible at certain spots in the room, in other spots, certain mixes of sounds were louder than others. The listening experience was spatialized because the sound sources were fixed points laid out in space, and moving visitors changed their proximities to each source through their motions through the space. Changing proximity changed the mix of sounds experienced.

**Relevance of “Constructing Beginnings” to Thesis Explorations**

“Constructing Beginnings” was an important stepping stone in my progress towards my thesis. This was the first work I created where I successfully spatialized sound. It
spatialized sound in a way that invited visitors to wander through the installation space successfully without explicit instructions. It was a work where visitors had a small amount of control over their experiential outcomes. “Constructing Beginnings” is also a work that emphasizes how simple cues can lead a visitor, without instructions, into navigating an installation space. This is a lesson that is directly applicable to my thesis work.

“Constructing Beginnings” is my first installation. Setting it up helped me learn about the installation construction process.

“Constructing Beginnings” is a work where I chose a relatable topic, new beginnings, that I believed is universally understood and of interest to visitors. This is one of the earliest works during my time in the MFA where I set out to explore a very specific topic in a very specific way. As a whole, these works lead me to consider whether an artistic exploration of my own perspective is valuable to an audience.

More Resources & Additional Documentation

The sound files for “Constructing Beginnings” are hosted on SoundCloud at: https://soundcloud.com/katarina-hoeger/constructing-beginnings-3-tracks-in-1. Further photo documentation of the work can be found in Appendix 4.3.

4.4 “Surface Thoughts”, Fall 2019

Audio, Projection, Pen, Sticky Notes
1 minute 16 seconds

An overview of “Surface Thoughts”

“Surface Thoughts” consists of a simultaneous audio and visual experience. There are 6 channels of sound. Speaker monitors one and two of the six play a loop of rambling voices and noise representing external voices and thoughts. Speaker monitors three and four of the six play a loop of midi piano representing different mental states. The remaining speakers, five and six, play a loop of the artist speaking self judgments, representing an
inner monologue. Spoken judgments are projected on the wall in writing. A podium lies at the entrance to “Surface Thoughts”. The podium holds instructions, sticky notes, and pens, inviting participants to add their own self-directed surface thoughts, or inner monologues, to the wall.

**Audience and “Surface Thoughts”**

Visitors are drawn into “Surface Thoughts” by its volume. Many stay for the short while necessary to listen to the entire work play through. Some follow the instructions and contribute a sticky note. Others leave and then return to read new sticky notes. No one lingers for long due to the extreme volume. The technology, speakers, and a projector are neatly arranged for minimal interference with the content delivery. Therefore the participants focus almost solely on the idea of surface thoughts and less on the construction of the installation.
General Takeaways from “Surface Thoughts”

This project emphasizes how simple methods of engagement and explicit directions can convert visitors into participants engaging with an idea. A set of instructions is a very direct way of encouraging participation. A simple interface, such as sticky notes and a pen, is a very easy way for participants to engage. It requires no explanation as to how to use the interface. The explicit directions are creating a scenario where the participants are solely participating within the confines declared by me, the artist. This is an efficient way to collect data and to collect stories, but does not necessarily induce participants to make meaningful contributions beyond contributing to the collection.

From a technical point, this work required me to think through how to hide a projector, how to route sound, and how to neatly gaff electrical wires. When working with technology, as seen earlier in “Parabolic”, it is vital to figure out how to integrate the technology in a way that at minimum, does not detract from exploring the idea of interest, but at best, enhances it.

“Surface Thoughts” is yet another work where I explore juxtaposing sounds. This is the first work where I specifically mixed sounds and visuals together to create an experience. When a set of sounds are presented at the same time in the same space, they are understood by the audience as one experience. Similarly, if visuals are presented simultaneously with these sounds, the visuals and audio make one cohesive audience experience.

Relevance of “Surface Thoughts” to Thesis Explorations

As a participatory installation with sound and visuals, “Surface Thoughts” is directly related to “Motion: Connecting Body with Sound and Position”. Through “Surface Thoughts”, I got my first experience with soliciting participation from visitors. This was my first attempt to create an installation visitors become participants.
Many of the technical skills learned during “Surface Thoughts” are used to help design and implement “Motion: Connecting Body with Sound and Position”. “Surface Thoughts” is my first exposure to audio routing and my first attempt to spatialize sound with powered speaker monitors. Early iterations of “Motion: Connecting Body with Sound and Position” included the idea that a projector would be used to project visuals onto either the wall or the floor of the installation. Hiding the projector in the rafters during “Surface Thoughts” helped me begin to explore what it would take to effectively and seamlessly project during “Motion: Connecting Body with Sound and Position”.

“Surface Thoughts” helped reinforce the necessity of creating an installation in iterations. It also helped convince me that “Motion: Connecting Body with Sound and Position” needed to be built in stages. “Surface Thoughts” was planned in detail and built quickly. However, it was only truly realized once. There was no time to tweak results, figure out what was most effective, and how to improve the work.

More Resources & Additional Documentation

The repeating sound track from “Surface Thoughts” can be listened to on SoundCloud: https://soundcloud.com/katarina-hoeger/surface-thoughts-reduced-sound-experience. See photos from the installation in Appendix B.3.

4.5  “Elsewhere”, Spring 2020

Video (60 frames per second, 48 kHz)
1 minute 15 seconds

An overview of “Elsewhere”

“Elsewhere” begins with a dark screen and a bass note. The darkness is broken up by images flashing periodically across the screen. The darkness gradually changes as the main image is shrunk from its extreme zoom and begins to pan. The images that flash by depict nature, man-made structures, plants and animals, and people from various places the artist
has spent longer stretches of time. Simultaneously, higher pitched electronic beeps occur at
an irregular frequency, disrupting the lower bass notes. The irregular beeping, long tones of
the bass notes, and the regularly flashing pictures all have differing rates of incidence.

In creating “Elsewhere”, I set out to create a video exploration of memory, presence,
timing, and the juxtaposition of sounds and visuals. “Elsewhere” is inspired by a modern
understanding of human cognition called the Penrose - Hameroff model.¹ The images that
flash by are from pictures of my past and present as of Spring 2020. The images are
accompanied by generated sounds. The sounds are synthesized from frequencies in voices
that appear in many of the pictured memories.

**Audience and “Elsewhere”**

“Elsewhere” is a work with many encoded memories. The audience can only gain
access to the specifics of the memories by talking with me. However, audience members

¹ Stuart Hameroff, “Quantum computation in brain microtubules? The Penrose-Hameroff ‘Orch OR’
model of consciousness,” *Philosophical transactions of the Royal Society of London. Series A: Mathematical,
can understand that media is being presented to them at different rates. While there is progression to the work, the audience is not expected to follow a specific narrative arc. The rapidly changing images appearing at different rates than three sets of rapidly changing beeps creates a flood of information for a viewer-listener. The audience is asked to do nothing but sit still and receive the visual and audio stimuli in “Elsewhere”.

**General Takeaways from “Elsewhere”**

“Elsewhere” is a work where I used art to explore a scientific concept. The question I asked was, what happens if I sonify and visualize what cannot model the biological mechanisms of memory? Choosing differing incidence rates for audio and pictures necessarily encoded meaning into the work. While pictures are often used to depict memories and voices are often tied to memories, the audience would find it difficult to decipher the logical mechanism of what is being depicted. “Elsewhere” is an exploration of what happens when you try to depict two different interpretations of the same content, in this case through both audio and visuals, which can be mentally processed simultaneously through multiple senses.

“Elsewhere” was one of my first works shaped by the COVID-19 pandemic. The work needed to reach my remote classmates. Therefore, it needed to be experienced over various personal devices and still be appreciable. I deployed my work on Vimeo, hoping to create an accessible experience for all classmates. I learned that it can be difficult to rely on the internet to deliver content of a particular quality. One obstacle is that the end user’s internet infrastructure may not support high quality images or fast data transfer. Additionally, the end user’s computer monitors and speakers may not have high visual or audio resolution. If the experience relies on specific infrastructure the work will be exclusionary to those without this infrastructure. If it is presented by a venue which has secured this infrastructure, the work is accessible to anyone who can attend in person. If
the audience cannot get to the work, say due to pandemic induced gathering restrictions or just cost of travel, the work is also inaccessible.

**Relevance of “Elsewhere” to Thesis Explorations**

“Elsewhere” is my most concentrated attempt since entering the MFA program into using art to explore a scientific concept. I learned that when I have complete artistic license and approach an idea my realization of the concepts might be considered at most a thought experiment. The work might generate interest because it is associated with science. It would generate interest because of the connection with science, not the quality of the art. The work itself would generate interest, but it would not be an exploration that helps advance science. “Elsewhere” helped me decide I did not want to use my thesis work to try to generate new knowledge in a field I have relatively little background knowledge in. This work is one of the works that helped me decide that I wanted my audience to be able to interpret and understand my work with little help from the wall text and without having to decode symbolism.

**More Resources & Additional Documentation**

“Elsewhere” is hosted on Vimeo at: [https://vimeo.com/414958176](https://vimeo.com/414958176). See the CSound code used to generate the sound files that make up the score to “Elsewhere” at [https://www.katarinahoeger.com/mfa-thesis/code](https://www.katarinahoeger.com/mfa-thesis/code).

### 4.6 “Vital Realizations In Life”, Spring 2020

Can of Seltzer, Cup, “Performance Behavior”

QRK M0
An overview of “Vital Realizations In Life”

“Vital Realizations In Life” uses the performance of an event score to explore the boundaries between music and noise as well as performance and daily experience. This piece is an homage to readymade multiples and the Fluxus tradition of event scores.

The revised score is as follows:

- Walk into room.
- Pick up Seltzer and Cup.
- Put cup down.
- Take bow. Exit.

Audience and “Vital Realizations In Life”

A performance setting elevates “Vital Realizations In Life” from the everyday act of drinking seltzer. Without the ceremony indicating that this is indeed a performance the
audience is likely to miss it. The audience perceives mostly the visual impressions of the performance. The performer perceives mostly the sonic and performative impressions of the performance.

**General Takeaways from “Vital Realizations In Life”**

A musical performance is what you make of it. In particular, having a score for “Vital Realizations In Life” makes the performer pay attention to the motions and sensations involved in drinking the can of seltzer. The audience may miss most of the musical aspects of the work, getting mostly the opening of the can, the fizzing of the seltzer, and potentially gulping and breathing sounds. However, the audience may perceive more of a visual performance, more of the vocabulary that a performer uses to indicate that the performance has started, is in progress, and has ended.

Having a clear, concise score is important to the replicability of a work. Following a score can indirectly lead a performer and viewers to focus on the ideas explored in the work. It gives directions while allowing for individual artistic interpretations. Without performance of some sort, a work such as “Vital Realizations In Life” is often too subtle to be noticed by the audience. The score defines this work - without it, there is a question of if the work even existed.

**Relevance of “Vital Realizations In Life” to Thesis Explorations**

“Vital Realizations In Life” uses commonly occurring sounds and events to create an experience. Through many of my earlier iterations of “Motion: Connecting Body with Sound and Position”, I envisioned using commonly occurring sounds, the sounds of the space where the work was set, to create the sound experiences arising from motion. “Vital Realizations In Life” may have been a short piece, and more of a creative response than a stand alone work. With a clever concept and clean execution, I can create an experience from sounds that are not traditionally considered performative. The sounds used can be sounds native to the piece’s surroundings.
In “Vital Realizations In Life” the score, a specific set of directions, makes the piece. One does not require skill to enact the score, just the ability to follow directions. While skill is immaterial, without a performer, the score will never be performed. Scores require the participant to opt into the experience, or the experience does not happen. Similarly, “Motion: Connecting Body with Sound and Position” is a work where without a trigger being triggered, nothing occurs. The trigger is often triggered by a participant, so oftentimes, without a participant, nothing occurs. However, “Motion: Connecting Body with Sound and Position” moves beyond scores, a scripted set of directions. Unlike “Vital Realizations In Life”, it creates an environment where participating in the system is a natural part of entering into and engaging with the system.

4.7 “Postal Scores”, Spring 2020 – Winter 2021

Box, Bellyband, Cloth, Code, Instructions, Postcards, Stickers

QRK M7

Figure 4.7: Both types of finished postal scores — the personalized set wrapped in cloth and the commercial set with boxes that fit in a vending machine.
An overview of “Postal Scores”

“Postal Scores” is a set of postcard artist multiple kits containing event scores. Participants read and follow the scores printed on the postcards. They will be prompted to experience a subset of the different connections between the sender and recipient. This was a foray into creating asynchronous, remote joint experiences. It was also an exploration of creating physical objects out of code. Lastly, it was a continuation into my explorations of crafting and delivering basic instructions.

A subset of the postcards was meant for a sender to enact alone. For example, consider the postcard titled “United By Smell”. It has the score:

lay me in an herb

smell me

fill me

The sender follows this score, before sending the postcard. Similarly, some scores are solely enacted by the recipient. some scores are intended to be enacted by the sender and the recipient together.

Audience and “Postal Scores”

An audience member can flip through the postcard set and read the work. To activate the piece and perform the scores requires the audience member to step beyond inactively taking in information to becoming a participant with a stake in the outcome of the work. The participant actually enacts sending or receiving a card. The line between audience and participant is blurred. It requires the initial card owner to make the effort of sending a Postal Score card out in the mail and distributing part of the original kit. The scores can connect participants through remote activities in ways that they would not otherwise be connected.
General Takeaways from “Postal Scores”

In theory, “Postal Scores” was an excellent way to create a participatory work that allowed for participants to work in their own homes at their own speeds with accessible materials. Creating “Postal Scores” was an excellent way to practice writing clear instructions. With clear instructions, it is possible to direct an experience, and enacting that experience becomes the participatory art.

Relevance of “Postal Scores” to Thesis Explorations

“Postal Scores” proved that to induce participation, having a well thought out set of directions is not enough. Lowering the number of steps needed to participate may improve participation. This was an early work in a set of works where I began to determine what sorts of costs of participation may be accepted by the majority of participants in different scenarios. In “Surface Thoughts”, filling out sticky notes was acceptable. I later came to the conclusion that this was an acceptable cost of participation due to its relative anonymity and the fact that the sticky notes were present at the site of the work. However, in “Postal Scores”, filling out a postcard and sending might be too high a cost of participation. With the creation of more works, I began to consider keeping the cost of participation as low as I could make it. The knowledge gained from this iterative process of creating participatory works was important in designing “Motion: Connecting Body with Sound and Position”.

4.8 “It Happened This Year”, Fall 2020

Web-based Virtual Reality, Photos, Story Submissions

An overview of “It Happened This Year”

A visitor to “It Happened This Year” starts from a web page, the landing page of the project. The landing page contains a lot of text. This text explains the work, how to
navigate it, how to contribute to it, and where to learn more about the project. If the visitor clicks on the box with the words “Enter Here”, they enter a light blue virtual world with gray rectangles of text jutting out of the ground. With the arrow keys and mouse, the visitor can navigate the world and read the text on each of the rectangles.

“It Happened This Year” is a virtual installation documenting the stories of participants in 2020 in an effort to combat the narratives depicted by the media. Participants in this specific case were visitors who after visiting the web installation decided to donated stories via email. The rectangles have a unique orientation and position each time the screen is opened. Therefore no individual’s narrative is privileged over another individual’s narrative. Additionally, each visitor experiences a unique story block layout.

“It Happened This Year” is an attempt to bring an installation space into the home of the viewer. The underlying idea is that if the installation exists in the home of the viewer, no matter the gathering restrictions, or physical location of the viewer, the installation should be accessible to all.
Audience and “It Happened This Year”

With a strong internet connection, computer, and mouse, an audience member can take in the stories at their own leisure. To actually access the piece, the audience member needs to enter a specific link into the browser. To participate, the audience member turned participant needs to send an email. This means this participant is required to leave the experience and send the email.

General Takeaways from “It Happened This Year”

A work that needs good internet, a computer, and a mouse to be accessed will remain inaccessible to anyone without these resources. Learning to navigate the virtual reality world is challenging for many participants. This adds an extra barrier to entry and navigation. Soliciting participation using the web interface I chose did not yield story submissions. I initially thought an email was a low barrier to entry. However, it requires leaving the exhibit to contribute, which is an extra step that breaks the mindset of being inside the virtual exhibition. An internal method for soliciting participation is possible. However, I would have needed more time and experimentation with materials, and potentially to rebuild the whole infrastructure to successfully implement it. This experience relies purely on visuals and does not have sound for similar reasons.

Relevance of “It Happened This Year” to Thesis Explorations

“It Happened This Year” was my last attempt to create a virtual reality installation inspired by in-person installations with a participatory component soliciting contributions from visitors. The barriers to entry, the lack of a feeling of interaction, and the low participation except from individuals I had independently solicited stories from all contributed to the idea that I have not yet been able to create a virtual reality that will bring my participants a transformative art experience. Participation in “It Happened This Year” was particularly low. This inspired my future attempts to make participation
independent of the technical ability and access of a participant. It also prompted me to minimize the steps needed to participate.

More Resources & Additional Documentation

Experience “It Happened This Year” from your own computer by accessing it on Glitch: https://it-happened-this-year.glitch.me/.

Watch a walk through of “It Happened This Year”, hosted on Kaltura: https://video.maine.edu/id/1_y8sciil4?width=608&height=765&playerId=44739341.

4.9 “Horizons: 47 Spectra of Dizi”, Fall 2020

Recorded Dizi, Spectogram, Video
Collaborating Artists: Justin Brown, Armando Armando Garma-Fernández
Sound Engineer: Steve Norton

Figure 4.9: Example spectogram of dizi tone. Image Credit: Armando Garma-Fernández.
An overview of “Horizons: 47 Spectra of Dizi”

“Horizons: 47 Spectra of Dizi” is an artistic analysis of the tone of dizi notes through visuals and audio. The video experience begins with dizi sound and spectra appearing. The dizi tones start over one another, and the spectra replace each other.

“Horizons: 47 Spectra of Dizi” was a group endeavor.

General Takeaways from “Horizons: 47 Spectra of Dizi”

“Horizons: 47 Spectra of Dizi” is a project where iterating over the work and tweaking each portion again and again was imperative to its development. Enough iterations did not occur before the project was presented. Even so “Horizons: 47 Spectra of Dizi” yielded a set of very clean dizi recordings that could be used in other projects.

Relevance of “Horizons: 47 Spectra of Dizi” to Thesis Explorations

“Horizons: 47 Spectra of Dizi” is inspiration for “Motion: Connecting Body with Sound and Position” in that it drove home the need for multiple iterations of the work. I contributed the dizi sound files to “Horizons: 47 Spectra of Dizi”. During the work’s conception, I listened to the dizi sound files ad nauseum. While these sound files did not reach their full potential in “Horizons: 47 Spectra of Dizi”, they are a digital raw material. This material is one that I was able to reuse in “Motion: Connecting Body with Sound and Position”.

More Resources & Additional Documentation

Experience “Horizons: 47 Spectra of Dizi” with this Google Drive link:
https://drive.google.com/file/d/1szV4azaJJ939iOlu0_DrO8SWsksjHVzd/view?usp=sharing.

2. The dizi is the name commonly used to refer to any member of a family of traditional bamboo transverse flutes from China. Dizi come in a variety of lengths. The starting length of the dizi dictates its base pitch, the pitch which it’s scale is built around. Dizi have a blow hole, six finger holes, and a thin hole that is covered by a membrane called a dimo. (H. H. Lee, How to Play Dizi, the Chinese Bamboo Flute: The Basic Skills)
An overview of “Breathing Scores, for Solo Performer”

“Breathing Scores, for Solo Performer” is a set of event scores that walks a participant through different breathing exercises. These breathing exercises ask participants to pay attention to their baseline breathing, their breathing under certain environmental conditions, their breathing under certain types of bodily constraints, and their exaggerated breathing.

The breathing scores were distributed in PDF form. A subset of participants recorded their performances. Some of those shared their recordings with me. The experience lies in performing the scores. Documentation gives us insight into those experiences but does not capture the essence of completing the score yourself.
Audience and “Breathing Scores, for Solo Performer”

“Breathing Scores, for Solo Performer” is a work designed to favor the performer over the audience. In fact, while an audience may watch and listen to a performer of this work, this work is meant for the performer. In the event that a specific performer documented his or her performance of a score, and submitted the documentation to me, submitted documentation has had an audience. This has been evident because some visitors to the page indicated that not all of the sound samples played back well for them over their various web-browsing devices. Mobile users reported more difficulty than desktop users.

General Takeaways from “Breathing Scores, for Solo Performer”

Pdf distribution of “Breathing Scores, for Solo Performer” was an efficient way to get the directions to potential participants. That being said, by nature of the work, it is hard to tell who participated, and how their participation proceeded, unless the participants submitted documentation. A few participants submitted recordings of their performances. The documentation can be found at the web page indicated in Section 4.10.

As a set of scores that deals with a necessary bodily function, “Breathing Scores, for Solo Performer” is accessible to everyone who comes across a score. Recording a session is a bit less accessible and has a higher barrier to participation, but performing the scores themselves is easy by design. Performing the scores brings a multi-sensory experience to the performer, wherever the performer is, focused around the process of breathing. This is a way that made creating a multi-sensory art experience accessible, without technology compatibility problems, in a distributed form.

Giving precise yet open instructions requires practice. To get interesting results from the scores, participants need to be given enough direction to complete the task, but not such precise directions that participants cannot control the task and complete the score in ways that feel most appropriate to themselves. In this set of scores, the goal was to guide each participant into exploring his or her breathing and potentially the sounds that
accompany it in very specific scenarios. The goal was to guide a participant into listening to a set of sounds that connect with the participant’s experience at the time of the performance while ensuring the participant has all necessary equipment to enact a performance.

Relevance of “Breathing Scores, for Solo Performer” to Thesis Explorations

Participants paid attention to their breathing, but often paid extra attention to the sounds of their breath and the sounds and sights of their surroundings in a way that they would otherwise not have if they were not just focused on breathing. They paid attention to the movement of their bodies. In short, through simple directions, “Breathing Scores, for Solo Performer” allowed for participants to live a full sensory experience.

I believe the key to this experience was recognizing that what we have in our body is enough to make an experience. Similarly, what is in our surroundings is enough to amplify the experience. With “Motion: Connecting Body with Sound and Position”, I set out to replicate some of the highlights of “Breathing Scores, for Solo Performer” and iterate on some of the differences. It made sense to me to use some of the experience of existing in the body and the attributes existing in the surroundings to create an experience. Like in this piece, in “Motion: Connecting Body with Sound and Position” participation is key to understanding the work. Also similar to this piece, the way “Motion: Connecting Body with Sound and Position” is set up does not allow one to truly know who participated and what forms their participation took.

More Resources & Additional Documentation

A curated collection highlighting each score and one of the submitted sound files corresponding to that score is hosted on Vimeo: https://vimeo.com/545186371.

Listen to the complete collection of submitted sound files corresponding with enacted scores on the project’s web page: https://www.katarinahoeger.com/projects_list/breathing-scores
4.11 “Computerized Pointillism: Greeting Cards”, Summer 2021

Computer Generated Image, Greeting Card

Figure 4.11: A generated image of a Koi composed of layered colored dots.

An overview of “Computerized Pointillism: Greeting Cards”

“Computerized Pointillism: Greeting Cards” is a set of greeting cards I generated images for, printed, wrote in, and then sent to friends.3 The images on the cards were an

3. While this work is titled “Computerized Pointillism: Greeting Cards”, it behooves me to make note of the fact that the output is not an example of pointillism. After learning more, I renamed my process. It is called Reconstituted Media, Reconstituted Images when dealing with imagery. When I initially generated images for the postcards, I based my naming scheme off of the code samples at its base. One piece of sample code is from a tutorial on accessing image pixels. (Daniel Shiffman, “Images and Pixels,” Processing Foundation, blog, accessed August 9, 2022, https://processing.org/tutorials/pixels). The second piece of sample code is from a tutorial titled Pointillism. (Daniel Shiffman, “Pointillism,” Processing Foundation, blog, accessed August 9, 2022, https://processing.org/examples/pointillism.html). Pointillism is actually a “painting technique … in which small, distinct points of unmixed color are applied in patterns to form an image.” (“Pointillism,” Museum of Modern Art, accessed August 9, 2022, https://www.moma.org/collection/terms/pointillism). These dots vary in size - they are not all consistently small. They are mixed in color. This is not what the code outputs. However, as the code used to generate the images was originally inspired by pointillism, and the name is printed on the backs of postcards that have been sent out, the name is still “Computerized Pointillism: Greeting Cards”. 

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exploration of what could be done if the pixel data from a photo was extracted and then used to recreate my understanding at the time of how pointillism works. The koi image was chosen because it is from a special moment I experienced in 2021 that I wished to share with my friends. It also reminded me of wabi-sabi aesthetics and a friend’s explanation of season’s greeting cards.

I wrote the code to extract data from images and then use the data as a source to build up a similar but abstracted image. The code itself is the source of many generated images. Over time I have continued to tweak the code, producing various results, and investigating what can be done with layered colors. “Computerized Pointillism: Greeting Cards” is the beginning of a lengthier period of exploration into building up media from its component parts.

Audience and “Computerized Pointillism: Greeting Cards”

The audience in “Computerized Pointillism: Greeting Cards” is small and personal. It is composed of the recipients of the greeting cards. With this work, I did not see the results of the audience’s interaction with the work.

General Takeaways from “Computerized Pointillism: Greeting Cards”

“Computerized Pointillism: Greeting Cards” is an example of a project that started off with a short prompt of “Can I make an artsy head-shot for a series of talks,“ and iterating on the result. It is the beginning of a larger set of explorations that shows that interesting results sometimes evolve through lengthy periods of small, incremental changes. This project did not have a pre-imagined end result. It has grown organically as I write more code and extend it over time.

Working with this project has been an example of why it is important to build modular code, code that works by making smaller working components, then building upon them. This code base has been built and keeps growing by adding code with a specific a functionality, then refactoring all the code (making the code simpler and more legible and
more modular), and then repeating the process again. It is also a work in which I have tried to make the code accessible by hosting it on Github. This allows me to share the knowledge and process with others and see how the process grows through their tweaks to the code.

Relevance of “Computerized Pointillism: Greeting Cards” to Thesis Explorations

I presented portions of this work at various at Mudd Makers Series 2021 – 2022 meetings and as well as at various Creative Code Berlin online Stammtisch meetups in 2021. It drove home the need for iterative explorations in my work. Additionally, it is a work that I considered as a potential visual component to “Motion: Connecting Body with Sound and Position” until around March 2022.

More Resources & Additional Documentation

See the code in its current state on Github:

4.12 “Reconstituted Media: Selected Sketches and Etudes”, Fall 2021

Projected Analyzed and Reconstituted Animation, Projected Real-time Manipulated Live Video Feed, Analyzed and Reconstituted Sound

An overview of “Reconstituted Media: Selected Sketches and Etudes”

“Reconstituted Media: Selected Sketches and Etudes” contains a projection of a pre-generated animation, a projection of real-time manipulated live video feed, and a sound track of generated sounds. All are played simultaneously in the same space, making one composition from three smaller explorations.

The projected animation was a continuation of the ideas and code explored in “Computerized Pointillism: Greeting Cards”. A set of three images was used to generate the animation. One image provided an outline. The second image was used to choose the
Figure 4.12: A still from a projected animation. The image is composed of 3 separate images broken down into their smallest units of data then combined into a conglomerate image. The projection crosses from a window shade to the wall.

colors used to surround the outline. The third image was used to choose the colors used to fill in the outline. The resultant image was built using the pixel data of the first 3 images as a guideline, then layering shapes in the appropriate colors over each other to create the final image. This animation was projected over a screen on the window as well as on the wall.

The real-time manipulated live video feed took a video stream from a web-cam and played back a pixelated, reduced color version of areas of the stream that changed color. This reduced the video into a set of pixels, reduced the camera resolution, and then in the projection depicted a reduced image of whatever moved in front of the reduced resolution video feed. This manipulated video feed was displayed on white wall, a different wall than the animation. The video feed showed white areas of motion against this white wall in a well lit room.
There were four sound tracks of generated sounds. There was a set of recordings of individuals reading a passage aloud. Each recording was algorithmically cut into roughly the phrases, words, syllables, and phonemes that composed the recording. Four sound files were generated from each recording — one with algorithmically chosen phrases distributed throughout the length of the file, another with the words, a third with the phonemes, the last with the syllables. Each sound file was played back through one of 4 speakers, placed on the ground along the middle of each of the 4 walls in the exhibit area.

Audience and “Reconstituted Media: Selected Sketches and Etudes”

“Reconstituted Media: Selected Sketches and Etudes” was displayed at an open house / open studio night. Many members of the audience missed the studio. They saw the animation from afar, and some came to the studio to see it up close. They missed the live stream unless they paid very careful attention to their surroundings and actually entered the studio, due to the livestream’s subtlety and placement. Many were driven away from entering by the familiar seeming yet unfamiliar sounds of many almost English sounding voices layered and emanating from the studio.

General Takeaways from “Reconstituted Media: Selected Sketches and Etudes”

“Reconstituted Media: Selected Sketches and Etudes” reinforced the importance of testing all equipment multiple times, especially in the combinations they will be used for a future display. It reinforced the idea of laying down cables early. It helped reinforce the idea that when multiple pieces coexist in a space, they mesh into one conglomerate work. It helped reinforce the idea that unless projections are extremely high contrast and colorful in a well-lit room, it is likely the audience will overlook them. It also reinforced the idea that when the audience is confronted with simultaneous sound and visuals, the visuals are often considered dominant. It also reinforces the idea that when the audience is given a work where they are able to see the direct effects of their actions and motions, they often
treat the work as a way to explore how they can see their actions and motions through the lens of the work.

**Relevance of “Reconstituted Media: Selected Sketches and Etudes” to Thesis Explorations**

“Reconstituted Media: Selected Sketches and Etudes” showed how it is important to craft a work to the space, not just present sound, visual, or multi-media work within the space without respect to the content. It also shows how important it is to determine the technical specifications far in advance of opening night. “Reconstituted Media: Selected Sketches and Etudes” was a test run of the idea of using reconstituted media as the sound and visuals for my thesis project and led to a few more explorations of this concept. It is also the initial public test run of the video analysis that picks up the changing in pixels in “Motion: Connecting Body with Sound and Position”. “Reconstituted Media: Selected Sketches and Etudes” also provided me with an opportunity to see how people played with the image of themselves, and consider if and how I wanted to use such a response in “Motion: Connecting Body with Sound and Position”.

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CHAPTER 5
RESEARCH THROUGH CONTEXTUAL REVIEW

Various artists have worked with the concepts of sound, spatialized sound, creating responsive systems, creating symbiotic environments, and creating interactive installations.

5.1 Alvin Lucier

Alvin Lucier created many experimental sound works that led the way for other artists working with sound. His works that are most relevant to my thesis explorations are “I am Sitting in a Room” and “Music for Solo Performer”.

In 1969’s “I am Sitting in a Room” Lucier sits alone in a room with two tape decks. He reads a text aloud and records it into the first tape deck. Then, he plays back the first tape deck and records on the second. He keeps recording and playing back the recordings until all that is left in the space are the sounds filtered out by the room. During much of my time working on “Motion: Connecting Body with Sound and Position” I tried to work the recording of sounds in a space and the filtering of sounds by the space exemplified in this work into my thesis piece.

In 1965, Lucier first debuted “Music for Solo Performer.” In this work, the artist sits with EEG scalp electrodes attached to a his scalp. Signals travel from his brain, to the electrode, to an amplifier, to a mixer, to a sound making devices such as other amplifiers, loudspeakers, or percussion. The performance is comprised of the artist just sitting, and through being present and his body sending brain signals as it always will, using a rig filled with electronics to generate sounds. While “Motion: Connecting Body with Sound and Position” does not require as minimal subject participation as “Music for Solo Performer,”

my thesis work is similar in that initially, sounds are generated as participants act as they will in the gallery space.

5.2 Bill Fontana

Bill Fontana creates sound sculptures.\(^3\) His sound sculptures are sonic compositions that take a set of live feeds of existing sounds in a city or environment and play the streams of sound back in a special listening environment. Fontana assumes that “at any given moment there will be something meaningful to hear and that music, in the sense of coherent sound patterns, is a process that is going on constantly.”\(^4\) This method of creating compositions backs up the idea that a live audio stream or set of live audio streams can be used successfully as artistic materials in situations it is appropriate to do so in. This influenced my pursuit of the idea of using a live audio stream as material in earlier iterations of “Motion: Connecting Body with Sound and Position”.

5.3 Brian Knep: Healing Series

Brian Knep’s series of interactive installations, the “Healing Series” began in 2003 with an interactive projection focused on the floor.\(^5\) When participants step on the projection they leave behind a wound. After they leave, the wound slowly starts to heal, but leaves behind a scar. This affects the growth patterns of future wounds and scars, leaving a visual pattern on the floor.

This series contains some of the few works surveyed that encourage participants to move through space, not just create gestures. Projecting on the floor creates a boundary to traverse the inside of. Creating an immediate reaction when a participant enters the projection area leads to participants moving around the space. When contemplating how

to approach “Motion: Connecting Body with Sound and Position”, reviewing works from this series showed that visitors can successfully be enticed to move through space using a visual guide.

5.4 Camille Utterback: Untitled 5

Participants in Utterback’s “Untitled 5” walk into an installation where their movements translate to wall projections that look painted. As a person gestures, strokes of paint follow their motions. The work only builds on itself when people are present and trigger it. A participant’s participation is tracked through the generation of brush like marks while they are present. Once the participant leaves the installation space, the corresponding marks transforms into less prominent marks that can be manipulated through the motions of the next participants to enter the space. Participants can reverse engineer how their presence effects the work through movement in the space.

“Motion: Connecting Body with Sound and Position” shares similarities with ‘Untitled 5’. The motion of a participant triggers a response and the actions of the participant effect the output of the system. However, “Untitled 5” maintains a visual history of the recent past participation, is completely visual, and entices people to move through gestures instead of through covering ground due to the vertical placement of the projection.

5.5 David Behrman: On The Other Ocean

In 1977, David Behrman created “On The Other Ocean.” This work is an interactive sound work, specifically a composition, where musicians play and a computer responds by producing sounds with them. This is a work performed by musicians (skilled participants)

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and a computer program that both responds to and prompts them. The sounds of traditional instruments mix with electronic sounds as the musicians improvise and the computer program responds. In “Motion: Connecting Body with Sound and Position”, I have an interactive sound work that creates a sonic experience using the actions of humans and computer responses. However, my computer code will not continue unprompted by human actions and my human participants need not be skilled.

5.6 David Rokeby: Very Nervous System

David Rokeby’s 1986-1990 interactive sound installation “Very Nervous System” is similar to my explorations with “Motion: Connecting Body with Sound and Position”. Rokeby creates an installation where the movements of one’s body create sound. He uses video stream, computerized image processing, and computerized sound synthesis to create this experience. A participant may try to master “Very Nervous System” and play it like an instrument. However, as Rokeby states, describing the installation as an “instrument that you play with your body . . . implies a level of control which [he is] not particularly interested in.” Rokeby’s goal is to have the participant’s interactions take place in “human-scaled physical space,” in which a participant’s instinctive responses can drive interaction with the piece.

With “Motion: Connecting Body with Sound and Position”, I take input from a video stream, run image processing to retrieve information from the video, and create a sonic experience, similar to “Very Nervous System.” However, my sounds are not synthesized. Instead, they are manipulated sound files. Some participants try to use my work as an instrument. However, watching documentation of Rokeby’s work shows some differences.

11. Rokeby.
12. Rokeby.
13. Rokeby.
To my ears, the synthesized sounds that Rokeby uses sound very much like musical instruments in timbre. The sounds produced seem to be restricted to a set of defined pitches. Notes seem to have set duration and they start regularly enough that at times it seems as if there is a rhythmic pattern. In contrast, in “Motion: Connecting Body with Sound and Position” the possible pitches are restricted to a continuum of pitches. There is only one type of instrument and only a cohesive timbre. The only rhythm derives from the movements of the participant. In the documentation, Rokeby’s participants can perform smaller, gestural movements. The camera setup and image processing identify small movements, unlike in my work, which does not pick up smaller motions. Both works are similar in that the participants are enticed to move through a sonic response to motion.

5.7 David Tudor: Rainforest

David Tudor constructed multiple versions of “Rainforest” over his career.16 “Rainforest” is a sound sculpture that has grown and changed with each iteration. Tudor built custom electronic instruments that emitted sounds, functioning as loudspeakers. The audience is encouraged to walk through the work and touch it. The work has been set up many times by different groups of people.

“Rainforest” is relevant to my thesis explorations as a large scale sound installation. By nature of it being large scaled and having multiple speakers, the work is spatialized. In “Rainforest,” having novel objects emitting sounds is part of the goal of the work. This is a work that showed me that I should stay away from custom objects in “Motion: Connecting Body with Sound and Position” to get participants to focus on their motions and not their surroundings.

5.8 Gary Hill: Withershins

In 1995, Gary Hill created an interactive sound installation based on text directions, “Withershins.” Participants navigated a maze and followed projected sign language signals or the verbally delivered directions. Based on where they were located different directions were given. When two people are in the maze, both can be tracked, leading to differing sound combinations than one would receive alone. This was a work that specifically used text as sound, used sound to prompt motion, and considered how to create an experience for multiple people to enjoy. It differs from the direction I wished to take “Motion: Connecting Body with Sound and Position” in that the sound is recognizable, and that the prompting, while given through sound, is not instinctual and directions are specific.

5.9 Liz Phillips: Graphite Ground

Liz Phillips’ 1988 “Graphite Ground” is an example of an interactive sound installation that encourages motion through space and interaction with the objects in the room without the use of a computer. She made use of the natural properties of conductors, capacitors and humans. In this work, Phillips uses basic electronics to pick up the motion of people, changes in temperature, and changes in humidity. This is an inspiring example of skillfully and simply carrying out a sound installation that encourages motion. While I do not have the electronics skills to emulate this approach, this work provided an example of a work that was more sound installation than anything else and managed to inspire motion and interaction purely through the changes in sound interaction produced.
5.10 Rafael Lozano-Hemmer: Voice Array

Rafael Lozano-Hemmer has created a myriad of interactive installations. Having been fortunate enough to experience works in person helped me understand the power of being inside of an interactive installation and that sound installations, especially collaborative and interactive ones, and interactive projections draw my attention in a way that not much else in a museum does. The projects I found most inspiring in person include “Voice Array,” “Sphere Packing,” “Pan Anthem,” “Sphere Packing: Bach,” and “Vicious Circular Breathing.”

17. Weibel, *Sound Art, Sound as a Medium of Art*, p. 46.
“Voice Array” is perhaps the most relevant to my thesis work. Each time a participant contributed a sound, the sound would start travelling from a voice box in the corner around the room. As the voice traveled to different speakers, it got mixed with prior voices, until all the voices became a babble. As the voice traveled to new speakers, LEDs lit up along the path the voices travel. “Voice Array” effectively got participants to contribute sounds from inside installation space, mixed the collected sounds with past sounds, and spatialized the sounds. During my iteration through concepts to create “Motion: Connecting Body with Sound and Position”, I attempted to collect sounds from inside the installation space and also tried to make use of sounds from prior visitors. However, I attempted to do this with a continuous feed of sound, not with a button and a prompt to press it.

5.11 Ryoji Ikeda: Test Pattern

Ryoji Ikeda’s multimedia installation, “Test Pattern,” is an excellent example of what happens when an artist creates a generated multimedia experience that is projected and played back over speakers surrounding visitors. Fast visuals and sound are projected. The visitors are engulfed but have no influence over the work. Watching the documentation of “Test Pattern” helped me determine that for my thesis work, I wanted to create a work that participants could actually influence, not just have happen to them. “Test Pattern” overwhelms the senses in a way that seemed might prevent visitors from tuning into their own senses, actions, agency, and placement within the exhibit.

5.12 Simon Penny

Many of Simon Penny’s works are relevant to my thesis explorations. Two of are particular importance are Sympathetic Sentience II and Traces.

Sympathetic Sentience II is an interactive sound installation. In this work, there are small microcontrollers that produce rhythmic chirps, and pass on their chirping pattern to the next microcontroller in the chain of microcontrollers. The work is interactive because each microcontroller is an independent agent that learns patterns from the next in the chain and synthesizes a new pattern from the rhythm it receives. Additionally, the presence of visitors causes the microcontrollers to pause in passing the pattern along, which serves to add changes to the pattern. The microcontrollers generate a sonic environment alone that the presence of visitors can impact. This work provides an example of independently programmed agents that communicate with each other and respond to user input. When originally constructing “Motion: Connecting Body with Sound and Position”, I considered creating an interactive sonic environment, which engaged itself on its own but responded obviously to visitor presence. This work provides one example of such a phenomena.

With 1999’s “Traces,” Simon Penny tries to include the body in virtual reality experiences to make virtual reality experiences feel more realistic. Penny and his collaborators use cameras to determine where the body is and use generate a body based on these images using code. As the participant can see a body, modeled after what the participant themselves is doing, when participating in “Traces”, the experience feels more genuine. This work emphasizes the importance of not dissociating a participant’s major senses from the participant during a work, unless the goal is to have a participant feel disconnected from their body. To have a participant feel a sense of embodiment, the sounds must come from appropriate directions and the visuals must not have inconsistencies such as missing bodies. In addition, through this work, Penny demonstrates the effectiveness of having the participant’s motions correspond with reactions happening inside the work. As a participant swings their arms, dragons are spawned, or structures break. It is effective when the participants see that their behaviors in the system, the motions themselves and

the speeds at which they are performed, are modeled in the experience. Both lessons were of use when formulating “Motion: Connecting Body with Sound and Position”.
CHAPTER 6
RESEARCH THROUGH CREATING WORKS, INTERACTIONS, AND
OBSERVATION OF INTERACTIONS: THESIS PROJECT

6.1 Research Through Creating Works: Initial Idea

6.1.1 Inspirations

6.1.1.1 Preexisting Ideas

Sitting through successive Monthly Music Hackathon NYC events acclimated me to the idea that I could build an interactive sound installation if I could dream it up. Prior to my regular hackathon attendance, some friends had turned a series of rooms into sound installations. Lecturers and friendly attendees describe installations and instruments they made. All examples were inspiring. The key, it seemed, is just to set out and do it.

As a child and teenager, I had paid a handful of visits to the NY Hall of Science and Universe Bremen. As an adult, I added the Arizona Science Center to the list. I used these experiences and visits to more traditional museums to dream up what an interactive art installation might be like. Then, I took a trip to Montréal, and experienced Raphael Lozano-Hemmer’s full room interactive art installations. Each exhibit engaged me. It was the first time I truly got to experience how being present in an installation, being surrounded by the elements of it, and having to move through it changed my perceptions of the work presented and my experiences with it. It inspired me to create similar experiences for others and learn about interactive art.

I was also inspired by my interests. I pay attention to sounds, far above visuals. I myself am rarely quiet, seek out opportunities to make sounds, and listen to sounds. I also adore playing music, specifically together with groups, and making music together is a highlight. I also like to move, specifically to dance, usually with partners. I have spent a lot of my life making sounds with others and moving with others. Something about the
togetherness, the being able to work together with others to create, increases my
enjoyment of these activities. I look for that opportunity - to create alongside others,
outside of dance and music, in volunteer opportunities and in communities I engage in.
This drives my interest in making work that others can participate in. My goal was to
create a work where a participant is a must, and extra participants can enhance, and that
through their actions, participants are creating alongside me.

6.1.1.2 Reasoning Behind Approach
The investigation of the impacts of presence on a space raises practical questions. For
instance, how would I recognize and acknowledge a participant’s presence? How am I
defining space? If the participant is necessary, what happens when there is no participant?
What happens if there are multiple participants? How does the work acknowledge the
presence of the participant over time?

In accordance with the writings of Stern, Clark, and Saito, to create a situation where a
participant pays attention to their presence, I needed to consider all potential interactions
with the system. I may wish to focus on sound and motion, but cannot ignore the fact that
the visitor will always have their vision, touch, smell, and taste senses while in my
installation. In this particular gallery setting and during pandemic times, smell and taste
could be avoided. Due to a wish to reduce the transfer of germs, I did not want to actively
encourage touching objects, just encourage touch through the soles of the feet. This left me
with one sense, vision, that could either be used to help encourage motion or treated
neutrally, as there and contributing to the experience, but not being catered to.

Ultimately, there were three primary practical considerations which shaped the
direction of the piece.

• how to measure a participant’s presence in and impact on a space

• how presence is portrayed and/or impact is portrayed

• how to show change in presence and/or impact over time
6.1.1.3 From Works

I drew inspiration from Brian Knep: Healing Series and Liz Phillips: Graphite Ground. I knew that spatialization of sound was important to me from musical experiences. I was used to hearing sounds come from around me as I made them myself as a musician - listening to the left and right to hear my own section mates, while also listening to sections across from me, behind me, or at an angle. In musical situations where I and my band-mates were moving as we played, I would hear how the sounds changed a section moved by me or as individuals moved by one another. I had spent a few years writing musical code that artificially placed sounds in different locations relative to the ear. Additionally, my limited experiences with multiple speaker setups and my experience with Rafael Lozano-Hemmer: Voice Array all pointed to my continued interest in spatialized sounds. I drew inspiration for identifying presence from Simon Penny and David Rokeby: Very Nervous System. I initially wanted to use sounds native to the gallery space, and backed the concept by considering Bill Fontana and Alvin Lucier.

6.1.1.4 Individual Impact

I was in part inspired by a hope that by learning through moving, a participant’s perception of existing in an environment and of their immediate and continued impact on the changing relations around them would be expanded. The idea was that the change in understanding of impact might just occur in the museum but has potential to stick with the visitor who experienced it. The visitor can carry the change in understanding to their thoughts and approaches in other parts of life if the generating experience is engaging and memorable enough. This could provide the impetus to create change from within individuals, through providing new experiences and giving them a new way to understand.

In short, c
6.2 Research Through Creating Works: Approach Trajectory

Initially, I had the idea of making a room based sonic environment, triggered by a person’s motion through the space, but as an environment, not masterable and not dependent upon the person to create. I was also fairly convinced that I wanted to include participants working together somehow in this installation, but unsure of what final form anything would take, or what it would look like. I began learning to use SuperCollider, an open source programming-based sound software, and learning to generate visuals quickly and mathematically, for potential use in an environment similar to an interactive version of Ryoji Ikeda: Test Pattern or a generative environment such as the one created in Simon Penny: Sympathetic Sentience II.

6.2.1 Fall 2021

I did not want to dazzle the audience with technique, or overwhelm them with too much simultaneous action, but instead wanted to entice them to participate. To do so, I would need to find a way to draw them in, keep them from being overwhelmed too quickly, and tap into some quality or the other that some participants and I would engage with, hopefully repeatedly. I stuck with sound and motion due to my enjoyment of both. “Reconstituted Media: Selected Sketches and Etudes” helped me keep very basic track of if visitors were present or not in the sub project where I detected changes in motion.

Why detect motion instead of presence? With a web camera and simple image processing, it is easy to analyze if there are changes in pixel values between any two frames streamed. To account for presence instead of motion, one needs to recognize clusters of pixels as individual presences first. Motion detection showed change in the image, and people move, so motion detection became a stand-in for presence detection that never got replaced.
6.2.2 Spring 2022: Studio Testing

I investigated how to make state-changing agents. A state-changing agent would hold information about if the agent had been triggered and how long ago it had been triggered, and change states based off of how much time had passed since the last trigger. At the time, in Max/MSP, I could use matrices to track visual changes as information, but this information just reflected the color of the pixels showing on the video camera. I did not know how to manipulate the matrices in the Max/MSP environment to track the changing colors of each pixel in a way that indicated when each pixel was last triggered, so could not use matrices to create a matrix of pixels as a that was also a matrix of state-changing agents. Instead, I decided to work with the existing video data matrix. I also decided that while they may not show changing states, any visual cues would work as a clear trigger for sound production.

I considered different sorts of mappings. Should I generate sound? I created a few synthesizers, but listening to the sounds they produced at length was not enjoyable to me while testing. My synthesized sounds gave me headaches. However, I realized that I was trying to use sounds to investigate being in a space. Therefore, perhaps synthesized sound was not important, having sounds themselves was. Should walking in certain directions change the sounds? If I care about presence and imply that presence is measured in motion, did I want to imply that the direction of the motion mattered? To me, the direction did not matter. I also considered if I should use different sounds for each speaker during this time period, but thought that different types of sound might distract from the free motion of the participant. One sound might be more popular than the rest, and motion would be restricted to one area.

Even though the prototype installation’s technological rig was less than ideal, it allowed me to start building code. At the time, I was trying to take in audio from my surroundings and route it to different speakers at different volume levels based on where the most motion occurred in the video’s view. I learned that my custom feedback loop worked well
on quiet days when the heater was off. It was enlightening to hear what I muttered to myself while working. I was harsh on myself, and hearing what I said played back on a slight delay would cause me to be more lenient with myself. I learned that when many others were around, or playing music in the background the system would start to go into a feedback loop, gradually getting louder and louder, and that sometimes a large clap would stop the loop. During this phase of testing, I could talk into the system, and hear what I said repeated 5 or 6 times, with varying types of distortion from re-recording over the initial sound. I enjoyed the effect, and hoped it could be used for my final installation.

I set up the projector, but mostly used visuals to capture motion. I learned that motion recorded from an upper corner was disorienting. The amount of motion needed to trigger a sonic event from different parts of the video camera’s viewpoint was very uneven. The camera’s range of capture was quiet large. I picked up motion in the main grad space, not
just in my studio. Having a lot of distance between the camera and a moving subject worked well.

The system was triggered by car headlights, by the room’s lights, and by my shadow as I worked. I decided this was a feature early on. The initial time I heard sounds from a speaker that should not have been triggered, I was surprised and a bit paranoid. However, once I realized my shadow was triggering the motion in the otherwise empty studio space, I thought that the ability of the camera to pick up shadows was perfect. Shadows are an unavoidable side effect of taking up space and being present, and that our shadow can have an effect on our surroundings is given. Having my shadow trigger the work was excellent because it showed that the system is can be triggered by more than just a human. We are not the only things that have presence and affect spaces, so I was delighted to have presence detected through motion in something that is not human.

6.2.3 Spring 2022: Studio Mock-Up I

On April 7, I flew the camera over the center of the studio and laid the speakers out in it’s four corners. I placed the microphone on a mic stand in the center of the room. Flying the camera over the center of the studio helped me realize that the area in which the movement is triggered is potentially very small. I spent the majority of my time with this arrangement trying to figure out why I was getting more feedback issues than I had been in the original arrangement, with the camera in a corner and the speakers in an arc.

The system would start off repeating sounds that had happened in the space at a slight delay. If initial sounds were too loud or long and rhythmic, or I moved too much while under the camera, the sounds would start to build, getting louder and louder with each repetition instead of dying off. A clap would usually stop the sounds from building to very uncomfortable levels. I made the guess that the feedback would be less severe, and manageable, when I moved the gear around so that the microphone would be many feet above the speakers. Thudding the desk with my fist consistently started a feedback loop.
I did not set up the projector in this setup. I could not figure out how to fly the projector in my studio safely, and also wanted to worry about making the sounds work properly. At this point in time, I was still considering projecting the visuals used to detect motion, and was planning on testing the projection in the next step.

6.2.4 Spring 2022: APPE Space II Mock-Up

With the help of University of Maine Graduate School Grant funding, I was able to move the prototype technological rig to the Adaptive Presentation and Performance Environment (APPE) Space II, an empty room with 4 speakers and a projector. It was isolated, so I could test my sound system and run it continuously.

First, I laid out a prototype technological rig using the room’s equipment, but I quickly realized that I would be better off using only my own. I would bring in my speakers, the
Figure 6.3: In APPE Space II, the four speakers, web camera, and microphone were placed in their anticipated Lord Hall locations to test the feasibility of the technological rig’s anticipated layout.

mac mini, and the audio interface daily, but leave the camera, the mic, the speaker stands, and all the wiring plugged in. The sounds from the speakers continued to create large feedback loops. Certain voices, especially low and loud ones, created feedback loops in the system more quickly than I did on my own, with my voice, through clapping, exercise, hitting things, or with my flute. Rain, the heating system, and voices in the main APPE space also created a feedback loop. I began to craft a method for restarting the system when it got too loud.

Additionally, I was sending different volumes of sound to different speakers based on the amount of motion happening in a quadrant of the space. When in the space, even when the sound was sent to the speaker opposite of the quadrant, because the sounds were bouncing off of the walls and the floors and volume was not consistent, it was hard to tell where the sounds were originating. At certain points, it seemed like sound would follow the
participant around, but often, it was impossible to hear. Also, the looping was not happening consistently. Sometimes, sounds would loop and morph as the sounds were picked up again, but at other times, the repeat was hardly intelligible. At other times, the hum of feedback eliminated all other sounds, eventually building the volume up to unsafe levels.

6.2.5 Spring 2022: Studio Mock-Up II

![Image of studio setup](image)

Figure 6.4: Four speakers are placed in the studio, with nothing else competing with them. A board is suspended from the ceiling, holding the microphone and web camera.

After two weeks, I brought my setup back to the studio, and flew the camera and microphone from the center. I proceeded to tune the setup to reduce the amount of feedback in my studio space, and tried to optimize it for the amount of motion available. I found that the camera height was too low, and that the range of motion of participants was limited and the boundaries of the work were very unclear. Participants would move in
areas where they felt there should be a response based on speaker position, but their actions would lie outside of the boundaries of the cameras. Additionally, feedback still occurred, and it was difficult to tell that motion was happening and different quantities of motion were occurring in different quadrants of the screen because the sounds that came through were not consistent and the volume of the sounds varied with the recording volume and which repeat it was on as well as how much motion was occurring. The signals were not clear.

To clarify the unclear signals, the code needed to be modified. These modifications occurred prior to the final implementation of the technological rig. Testing and setting of variables could only be completed in Lord Hall, once I had finished constructing the installation.

Instead of trying to use live streamed sound as input to the system, I decided it would be best to reduce the number of variables and use an existing or generated sound. The intent was that this sound would get the visitors to focus less on hearing their own repeating voices and actions, and pay more attention to their motions in conjunction with their sounds. Additionally, as many people are quiet visitors to galleries, without a written prompt, there may be no reason for a person to make noise that can be picked up by the microphone in the middle of my installation space. I considered whether trying to depict a history of motion in the system was important, or if just showing impact on the environment at the time of motion was acceptable. I ended up deciding that sonifying or visualizing history was not necessary when inviting participants to be present in their current bodily experience. I needed to figure out how to ensure that feedback never happened - that sound was consistent so that spatialization was obvious, but so that no one’s ears were hurt by the volume of the sound. I needed to think deeply about why I was conflating motion with presence, and motion and sound. I also considered if it made sense to have four speakers or if that would introduce unnecessary complexity to the system.
In order to address the above issues and questions, I decided that my approach to the thesis question would need to change. Each participant would experience how their basic positioning with respect to a fixed point changed via sound.

6.3 Research Through Creating Works: Final Build

6.3.1 Layout & Final Code

The final layout in Lord Hall is pictured in Figure 6.5. It allowed for ease of passage of small children and those with mobility issues and ease of entrance for participants. The layout also allowed for inconspicuous placement of wires.

The code used in the final installation is included at https://www.katarinahoeger.com/mfa-thesis/code.

6.3.2 Thought Process

I worked from an assumption based off of past personal experiences where empty, open space in an otherwise packed room drew me in because of the space and contrast with tightly packed nature of the rest of the room. There was clearly a decision not to make explicit visuals. Why, when dealing with art? To emphasize that the art is not in the visuals.

That said, when a seeing person walks into a lit room, it is difficult to eliminate visuals. To make electronically delivered sounds, one needs a certain amount of infrastructure. The necessary infrastructure that is used in sound work is often visually imposing.

The question is, then, how best can we ensure that the infrastructure does not become the subject of contemplation? Do we try to hide it? Hiding it feels like apologizing for the nature of the sound art and its infrastructure. Do we make excuses for it, or take what it is and make it visually distinctive while also minimally distracting?

My attempt to do the above lead to first placing the speakers on monitors in an arrangement that would maximize sound perception of the audience. These speakers
Figure 6.5: The final floor plan of the setup in Lord hall for the installation setup of “Motion: Connecting Body with Sound and Position”. Starting from the upper left corner of the diagram and going clockwise, the speaker layout and video partitioning by sections are: Lower Left, Upper Left, Upper Right, Lower Right.

needed to be powered and provided with audio somehow, through cables. The cables could have run along the floor, or could go up along the walls and over the ceiling. There are
many ways to get from the speakers to the outlet and computer monitor, but I wanted a way to get there in a way that didn’t hide the mechanism but also was not so distracting that the participant’s attention was drawn mostly by the infrastructure. Therefore, I went up the walls, in straight lines so as to not drawn too much attention, and did not cover up the wires. The black wires stood out against the white walls, but not in an unexpected way, given the speakers need power and sound somehow.

There is no distracting mystery to the audio. The wires are laid neatly, in straight lines along the walls, across the ceiling, so as to not distract a participant. When the wires are hidden on the ceiling, the hiding looks and is natural - they are clearly laying on the I-beams. They are held in place by C-clamps the same color as the ceiling, so the C-clamps look like part of the ceiling infrastructure. In some ways, they are - they just hold the wires on the ceiling, and serve no other function. Once the wires reach the fake wall, they are dropped neatly onto it and taped down, then drape over the back into the area with the computer, monitor, and keyboard.

A webcam is also suspended from the ceiling. First, a PVC pipe painted to match the ceiling was suspended between two I-beams down the center of the room. Then, the
Figure 6.7: Setting up wires to run up the walls in straight lines to the sources of electricity and sound signals.

camera was hung at roughly the center of the two speakers from the pipe. The camera’s wire is threaded through the pipe, comes out the end, and carefully joins the bundle of wires lying on the I-beam ledge running towards the computer.

There are four gallery lights aimed towards the point on the floor where the camera is shooting. There is also a spotlight pointing from one wall onto the center of the floor. The wires connecting this light to power are also hidden in the bundle that contains the speaker wires, power cables, and web camera cables that run across the ceiling via I-beam, down onto the top of the fake wall.

There is no sound from this work until triggered by a participant walking through. A listener may listen from anywhere inside and some spaces outside the gallery. But the participant must walk into the field of view of the camera before any sound is heard. This is purposeful - it serves to emphasize the fact that motion was detected in the space, that some presence has been registered. It helps a listener connect their motions to the sounds
that occur. It also helps to make the sounds that happen special, make it more obvious that the art is happening. It also helps reduce the possibility of listener fatigue, and makes it so that the sound only combats with other works of art when this work is being activated. The camera’s field of view is broken into four quadrants.

The sound that is heard is derived from one of four dizi sound files, *dizi A1* (western A4), *dizi A3* (western C#4), *dizi A5* (western E5), and *dizi A7* (western G#5).

Dizi sounds were chosen because I had rights to them, was familiar with the sound. It is not a wholly unfamiliar sound, yet slightly different than what we are used to, so catches our ear. The sound is something that sounds organic because of the harmonics and attack, so it is something that doesn’t feel like you are collaborating with a machine when you move. The long notes make it easy to mostly focus on the change in pitch based off of motions, but the attacks give variation and also shape to the sound.
These pitches were chosen because they were middle range sounds, had well articulated attacks and relatively steady pitch, were roughly the same length, and were different enough so that a listener or listener-participant could hear that the pitches were different. The file that plays back is dependent upon which quadrant of the web cam’s field of view a participant has entered into.

The speeding up and slowing down of the files helped identify that the motions made mattered. It is not just a matter of making enough motion, then triggering a reaction. It is also a matter of understanding that your motions effect what happens in the space.

Why monitor motion when I want to keep track of presence? Motion is a very primitive way of keeping track of presence, especially in a space without seats. An open gallery is likely to be the sort of place where a person will walk, not sit. They may stand, but standing completely still is unlikely. So there is presence of some sort when there is motion.
Does it matter if the presence is human? My original goal was not necessarily only for humans. It’s about the presence of things in an environment, and how their actions and interactions effect everything else around them. But, in a gallery, there’s very little else that comes through other than humans. A broom triggers the system, as might a dog or a rolling kickball, but a rolling pencil is too tiny to trigger the system.

The camera is not centered, just slightly off center. This helps, because this means that the field of sound being triggered extends only slightly into the neighboring piece, and well into one of the two entryways into the piece’s boundaries on the other side.

6.4 Research Through Interactions and Observation of Interactions: Lord Hall Exhibition

“Motion: Connecting Body with Sound and Position” was installed in Lord Hall Gallery in Orono, Maine as part of the “Without Borders: This Place, This Time” 2022
Intermedia MFA thesis show. The installation was accessible to visitors on weekdays from 9 - 4 PM. On May 20, during a gallery opening running from 5 - 7 PM, there were special visiting hours. Conditions were very different at the opening than during the majority of the 2022 thesis show.

Based off of observations from personally visiting the gallery at various times of day, the number of visitors in the gallery varied greatly between the gallery opening and typical day numbers. During the gallery opening, there were at least 40 visitors standing in the gallery for the majority of the time. These visitors talked, moved throughout the gallery, and engaged with all of the works, taking up space, making noise, and providing an audience for anyone experiencing “Motion: Connecting Body with Sound and Position”.

When visiting the gallery on a typical day, the visitor tended to only share the gallery with any other companions he, she, or they brought along.
6.4.1 Typical Variable States of “Motion: Connecting Body with Sound and Position”

For a consistent gallery experience, I choose certain variable values to set the installation’s settings to. On opening day, and on days when I entered and the gallery had a lot of ambient noise, I set the volume to \(-21\) dB. On quieter days, I set the volume to \(-25\) dB. The playback speed for the dizi sound files varied between \(\frac{1}{2}\) and \(1 \frac{1}{2}\) time’s the recording’s recording speed. The web cam’s frame rate was 30 frames per second. The web cam’s width was 480 pixels and its height was 270 pixels. I set the default sensitivity to changes in pixel values to 20. For example, the Red value of a pixel ranges from 0 to 255, so if the camera picked up a red value of 150 for the pixel in one frame, and then 155 in the next,

\[|150 - 155| = 5 < 20,\]

so no change is picked up. However, if instead of 155 the second frame had a value of 175, because

\[|150 - 175| = 25 > 20,\]

the program picks up a change in pixel values, and gets replaced with a new value. I set the default percentage of pixel change allowed before sounds were triggered to 2.4 out of 100%. These default values were chosen by walking through the installation system and watching others traverse it, and listening and adjusting values.

I chose the dizi playback speeds similarly. I started with \(\frac{1}{10}\) of the recording speed and 3 times the recording speed. Then, I walked through the work. While I liked the sound of the low tones, the slide between pitches was very extreme. I changed the 3 to 1. I found the high pitches to be too low. I changed the 3 to \(1 \frac{3}{2}\), and decided that the highest tones were acceptable. I still did not like the ease at which the tones changed from low to high, so I brought the \(\frac{1}{10}\) up to \(\frac{1}{4}\), and then to \(\frac{3}{4}\), finally settling on \(\frac{1}{2}\) by walking through the installation with each change and listening. I wanted to hear a slight variation in dizi pitch, but not provide so much variation with simple walking that the difference in steady
Table 6.1: The range of frequencies covered by each dizi sample as it is sped up or slowed down as sound playback is triggered in the installation.

<table>
<thead>
<tr>
<th>Dizi Note</th>
<th>Playback Rate</th>
<th>Western Note</th>
<th>Frequency (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>$\frac{1}{2}$</td>
<td>A3</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>A4</td>
<td>440</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>E5</td>
<td>660</td>
</tr>
<tr>
<td>A3</td>
<td>$\frac{1}{2}$</td>
<td>C#4</td>
<td>~277</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>#4</td>
<td>~554</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>G#5</td>
<td>~831</td>
</tr>
<tr>
<td>A5</td>
<td>$\frac{1}{2}$</td>
<td>E4</td>
<td>~327</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>E5</td>
<td>~659</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>B5</td>
<td>~989</td>
</tr>
<tr>
<td>A7</td>
<td>$\frac{1}{2}$</td>
<td>G#4</td>
<td>~415</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>G#5</td>
<td>~831</td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2}$</td>
<td>D#6</td>
<td>~1246</td>
</tr>
</tbody>
</table>

walking and changes in pace or moving in various methods was not distinguishable through sound. I also wanted to provide sounds that were interesting to the listener, still distinguishable as dizi, and not so piercing that they hurt the listener’s ears too badly. The range of the pitches that can be experienced in “Motion: Connecting Body with Sound and Position” with the playback speeds ranging from half time to one and a half time the starting pitch is from 220 - 1246 Hz, which is roughly a low midrange to midrange range. This is a range we hear a lot of instrumental music played within, The lowest pitch was a dizi A1 note, or a western A4 (440Hz), so at half speed, it plays back a western A3 (220 Hz). At its highest point, it plays back at 1.5 times it’s original pitch of 440Hz, so it is E5 (660Hz). Table 6.1 contains a list of dizi notes and corresponding pitches and frequencies at certain playback speeds.

When the default sensitivity to pixel value changes is lowered from a threshold of 20 out of 255 changes in electronic color detection allowed, it is easier to detect visual changes, but also easier to pick up noise. I chose 20 after trying lower and higher values. Higher values made it less likely for the system to pick up the motion of shadows. Lower values

made it more likely for the system to pick up camera noise, not actual shadows, but slight variations due to the transformation of a continuous stream of data into the digital realm and rounding errors.

I initially started with a default percentage of pixel change of 15%. While testing alone in Lord Hall, this seemed reasonable. However, I tested with vigorous motions. When watching the first couple of participants during the gallery opening, I realized that not as many participants will move vigorously initially. To ensure that participants were more likely to receive a sonic response without needing to resort to very vigorous motions, I lowered the percentage of pixel change to 2.4. Lower than that made it so that the sounds sounded continuously, and it was hard to get silence out of the installation. Much higher made it hard for visitors to trigger reactions when moving through the work.

6.4.2 Environmental and Personal Interactions with Installation In Final Form

6.4.2.1 Incidental Interactions

Incidental interactions with “Motion: Connecting Body with Sound and Position” occurred when a human who knows that the system exists was not purposefully trying to trigger the system yet also not purposefully avoiding it. These interactions also occurred when the environment itself created a situation that triggered the system. These are interactions that are side effects of creating an interactive installation that has an activation area of more than 100 square feet of gallery space and is triggered by substantial enough changes in the stream of pixels recorded by a web camera constantly monitoring the space.

The first set of incidental interactions are environmental. The Lord Hall Gallery lights turn on and off with timer, turning on sometime before 8AM and off around 6PM every weekday. When I was in the Gallery and the lights turned on or off, all four speakers would emit sliding sounds for less than a second. This occurred because the camera caught the changing levels of light evenly across all quadrants as it the light levels increased or
decreased with the toggle of the light. A similar phenomena would occur slightly less drastically when the floodlight turned on and off with its timer. The floodlight contributed less light to the overall setup, so the change in light captured was less extreme and there was less of a full range of pitches coming from the speakers, but all four speakers were activated as well. While time of day and cloud coverage influenced the depth of the shadows produced and how well the system picked up these shadows, these changes happened gradually enough that they did not trigger sounds in the speakers.

The second set of incidental interactions are the interactions that occurred as I navigated the installation area for practical reasons. If I ever needed to check on a speaker, I needed to walk to the speaker, and would trigger the system. Many times as I walked to the command center, I would trigger the system by passing slightly too close to the box defining the web cam’s viewing observation area. As I was otherwise occupied, I let the sounds occur, but did not go out of my way to cause them or engage them further. I just let the sounds happen.

An incidental interaction of particular note to me was the time at the beginning of the installation when I swept my installation area. I was convinced that because my visuals were minimal, visitors would pay attention to any visual distractions, such as dirty floors, and be distracted away from their motions and the corresponding sounds if I did not have as visually tidy a set up as I could get. While I never did test this completely, what this conviction led me to do is it led me to sweep the floor semi regularly. I dragged out the push broom, and systematically swept my installation area. I swept a straight line parallel to the walls, turned once I reached the end of my installation area, and returned sweeping over a slightly different line. I found that because my broom moved at a slightly different pace than me, and because my body and the broom were not always spaced at the same distance from one another, the sounds that were generated by the sweeping were interesting. The sounds were not regular in pitch or speed, but the intervals created, the variation in pitches created by the changing speeds, the harmonies created by having two
larger masses moving at the same time, and the times when the sound stopped because there was not enough motion to trigger the sounds was interesting. I kept sweeping far beyond when I needed to. The interaction brought to mind a Zen Garden and the meditative state produced through the repetitive actions of sweeping the pebbles.

As the designer and builder of this installation, I do not feel like I truly had an initial experience with this installation. While I technically entered the installation in its final form for the first time before the Open House and again after I finished my final tweaks to the variables when the HVAC system kicked on, I entered it daily, in all its forms, since I started building a final form. Therefore, I never did understand what the system was like the first time inside it. I usually had an idea of what might happen while I was inside the final version, because I had spent enough time inside previous versions to acclimate myself to what might occur while I was in it. Therefore, I resorted to spending extended periods of time in the installation, copying first time visitors to the installation, and listening to sounds, paying attention to my motions, and thinking of all sorts of actions I have performed over the years to figure out how I might want to test the system.

6.4.2.2 Prolonged Interactions

While building the final setup, I tested the work by sitting inside of it when I could. For a majority of the setup period, not enough wires were connected to create a cohesive listening experience. But once the wires were laid out and the power running through the setup, I rested inside of the work, graded from inside the work, and wrote from inside the work. I tended to drag all of my belongings into the center of the floor, under the camera, and sit there on my laptop. As I was setting up, all of the speakers would emit noise. Speakers corresponding with my entrance trajectory would make sounds first. Speakers corresponding with where I set my bag, or placed my books or note cards, would also make noise. Once I was sitting in the center of the floor, all of the speakers would emit sounds as I shifted to find a comfortable position. Then, after I reached a comfortable position, the
sounds would die down. As I concentrated, I was relatively still. The times I would shift and change my position or reach for a different notebook or pen would often be punctuated by loud sounds. The sounds would often be shocking, as I was working quietly and not focusing on the sounds themselves, and shocking because their volume contrasted with my quiet study and subtle movements and stole my attention.

\textbf{6.4.2.3 Exploratory Interactions}

As I traversed the installation space, intent to experience as many of the installation system’s responses to me and my reactions to those responses, I tended to complete a set of specific actions. This testing was only done in the final setup once the installation was constructed in Lord Hall. This is because the code and technological rig’s layouts both changed in the week prior to install, and testing could only begin once the technological rig’s lengthy construction was finished. These are personal actions, different than what others might complete. The learning is in the actions I took, not in this recounting of the actions taken.

I would walk into the space. Sound would emerge out of a speaker or out of speakers. I would tend to turn both ears towards the sound emitting speaker and then move bodily towards it. Sometimes, I would lean in towards the speaker or lunge towards it in addition to moving bodily towards it. I would generally not get closer than a foot to the speaker. I would occasionally stare at the speaker, not moving, then move a tiny bit, and stare again.

I tended to walk around the installation. My walking through the installation was slow, not glacially slow, but with carefully placed footsteps and not extremely large strides. Unless I was testing something specific, such as turning, or sound trigger boundaries, or how many speakers could sound at once, I kept my arms down.

I spent a lot of time twisting in the installation. I would turn my head, rotating it back and forth. I would twist my upper body back and forth. I would rotate my torso, keeping my arms out in a T, or bent at the elbows. I would bend forward in half, then
rotate to the side, then bend backwards, then rotate to the other side, to test how different motions in the space felt and what sounds occurred. Twisting took up different amounts of space. It led to interesting differences in pitch. Depending on arm position and body placement, I might get different pitches simultaneously, or faster wavering of pitch.

I also completed many vertical arm motions. One commonly carried out motion would be to slowly raise my arms slowly into a T position from lying next to my torso, then lower them. Sometimes, I carried the motion further, bringing my arms up next to my ears through the T, then lowering them. I sometimes bent my arms forward at the elbow, and rotated them and my torso from side to side in a motion similar to that of window wipers. My arms would move in tandem, the space between them usually equidistant, only decelerating, stopping, and accelerating when they reached the range of their motion. This produced a relatively steadily pitched sound, with a bit of tonal wavering, similar to the sound of a dizi being played, and was a sound I sometimes purposefully pursued so that I could listen to the sound of the dizi’s attack. Moving arms was a method that made me feel like I had a lot of control, because it was easy to control my each arm’s speed, direction, and coordination with its pair.

Another way I liked to explore the work with my arms was by putting them out in a T, and walking up to potential boundaries. I enjoyed triggering the outermost boundaries, walking and causing sounds, then having them suddenly stop, even though the motion continued. I also enjoyed triggering multiple sounds at once, and hitting the intermediate borders between two quadrants and switching between two sounds this way.

Turning was another favorite. I found that the flurry of sound produced enticed me to continue turning. The faster the turning, the more interesting the changes in pitch. When I turned under the center of the camera, pitches changed across all speakers. When I completed a series of ballet inspired chaînés², I traveled through different divisions of the

² Chaînés are a basic form of traveling turn taught in ballet classes. This is not meant to be confused with a direct French translation of the word, from which the traveling turn got its name. To view chaînés, see (Magali Messac, “Chaînés,” Ballet In Form, accessed July 23, 2022, https://balletinform.com/chaines/)
web cam’s image and therefore triggered various speakers in turn. Turning more wildly, with one foot off the ground and trailing through the air at an angle, led to more interesting turn sounds, because it sometimes triggered a sound in a different quadrant, but mostly triggered sounds in the quadrant my torso and arms were turning in.

Changing levels, bending my knees and bring my body down towards the ground, bending at the hips and moving there, standing tall, and jumping, all led to differing sounds. The farther my body was from the camera, the more I had to move to trigger higher sounds. When I jumped, sounds often came from multiple speakers. My best guess is that the jump triggered shadows, and so while I was firmly in a specific quadrant, say the Lower Right quadrant, the shadows extended into the Upper Right Quadrant, and both speakers produced sounds.

At certain times of day, when there was less light pollution from the windows, and when motions were quick enough, shadows mattered. On occasion, shadows triggered sounds in different quadrants than where the motion was occurring. Motions in the Lower Left and Upper Left quadrants were most likely to trigger sounds in the right sided quadrants, most often the Upper Right quadrant. My best guess as to why this occurred was that the lighting was slightly skewed towards the left side of my work, due to its potential to bleed into a nearby work.

Varying speed also brought joy. I enjoyed inching my feet along, and listening to how low the notes would get, then moving slightly faster, then moving faster again, keeping up a steady pace for a length of the installation and listening to the relatively steady pitch until I sped up or slowed down. I enjoyed trying to move so slowly that no sounds were triggered, or moving so quickly that the dizi notes reached their limits. I could not move quickly enough, could not displace enough pixels, to trigger the fastest playback of the dizi notes.

Another common action was trying to use different body parts to trigger all speakers at the same time. Generally, using two arms, I could trigger sounds out of any 2 speakers. Using two arms and one leg, I could trigger sounds out of 3 speakers, with slight
contortions or turning of my body. However, using two arms, one leg, and my torso, I could trigger sounds from all 4 quadrants at once.

Testing subtle motions was also engaging. I would slowly roll my head on my neck. At certain speeds, the motion was too subtle to trigger the sounds. I would roll my shoulders, to a similar effect. Similarly, I would very slowly raise my arms, shift my weight, lift a leg, bring up a knee. I would enact motions with different parts of my body, very slowly. Some motions, even while slow themselves, led to full body motion that I might not have noticed much without the emphasis brought about through the sonification of large enough motions.

I built up intensity of motion. I would start by swaying side to side, and increase the size of the sway. Eventually, the swaying would give way to slight lunges, lunges that fully used the legs, to lunges that fully used the arms, head, and torso to extend the motion. This sort of motion triggered first consistent sounds, then slightly higher sounds, then sounds with pitches that slid to even higher notes before stopping, and returning to a lower pitch. Pairing the change in intensity of motion with the change in pitch encouraged me to repeat the motion.

Apart from these general actions, I tended to try motions that in past activities I practiced ad nauseam. Some of these include diving approaches, backstroke or butterfly form, ballet warm ups and arms, salsa dance basics, samba walks, conducting in different times, various blues moves, and qi gong. I found that performing well-practiced motions, especially those that follow a certain cadence or often have a very specific speed, led to very regular and predictable sound output. The sounds output varied a bit in length and pitch, but not nearly as much as when I performed less practiced motions. This was the closest I came to having very precise control over the response of the installation, and the type of activity where it inched close to instrument.

After watching another participant navigate with closed eyes, I tried myself. I stood in the middle, closed my eyes, turned, and then started wandering. Very soon, due to the
pitches of the speakers, I was able to orient myself. Soon after that, I was able to walk back and forth between the walls, not in completely straight lines, but without running into the speakers or leaving the boundaries of the installation.

These are just many of the repeated ways I actively explored the installation space alone. The majority of my time in the installation was spent in the hours I spent in the gallery by myself. I did also explore with others. Sometimes, I triggered speakers opposite those of a friend. Once, we tried to trigger sounds in rhythm with one another. A handful of friends tried dancing with me, and our motions and our footsteps created an interesting set of sounds, distinct depending on the dances we used for inspiration.

6.4.3 Observation of Others’ Interactions with Installation

Visitors to Lord Hall Gallery interacted with “Motion: Connecting Body with Sound and Position”. The interactions varied based off of when the visitor visited. Visitors who attended Open House had others to watch and learn from. Visitors who attended alone had to rely on their individual senses when engaging with the installation.

6.4.3.1 Open House Dynamics

During Open House, no matter where a visitor stood in the gallery, sound from “Motion: Connecting Body with Sound and Position” reached them. The sounds carried throughout the gallery whenever someone decided to trigger the installation’s system. The gallery’s acoustic environment was profoundly impacted by motions in the system. This alerted gallery visitors, no matter where in the gallery they stood, that there is an artwork in the relatively bare space towards the back corner of the gallery. However, other works emitted noise during Open House. The buzzes and recorded voices of neighboring works played simultaneously, coming together with the voices of visitors and the sounds of their movements to create the Opening Night sonic experience of “Motion: Connecting Body with Sound and Position”.

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The sounds themselves drew visitors towards “Motion: Connecting Body with Sound and Position”. At minimum, visitors wanted to know what was causing the sound. Therefore, visitors would wander to the work, watch whoever was generating the sounds with their motions, and potentially enter or wait to enter. If a visitor wandered over when no one was using the work, the visitor often entered right away. Usually, visitors did not enter the work while others were using it, but some participants would enter irregardless of if the installation space was clear or not.

On Opening Night, it was rare to see a participant walk into the work without much of an idea of what would happen. The experiences of those before warned the participant that noise would occur. On Opening Night, while there were a few people who did not seem to approach the work, it was common to see those who would carefully remain on the borders, not triggering sounds but instead watching other participants interact with the work. This response to the system was unique to the crowds of Opening Night, and non-existent on days without multiple visitors.

6.4.3.2 Standard Gallery Hours Dynamics

During the many standard Lord Hall gallery hours I sat in the gallery to see how visitors interacted with work, I noticed that visitors tended to visit the gallery alone or in small groups and have the entire exhibit to themselves. Groups who entered together tended to move through together, look at each work individually, and then move on to the next work. There were no sonic cues indicating that the installation was active on these days. A visitor would see an empty space framed by speaker monitors towards the rear of the small gallery and move towards it as they wander between different works. The visitor might also enter the space because it was a visually empty space in an otherwise full gallery. However, the visitor is not led into the space through sonic cues from other visitors or from visual cues from watching other visitors, as this tended to be a solo experience.
When a solo visitor triggered the system, one of three things could occur. The visitor ignores the system and continues doing whatever they were without pause, which I classify as refusing to respond to the system, or non-engagement; the visitor responds to the system by removing themselves, participating in one form of engagement; the visitor responds to the system by repeatedly triggering the system with further motion, which is another form of engagement.

6.4.3.3 Interaction Patterns Observed By The Artist Across Multiple Visits To The Gallery

As an installation dependent upon space and motion, without a physical interface for visitors to manipulate, there are as many ways in which a solo visitor could approach interacting with the work as the visitor can move. With multiple visitors, the ways in which the visitors can engage as a group expand even further. Even so, there is a way to characterize the actions of visitors based off of the basic decisions they made. Would a visitor react to the system’s response to the visitor’s presence or would the visitor ignore this response? A visitor who responds to the system’s response by changing their own behavior becomes a participant, interacting with the system. A participant can participate in many ways, whether by further avoidance of the system, observation of the system, use of the system, or systematic use of the system.

A handful of visitors are not deterred from their prior actions by the the response of the system. They walk through the system ignoring the system’s response, often with a purpose. This sort of visitor includes a janitor sweeping the floor with purpose, a parent searching for a child, a person in a hurry, or anyone else who does not react to the sounds. This type of visitor likely includes the hard of hearing visitor - unfortunately, the work is geared towards the sense of sound, and therefore not accessible to those who are hard of hearing. Perhaps this visitor does not understand that their motion triggers the work and that they can enact changes. Perhaps this visitor understands, but does not care to engage.
Whatever the motivation, this visitor does not respond to the system’s response, so therefore does not engage with the system, and does not become a participant in this instance with which the visitor interacts with the installation. An example would be when, after hours, the custodian came through and swept, very systematically passing through at one speed in one direction without stopping. For another example, read A.1.2.1.

Many visitors respond to the system outputting sounds as they move through by deciding to avoid the system. A typical visitor of this sort might walk into the installation space, trigger sound, and stop. Once this visitor realizes that walking into the area delineated with speakers, or just continuing in the direction this visitor is walking produces sound, the visitor removes themselves from the area where sound responded to this visitor’s presence and return to an area where sound is not triggered. Another observed method of a visitor dealing with this was the visitor sprinting to the other side of the system, and not returning. Read Appendices A.1.1.1 and A.1.2.2 for descriptions of what specific interactions of this sort look like. Perhaps, for these participants, the unfamiliar sounds make them uncomfortable. Perhaps, being at the center of the work, and the work not being complete without the visitor makes this participant uncomfortable. Perhaps, not understanding how to engage with the work makes this visitor uncomfortable. Perhaps, not wanting others to watch them inside of the work makes this visitor uncomfortable. The reasoning behind this participant’s self selection out of further participation is immaterial. This participant has removed themselves from further interaction with the system. Something about the experience has created a situation this person does not want to further extend.

In a setting where multiple visitors visit the gallery at the same time, observation of the system from outside of the trigger space becomes a viable form of participation. Some visitors hear the sounds of others within the space, watch their motions, but are not tempted to further engage. While this is not an active form of participation, it still is a form of engagement. Without the urge to observe, the visitor would not avoid the trigger
area. The specific avoidance of the trigger space due to the happenings inside the system, the movements of another in the space and the sounds generated through the mover’s actions, is a response to the happenings of the system. Therefore, while this participant does not engage the work through activating it, this participant is still a participant. We can speculate as to what causes this response. Participation through observation might be caused by an academic interest in the happenings of the installation, an enjoyment of watching others move and explore, an interest in what sorts of motions cause what sorts of sounds, politeness while waiting for a turn, or shyness and wanting to avoid being watched by others. At the moment, this participant does not engage with the work themselves.

Many participants choose to respond to the system’s sonic response to their presence by continuing to move within the trigger space. Some participants explore through walking, as pictured in Figure 6.13. The visitor enters the space, walks around it, stopping occasionally. This participant continues to engage the system and over time may notice that their individual actions affect the sounds output from the system. This visitor may
enter with companions, who may participate in the same manner or engage differently. Perhaps this visitor tends to walk places, not run, especially when indoors. Perhaps this visitor is curious, knowing that the speaker defined area is inside a gallery, and explores to understand why it is in a gallery. Perhaps this visitor is driven by the sonic response. Whatever the reasoning, this visitor walks through the installation, explores the space, but is not necessarily driven to explore through more than just spatially changing their position in the space. When walking as a group, a set of visitors can get a larger variety of sonic reactions to their presences. Walkers sometimes transition to other types of engagement.

Some participants extend their motions to further exploratory actions than walking. This participant may engage other body parts in the exploration, vary the types of motions they enact, stop and start moving in various fashions, speed up their motions, play with levels, engage other items than themselves in their motions, work with others in interesting ways, and more. This sort of participant enjoys the exploration. The participant is not necessarily trying to understand all of the details of what is happening in the space, but
learns a lot about the space by exploring what motions are possible and what happens when these motions are enacted. One friend who explored the work with this mindset turned to me, wide-eyed, and said “It’s fun!” She proceeded to spend a few minutes hopping from place to place around the installation, seemingly goal-free, just paying attention to her own motions and the system’s response. To read about some example exploratory interactions, read Appendices A.1.6.1, A.2.1.1, A.2.2.1, and A.2.3.1. A participant’s reasons for engaging in this type of participation can be speculated upon. Perhaps this participant enjoys the sounds. Perhaps the motions and responses bring joy to this participant. Perhaps this participant is engaging with others in the space, and the combined interactions trigger this participant’s curiosity. The motivation of individuals is not being analyzed. The fact that the individuals engage with the work, and the fact that they are motivated to continue engaging is of interest.
Figure 6.15: Many participants decide to test the boundaries of the work and determine if they can figure out how it works. This participant tests how far and how fast he needs to move his arms to trigger sounds when standing with his back to the wall.

An extension of exploratory motion that some participants engaged with was participants who begin to try to learn the nuances of the system and try to exert some sort of control. This participant understands that their motions are triggering sounds. This participant begins to figure out which motions trigger which sounds. Perhaps this participant tries to manipulate the sound output of the system precisely through action, as if the system were an instrument and the method for playing this instrument were bodily motions. Perhaps this participant looks for sensors that can reasonably be triggering the sonic response to their presence. Perhaps this participant tests the boundaries of the work. Perhaps this participant very systematically tests variations of every motion they can think of, alone or with partners or props. Some accounts of participants engaging in this manner are in Appendices A.1.2.3, A.1.3.1, A.1.4.1, and A.1.5.1.

For an example of what motion in the installation space can look like, watch a walk through I complete on Vimeo: https://vimeo.com/725054121. I imitate some of the more common motions that I saw participants enacting.
6.5 Further Thoughts & Conclusions

As an interactive sound installation, “Motion: Connecting Body with Sound and Position” takes time and engagement for a visitor to appreciate. Careful design and many iterations led to a set up that gave participants an opportunity to trigger the work and learn about what can be done inside it. This is a work that not everyone will appreciate, but most participants will engage with the work in a variety of ways including avoidance, observation, non-engagement, play, to various levels of exploration and reverse engineering.

Let us return to the statement of this work’s research goals and compare these goals with the work completed. I set out to create a participatory installation space, where a visitor’s bodily explorations of the space have potential to impact the system itself as well as the installation’s acoustic environment. I also set out to take into account how the participants’ interactions with the installation affect the system.

“Motion: Connecting Body with Sound and Position” influenced the actions of many participants. The work is interactive because the actions of the participants triggered a response that shaped the installation at the time of the action’s immediate future state. The work responded to the participants’ movement through the space, a type of bodily exploration that is only possible through their presences. Participants either chose not to engage further with the system, watch the system from outside, or engage the system further, and their engagement with the system changed the trajectory of their actions in the installation space. Participants who engaged with the work moved and listened, and had the potential to learn about their bodily motions and their impacts on their environments, especially sonically, through their engagement with the work. All of these are basic conclusions I have been able to draw, for they were the foundational questions I set out to answer.

The motions that participants engaged in extended beyond the walking often engaged in inside of buildings in societies such as ours where children are encultured to walk, not run, inside of public indoor spaces that tend to house expensive items and are not built
purposefully to exercise within. The work helped participants step outside of the boundaries of the social norms of many galleries. They ran, jumped, and turned. Their actions, by design, made a lot of noise. Their presences were broadcast, they became the center of the work. In these ways, the work challenged the institutional system it worked with.

While moving through the installation space, a participant would often trigger sound. With practice, experimentation, and very deliberate movement, the noises produced could become almost controlled. A participant could generate semi-predictable pitched sonic responses. The work has almost instrumental properties, which are accessible to all mobile and hearing visitors to the gallery with practice.

Even though it was carefully designed, the way in which my work coexisted alongside the other works in the exhibit at the same time created interesting dynamics. Together with “The Home Project,” “Future Hardware Sketches,” and “To the First White Woman Here,” “Motion: Connecting Body with Sound and Position” formed a major component in the gallery’s acoustic environment. The noises and the silences of each work became part of the others’ experience. My work’s silence, meant to provide contrast and give importance to sounds when they occurred, was less silent than it would have otherwise been. However, the continual noise connected my work to its surroundings, tying it into a larger system, which is appropriate for a work examining being present. The work had a presence in a system, just as its participants had a presence in its system.

For participants, the setting within which they visited had a large effect on their engagement with the work. Participants who attended during Open House could watch others, while those who visited alone would only learn about the work through active engagement. Participants who attended during Open House could engage with the work alongside a partner in exploration, and generate different sonic experiences than a solo participant could alone. Many participants who attended during Open House lost the opportunity to be surprised by the work, or figure out how it works on their own.
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APPENDICES

APPENDIX A

OBSERVATIONS AND PARAPHRASED TESTIMONIALS

I managed to catch a few friends who either told me what they thought of the installation in Lord Hall, or were kind enough to let me watch their experiences in my work. The main points from my conversations with them and observations of their interactions in the work are listed below.

A.1 Observations

A.1.1 Collected June 25, 2022

A.1.1.1 Person C

This friend very much did not enjoy the installation. As I observed, she walked in, moved, then removed herself. Because she was there, she tried it a few more times, asked me questions about how it worked, and copied a few of the motions I did, but it was clear that she did not enjoy the work.

I wanted to understand more, so asked a few questions. I wanted to know, if there had been no observers, if I and other watchers had not been in the room, did this friend think she would have felt invited to move, and would have enjoyed the work more than she did? She answered no, it was not observation, but the sounds. She felt the sounds were too unfamiliar, to off-putting to interact with the work further.

I am fortunate that she stepped into the work and felt comfortable enough to give me insight.
A.1.2 Collected June 29, 2022

A.1.2.1 Person E

This friend moved at a normal walking speed through the gallery, initially. His speed was so consistent that he did not trigger much variation in the sound. As he did not stop, sound was continuous until he left the area. As he did not slow down or speed up, the sound was basically uniform in pitch for each individual speaker. As he was one person, and did not use his arms, only one speaker was triggered at a time.

When I joined this friend in the system, he was delighted to notice that multiple speakers could be triggered at once. Additionally, after I began to do more than just walk at a consistent speed, he learned that the speakers would stop and start, and that pitch could be changed through motion.

This friend was interested in learning about how the system worked. He had found the camera, but wanted to learn about the logic and coding language used.

I saw this friend’s second visit to my work.

A.1.2.2 Person F

This friend walked into the area of interest, then walked out quickly. He mentioned finding the sounds a bit oppressive. He asked why I had not used nicer / more relatable sounds, such as piano tones. He also wondered why I did not use different instruments for each speaker.

After we chatted and after I showed him a few ways the system could be manipulated, he returned into the installation. He eventually tried to trigger all the quadrants at once through bodily contortions and tried to trigger the installation at different speeds. He did move through mostly using his body as a whole, but occasionally triggered the work with his arms and legs.

I am glad that he was willing to tell me what he found uncomfortable in the work, and that he continued to test the work anyways.
A.1.2.3 Person G

This friend absolutely loved spending time in the installation. He was perhaps the most frequent visitor. Counting opening night, I believe he visited the installation at least 5 times and spent sizeable amounts of time in it each visit.

When this friend explored the installation, he was visibly happy. He kept on thinking of new actions to try, and performed them.

Many others who went through did not use their arms to explore the space. Not so with this friend. He almost exclusively used his arms to reach out in directions and manipulate the work. He did sometimes lunge or lean in directions.

He showed me how he initially went about finding the camera, and figuring out that there were no sensors in the speaker. He also went through with closed eyes to make sense of the space.

While watching him, I was convinced he felt invited to play in the space. It may not be there for all, but it definitely was there for this friend.

A.1.3 Collected June 30, 2022

A.1.3.1 Person H

This friend played with the work.

Her time in the work was extremely brief, but efficient. She walked into the work and was not confused by the sound. She started to skip, try fancy footwork, and try other motions to see what happened when she moved. She found that fancy footwork did not yield interesting results, but faster motions in general did. Her cartwheel also brought lots of fun sounds. Apart from the cartwheel, most of her explorations were based off of the movement of her torso or legs with very little arms involved. She also investigated the speakers to see if she could figure out how they worked, then noticed the camera, and determined how it worked.
This friend is visually oriented, so would have found it more engaging with visuals. She was not thinking about anything in particular while in it and just explored. She mentioned that being in the work made her feel playful. Her playfulness while exploring was palpable.

A.1.4 Collected July 1, 2022

A.1.4.1 Person I

This friend happily explored. She walked from speaker to speaker, lunged, stuck out her arms, twisted and turned, and tried multiple quadrants at once.

We danced together. Dancing waltz was relatively uninteresting sonically - we moved basically at a very steady speed, so the pitch was relatively constant and as the frame is relatively stationary and connected, we only triggered the same sounds at the same time. Our footwork was relatively quiet. However, dancing swing was more sonically interesting. We had variable speeds in different parts of the dance, so there were different pitches. We were often in different quadrants, then would meet up somewhere in between, then end up in new quadrants. Our footwork was loud enough to become part of the work too. As our actions were creating the sounds we were dancing with, the experience felt like it was all about our connection.

This friend asked many questions. She asked why these sounds were chosen and why were these pitches chosen. She found the minimalism helpful to understanding the essence of the work was about the movement and the resulting sounds. She also agreed that the minimalism probably helped participants feel like they had the space to move. She mentioned that the work made her feel engaged, and that she enjoyed being part of the work. To her, it felt like the exhibit was a microcosm of life, where her actions impacted the surroundings. She also understood that some participants might feel uncomfortable because the work demands the participant invests in the work itself to get an outcome.
A.1.5 Collected July 1, 2022

A.1.5.1 Person J

This friend enjoyed playing with the work, and his playful spirit when approaching it was contagious.

He kept on jokingly referring to the sounds as “poop” sounds, which was a new and interesting descriptor. A few others had mentioned the sounds reminding them of a whining animal or child.

He walked in, and started shaking his buttocks, which actually triggered the sounds. Then, he tried pointing, first pointing at each speaker individually, then, at different speeds. He then tried head shaking and nodding, then worked to find the center and trigger multiple sounds at once. Then, he finally found the camera. He later told me that he thought the indicator lights on the speakers were extra sensors. Then, this friend tested the boundaries on the side of the work. He found that as a skinny individual, he could hug the wall and creep under the speakers without necessarily triggering sounds. He got past one speaker and down most of the wall before he triggered a sound while crawling. He was also able to stand with his back to the wall and raise a hand in front of him without triggering the speaker.

This friend asked about the technology setup, and then asked to see what the camera image looked like.

After this discussion, the friend and I danced. We started off with a swing, then switched into tango. Both made fun sounds, for footwork, variations in walking speed, and for the fact that two people were in the system, triggering it in a different way than one would.
A.1.6 Collected July 1, 2022

A.1.6.1 Person K

This friend enjoyed playing with the work. She walked in confidently, stopped when she heard a noise. She took another couple of steps, one going over the invisible dividing line that decides one pitch vs the other. She stepped confidently back onto the foot with the first pitch, hopped to the pitch with the second pitch, and proceeded to hop back and forth from foot to foot around the space for the rest of her time in it. Wide eyed, she stated, “This is fun!”

A.2 Paraphrased Testimonials

A.2.1 Collected May 26, 2022

A.2.1.1 Person A

I caught this friend on her way out of the installation. She mentioned that moving through the installation helped her deal with the stress of her day as a school teacher. Exploring the motions helped her briefly escape her set mental state.

A.2.2 Collected June 18, 2022

A.2.2.1 Person B

This friend enjoyed navigating the installation. It made her think of a TV show she is currently watching. In the show, if the lead detective made certain motions, there was a “do-woop” sound. Therefore, this friend was inspired to copy the motions of the detective.

A.2.3 Collected June 28, 2022

A.2.3.1 Person D

After walking through “Motion: Connecting Body with Sound and Position”, this friend mentioned that this work reminded him that not all art is tangible, and that experience and conceptual interactions are sometimes all that can be taken away. He
proceeded to recommend that I check out the podcast Make Art Not Content (https://makeartnotcontent.com/).
APPENDIX B

EXTRA CONTENT FOR PORTFOLIO PIECES

B.1 “I Don’t Like Him”

The following photos are still frames from various scenes in “I Don’t Like Him”.

Figure B.1: The audience sits in armchairs and watches the video, projected on a sheet.
Figure B.2: A close up of the screen, during the first scene where the artist begins to write one of the men.

Figure B.3: The title screen.
Figure B.4: The artist speaking with her friend’s image.

Figure B.5: The artist writes some of the thoughts associated with one man.

B.2 “Constructing Beginnings”

The photos below show various views of “Constructing Beginnings”, details explained in the captions.
Figure B.6: “Constructing Beginnings” is viewable from far away, inviting participants towards it.

Figure B.7: Decorated stairs lead a visitor visually towards the exhibit.
Figure B.8: Wall text for “Constructing Beginnings” is spread along the wall, encouraging a participant to walk through the work.
Figure B.9: The pipes from “Constructing Beginnings” match the pipes from the installation site.

Figure B.10: Visitors are provided a place to sit and contemplate the work, to watch and listen from afar.
Figure B.11: Structures are visually composed of a mix of PVC pipe, cinder blocks, and sand.
Figure B.12: Sounds are played back over mp3 players hidden inside of the PVC pipes.

B.3 “Surface Thoughts”

The following pictures are from the installation “Surface Thoughts”.
Figure B.13: With “Surface Thoughts”, speaker monitors are not hidden, but placed unobtrusively towards the back of the work.

Figure B.14: The projector was hidden above the audience’s head, in an attempt to create a more seamless experience.
Figure B.15: The audience was given a prompt. Writing on post-its and contributing their current surface thoughts in response allowed them to transition from audience into participants.
Figure B.16: The main visual component of “Surface Thoughts” is one of the artist’s internalized self-judgments projected on the wall next to a bunch of sticky notes contributed by participants.

Figure B.17: A close up view of some of the contributed sticky notes.
Figure B.18: With physical, mobile installation components, an artist should keep in mind that over time, the installation may morph, such as when sticky notes fell to the floor.
Figure B.19: A shot of the audience. Photo credit: Armando Garma-Fernández.
BIOGRAPHY OF THE AUTHOR

Katarina Folani Hoeger explores the relations created as a side-effect of being a body, often a human body, cohabiting spaces with ourselves and other entities. In each work, she chooses a specific relation to investigate or highlight. Most experiences Katarina Folani Hoeger creates use a combination of computer-generated visuals and sound, to provide an audience member or participant an entry point into the intricacies of the relation chosen.

Katarina Folani Hoeger’s most recent work draws a participant’s attention to the shifting spatial and audio relations that are part and parcel of existing in an environment. A previous work explores our recognition of images and speech extrapolated from their basic parts, pixels and granules of sound. Even prior work had participants confront mental health concepts with respect to themselves and others in virtual or physical spaces. Viewer - listeners have also been led through the artist’s personal considerations of the relations between image, sound, memory, and her present in past work.

Katarina Folani Hoeger holds a Bachelor of Science in Mathematics from Harvey Mudd College and a Master of Science in Computer Science with a specialization in Computational Operations Research from the College of William and Mary. Katarina Folani Hoeger is a candidate for the Master of Fine Arts degree in Intermedia from the University of Maine in August 2022.