

*Ambiguity,
the New Accuracy*

Ambiguity, the New Accuracy

How information technology can enable
intuitive exploration

Thank You,

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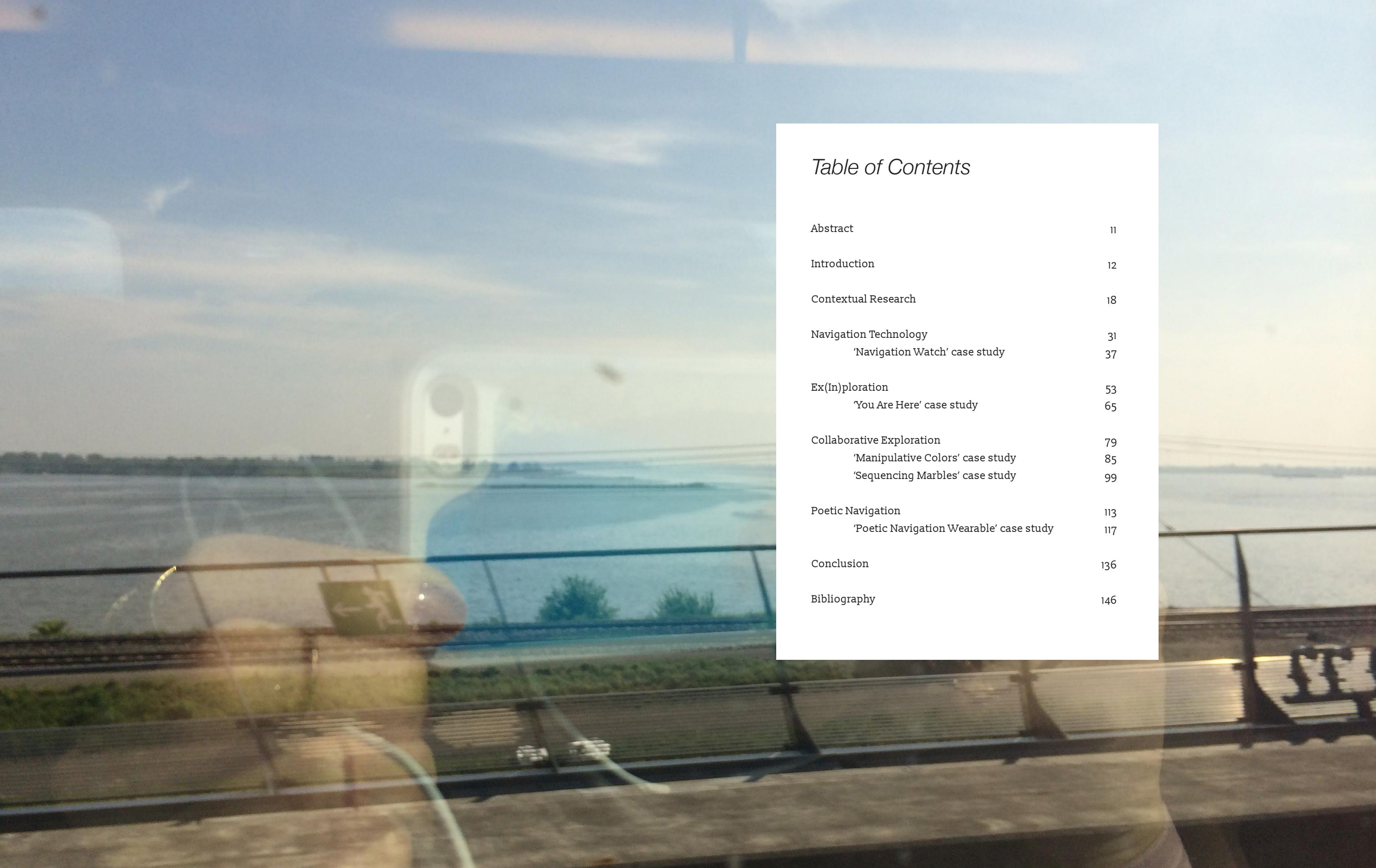


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Abstract

Exploration is an intuitive act. It doesn't require any particular skills beyond a curious mind and physical mobility. In the context of space, exploration isn't about getting from point A to point B, but everything that happens in between.

On the other hand, navigation is a task-oriented activity. It is about getting from point A to point B, often with little regard to what is between each point. In the past, one had to have a good sense of direction and orientation in order to succeed. Global Positioning System, designed to get people from one point to another, have made those skills unnecessary. GPS is nearly ubiquitous today, as it is embedded in most people's phones, always letting them know where they are or where they need to go. Calculated routes also tell them how to get there as quickly as possible. What's lost is a user's natural propensity to explore.

Through my research, I believe that ambiguity in information technology can enhance people's interaction with their surroundings. The impracticality of ambiguous information inspired me to explore how intuitive perceptions of space can be enabled. Ambiguities leave room for interpretations that allow for poetic experiences which require people's background and intimacy to contextualize. With that, people get the experience of space that they deserve through the information that they unobtrusively receive.

Introduction

I remember being taken to watch the sunrise on a mountain somewhere in Thailand when I was young. It was one of the most boring experiences of my childhood. I didn't understand why anybody would get up at 4:00 a.m. just to see the sun rise, even for an occasion. I was grumpy and just couldn't wait to go back to sleep.

I have started to appreciate the things around me and how they make me feel now that I've lived a little bit longer. I have become more attentive to them after being in an architecture school.

In my freshmen year of university, I had a project to design building facades. I spent so much time on it and lost so much sleep over it. Now, four years after that project, I still can't stop thinking about the facades of every building I look at. What I learned from that project was how to design a facade that brings the right amount of direct or indirect sunlight into different spaces. Now I can generally tell if a facade of a building is a good or a bad functioning design. However, I always wanted more than just to design a functional building.

I got my Bachelor degree in Architectural Design from Chulalongkorn University in Bangkok in May 2014. Two months later, I became a graduate candidate in the Dynamic Media Institute at MassArt.

Dynamic media is not something I knew the meaning of before I came to MassArt. I came from a very different background and also from a country where dynamic media is not something that people generally know or study.

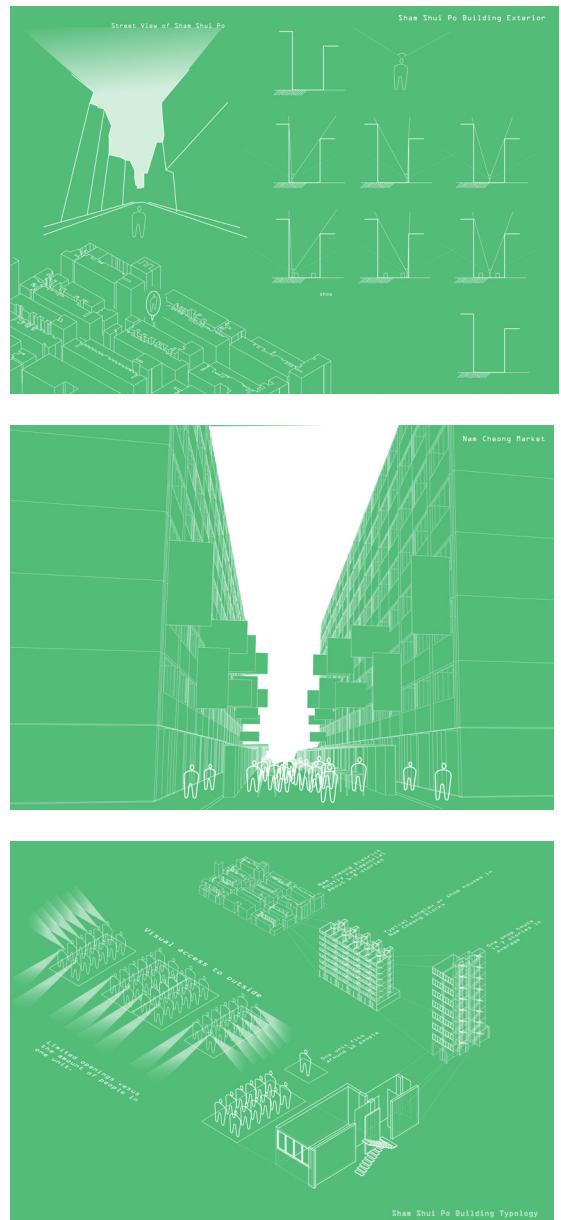
In architecture school, I approached almost every project with a disregard for structural concerns. I focused on being site specific, user friendly, and innovative. I liked moving parts, transformable space, and customizable units. Architecture requires a lot of time and effort to complete a project and I didn't think I could lose any sleep over a project if it was not exciting to me. I was lucky enough that most of my project instructors accepted my conceptual projects. However, some of them didn't agree with designs that were not buildable, which I understood and didn't take personally. I realized quite early on in school that being an architect was definitely not what I wanted to be. Real life architecture needs to be able to stand and not collapse, and that certainly was my last concern when I designed my projects.

Let me give an example of one of the projects that I completed in architecture school.

In the first semester of my senior year, we were allowed to pick a studio project that we were interested in. I picked the 'Dencity' studio, which dealt with designing residential architecture for a densely populated area in Hong Kong. I had a personal interest in over populated urban areas since it is a global problem with many areas needing improvement. For the Dencity studio, we flew to Hong Kong to study the actual sites where our projects were going to be. I picked an area called Sham Shui Po. It was one of 4 areas that we visited.

My concept was to bring the ephemeral qualities of the site into each of the individual dwellings. Unlike the other parts of the city, Sham Shui Po was very over populated, yet the buildings are still very low. From walking on the street of the site, I got a clear view of the open sky, good sunlight, and good ventilation. It was a fairly nice experience walking around the area.

The buildings in this area were mostly residential buildings with store fronts on the first floor. The inside of the buildings were a totally different atmosphere to the outside. There were way too many people packed in all of the old dirty rooms. There was no sunlight since people put cardboard everywhere trying to divide the space up, and of course, no ventilation whatsoever. It was almost depressing to witness. I wanted to bring the outside atmosphere to the inside, without destroying the existing outside atmosphere.



My presentation plates for site research.



I went through many design iterations until I finalized my concept. By making the buildings tall but porous, they wouldn't block the sky view, sunlight, and ventilation of the existing site. I also decided that the dwellings would come in customizable units of various sizes to fit different family sizes. The units would be located in the air, but connected to the main tower structure by branch-like sub-structures. I created a set of unit installation rules for the dwellers to follow. That was so all the units get the amount of the outside qualities that I hoped for. To make it a community-friendly building, I also put different programs on the structural branches like running tracks, parks, and common areas where people can hang out and be a healthy community as well.

Because I know that this is quite an impractical project, I also created a user scenario analysis to show how different people would live in these buildings.

The 'users' were one of the things that I paid a lot of attention to when I think about all of my architecture projects. Introducing new experiences of spaces was very fun.

Again, I didn't know what dynamic media was until I came to MassArt. I, however, did know what experience design was.

During architecture school, I was very lucky to be one of the candidates to go to a workshop in Stockholm during the summer of 2013. The workshop was called "Vaults of Pulp". It was a visionary project on the Garden of Rosendals and the Royal Institute of Technology in Stockholm. The project explored the possibilities of using renewable material in the cultivation, processing, and consumption of biodynamic vegetables. I was introduced to the idea of time-based performance architecture, the slowly-degrading, shape-changing structure that we built. Moreover, we were given a lecture by my professor's friend, Nandi: an experience designer who lived in Stockholm at the time.

That was the first time I had ever heard of the term "experience design". I was very interested in the projects that he was telling us about and I learned about the impact of an experience for the first time.

At the workshop, the team was divided into 3 smaller groups. One team worked in the garden to study plants and gardening, one team worked in the lab to study biodegradable materials, and the last team worked on documenting the whole thing. I, of course, chose to be on the gardening team. We had to do pretty much everything as the rest of the gardeners who work at the garden did. It was such a great experience and I enjoyed it a lot.

I was later assigned to be the leader of this team because I was so enthusiastic about gardening. We got to plant all sorts of flowers and vegetables, go in the forest to find wild plants, try some edible wild plants, and do lots of weeding. All the teams met almost everyday to update each other on the process. The other groups did some interesting things as well. I got really excited to hear about the lab group and how they spent all day in the lab, trying to find the right mixture of substances including water, gluten, etc. They had to create the right consistency of liquid to later on be put in the special oven to be solidified. At the end of this 6 weeks long workshop, we built a structure from biodegradable materials that we made, and also put on a small opening event for it as well. The purpose of this structure was for it to degrade into the soil over time, and for the people who came to the garden could witness that process.



Documentations of gardening and the degradable gluten material the we used to build the sculpture.

This workshop was probably the only non-architectural workshop that I did during my time in architecture school. It made me realize how much I enjoy making things with my hands and actually seeing them come to life.

After that workshop, I felt like experience design was what I should look into. I didn't plan to go to graduate school right after I graduated from architecture school, but I couldn't stop looking and reading about it. I decided to just apply for graduate school during my first semester of my senior year in architecture school.

I looked up experience design graduate programs, and I found SIM. It was one of the programs at MassArt. I saw projects that one of the SIM students did. He designed visualizations that were triggered by the sound of a live performing orchestra. I became more interested in the use of technology in design because I believed it is what makes design possible. I wrote that in my personal statement for my application to SIM. The school replied, saying that I would be more suitable for DMI. That was the first time I learned about DMI and it sounded exactly like what I was interested in doing: to design new spatial experiences for users.

Now that I've been in the program for almost 2 years, my interest in space has broadened. I connected space, users, and technology together. I became more and more interested in how technology plays a role in people's experiences of space. I have developed my research area in navigation and how technology adds to, and takes away from, people's navigation experiences. It is a very common scene in the city to see people walking on the streets with their phones in their hands. It doesn't matter what is on their screen but they don't seem to pay much attention to what's going on around them.

There were many times when I was walking on the streets and the person walking in front of me was on their phone. It ruined my walk pace because they were blocking the way. They slowed down or just stopped walking at weird unpredictable times, probably depending on how intense the subject of their text message was.

Sometimes it's necessary for people to look at their phones on the street. People need their GPS to help them turn at the correct intersection. I wanted to explore ways to take advantage of technology to help people navigate while still being able to let them know what they are surrounded by. I believe that navigation skills need to be trained, and having GPS telling people exactly where to go all the time will not help improve those skills. When people don't have navigation skills, they aren't able to navigate without technology, which means they won't get to explore their surroundings either. Necessary experiences for improving navigation skills are missing. People don't experience being lost very much because they always have data about where they are, where they want to go and how to get there. Not having all of the data might allow them to be a little more alert to their surroundings along the way. Every place has its own story and aesthetics. People will only discover them if they are open to explore.

My thesis research explores the idea of ambiguity in navigation and how it would enable people to experience spaces in both physical and emotional ways.

Contextual Research

My area of research lays at the intersections of space, information technology, and people. As a former architecture student, my initial interest was purely on space and how people feel in it. I was interested in how people could manipulate space and how space could manipulate people.

Technology came to my attention later when I was assigned to read the work of J.C.R Licklider, "Man-Computer Symbiosis", in the DMI Design Symposium class. The work was published in 1960 when technology was nowhere near as developed as today. The author's visions on how humans and computers can work together made me think of my relationship with the technology I am surrounded by. Does it help me grow as a human in a better or worse way?

Licklider thought that humans and computers should work together in a balanced manner, neither dominating the other. Today, people have many forms of technology to keep them connected to screens all the time. They can talk to one another person from across the world at anytime from anywhere, buy everything they need from home, or find a ride anywhere without ever having to pull out their wallets.

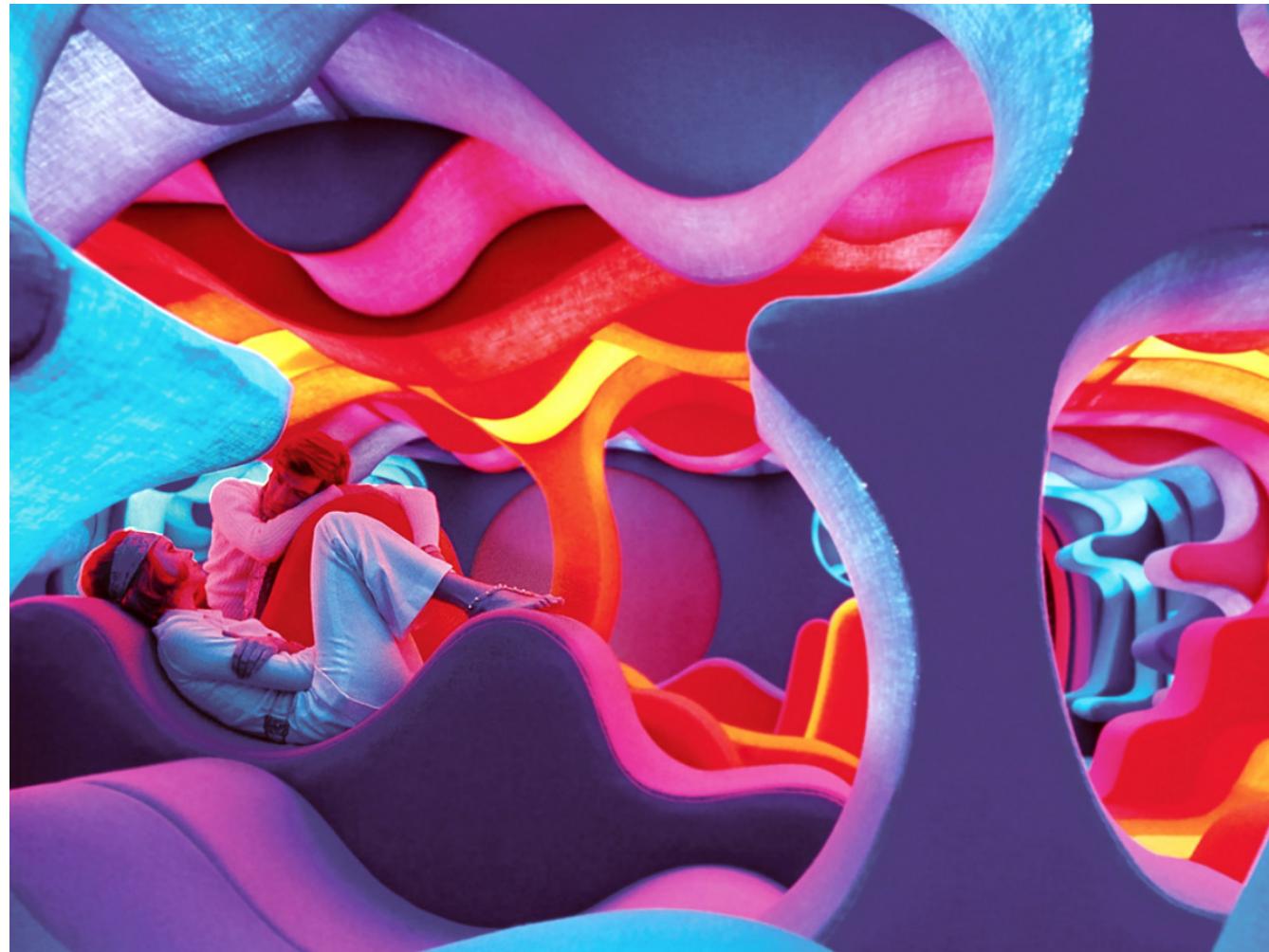
I love technology and I'm very optimistic about what it will bring in the future. To me, technology makes my life easier because it helps me exert less effort to do things. For example, with my best friend Siri, I never have to set my own alarm, physically go through my phone contacts to call or text anyone, or have to check the weather. I can just ask him to do it all for me. (My Siri is a man for some reason). I technically don't need any real friends to talk to anymore since Siri is always willing to talk. Most of the time, I trust what he says more than I trust myself when it comes to knowledge, because he is very smart. He is very precise and fast too. If I asked him how much 1,683 x 43,238 is, he would give me the answer right away; whereas, if I have to calculate that by myself, maybe a week later I can produce the answer. My main calculation work for Siri is conversion. I ask him on a daily basis about pounds to Kilos conversion or Fahrenheit to Celsius. Yes, I still need to convert those values after being in the US for almost 2 years.

Architecture

In architecture school, I was introduced to many well-known architects and their fascinating projects, but I don't remember most of them. Most of the architecture projects were functional and well-designed. 'Visiona 2' wasn't one of those, however. It was one of the very few architecture projects that I remember well because I found it interesting and different. 'Visiona 2' was an architecture/interior design project designed by Verner Panton back in 1970. The project was described on Panton's website as,

"From the end of the Sixties to the mid-Seventies the chemical company Bayer rented a pleasure boat during every Cologne furniture fair and had it transformed into a temporary showroom by a well-known contemporary designer. The main aim was to promote various synthetics products in connection with home furnishings. Verner Panton was commissioned no less than twice to design this exhibition, entitled 'Visiona'. The 1970 'Visona 2' exhibition showed the Fantasy Landscape which was created in this environment. The resulting room installation consisting of vibrant colors and organic forms is one of the principal highlights of Panton's work. In terms of design history this installation is regarded as one of the major spatial designs of the second half of the twentieth century ("Visona 2").

To me, there's nothing practical about 'Visona 2'. The space was full of curved structures that were covered with stretchy colorful fabric. It almost looked like a playground. It reminded me so much of those colorful play houses that I used to love when I was young. What most interested me was that it immediately suggested to people how they should behave in the space. Spatial design effects how people feel. I like to compare the design of 'Visona 2' to the design of the 'Barcelona Pavilion', a work done by Ludwig Mies Van Der Rohe in 1929. Both were built to be exhibited, not lived in. The 'Barcelona Pavilion' was a revolutionary design of very crisp, minimal lines and structure. It was one of the very first examples of architecture design during the modern movement. The pavilion was built and decorated with mostly glass, steel, and different kinds of stone ("The Pavilion – Fundacio Mies Van Der Rohe"). The interior of the space was very clean and minimal. There were a few rigid looking chairs in the space. I tried to imagine myself walking through that space. I would feel very anxious trying not to make any noise on the hard floor. There were only 2 uncomfortable looking chairs in the space that I wouldn't want to sit on. Everything just looked and felt very sophisticated in that space. The clean and streamlined look of the pavilion didn't make the space feel inviting. However, that was the intention of the architect and modern architecture at the time. The architect succeeded in making people feel that way.



'Visiona 2' by Verner Panton



'Barcelona Pavillion' by Ludwig Miles Van Der Rohe

Contrastingly, 'Visiona 2' looked very inviting to me. The organic structures invited people to play, climb, and roll around in the space. I couldn't imagine myself being in that space and not climbing around, and I'm not that young anymore. I was inspired by the idea that spaces can manipulate people's behaviors and moods. Spaces can make people curious of what they can do in the space or with the space. I believe that one of the reasons why these spaces could manipulate people's behavior was because people actually noticed the spaces. They actually paid attention to the things they were surrounded by. The playful space with its colorful curvy structure suggested that people not take the space too seriously, to relax and be comfortable. This showed how spaces can manipulate people's behaviors.

However, I wonder if this project were to be installed somewhere today with everybody having their smart devices in their hands, would people give it the same amount of attention? I am very skeptical about how people are living in the virtual world and what that does to us as human beings in the physical world. I'm really interested in the balance point of technology use, especially in the context of space.

GPS

These days, everybody has GPS embedded in their smart phones, allowing their phones to take them to wherever they need to go without having to be late or lost. I am a GPS user, both when I drive and walk, and so are most of the people that I know. I am very familiar with the gesture of looking at my phone, waiting for it to notify me of when to turn. In terms of the practicality of it, I don't really have a problem with doing that. I just always have to look down at my phone and make sure I don't miss the turn, and also look up to make sure I don't walk into something. However, GPS is so precise that it is worth it for me to feel a little anxious from looking up and down. I know if I get lost I would feel a lot more anxious.

Maybe a little bit of anxiety is better than a lot of anxiety.

Before I started to use GPS, I read physical maps. Of course, reading physical maps was different since you don't always know where you are. What I did to keep track of where I was in relation to the map was to remember the landmarks around me. For example, walk north 2 blocks and there would be an ice cream shop on the corner of the street, and then turn left. They acted as clues along the way guiding me to my destination. Physical maps also allowed me to connect the streets in my head when I saw those landmarks. It made me understand the whole area better since I already saw the layout of the streets on the map.

Treasure Hunt was a game that I used to play when I was a kid. It required receiving clues to help with navigation. My parents used to hide clues in different places that led me up to a piece of candy. They would hide the clues in discreet places like the cabinet or under the mattress.

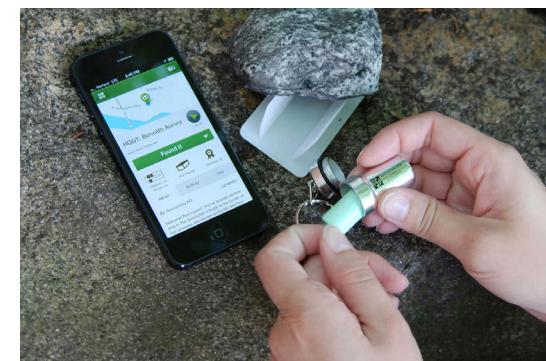
A company called Groundspeak, Inc made an app called "Geocaching" to recreate the experience of treasure hunting with the use of GPS. Geocaching is a real-world, outdoor treasure hunting game using GPS-enabled devices. Participants navigate to a specific set of GPS coordinates and then attempt to find the geocache (container) hidden at that location. Geocaching has different levels but the simplest level requires these 7 steps after registering for the app.

1. Visit the "Hide & Seek a Cache" page.
2. Enter your postal code and click "search."
3. Choose any geocache from the list and click on its name.
4. Enter the coordinates of the geocache into your GPS Device.
5. Use your GPS device to assist you in finding the hidden geocache.
6. Sign the logbook and return the geocache to its original location.
7. Share your geocaching stories and photos online.

Even though the GPS tells people the locations of where the treasures are, the treasures are hidden in places where the GPS can't be specific enough to tell where they are exactly. For example, it might tell people that the treasure is in a particular spot in the forest, but within that spot, there are tree branches and rocks for them to dig around. The logbook allows the experience to be more community-based. It lets the players feel like a part of something big by writing their names down with the other people who also found the treasure. People can also exchange 'treasures' in the treasure box. They are usually just small toys. However, the fact that nobody knows the origin of the toys, like who put them there or where they were from, makes them more valuable and sentimental.

Geocaching touched on many areas of my interests. The app allows people to explore different spaces. Using the treasures as rewards, people are more engaged in the act of exploring. It gives them an end result to their exploration which makes them feel accomplished. They also feel like they are a part of the community. Even though, they might not ever get to meet with the other people from this community, they still feel supported. It is as if people in the community do the treasure hunting together since they have to go have similar experiences trying to find the treasures.

By the act of exchanging treasures, they would feel as if other people in the community gave the treasure to them as a gift for completing this hunting task. They empathize with each other without having to actually meet in person. The act of putting down their names with the rest of the people in the logbook also confirms their accomplishment of being a new member to the community.



The geocache

I'm interested in the ways people can navigate and explore collaboratively. How that would change the experience and how it can affect the outcome of the act.

Haptic Communication

It makes sense that navigation devices like GPS are screen-based communication because it can show many data points at the same time. However, alternative ways to navigate people are helpful for those who don't have or don't want to use their sights for navigation.

A navigation device called "Animotus" was designed by Adam Spiers, a postdoctoral associate in robotics at Yale. It was initially prototyped to use in an immersive theatre installation where the device was used to help guide audiences to walk in complete darkness by giving them haptic information. The haptic device changed shape to point the way. One portion of the cube twisted left or right, indicating directions; the other part slides forwards or backwards, denoting distance (Hester). People only used their hands to feel the directions of where they need to go. It was interesting that the device came in the form of a cube, something that the users held in their hands. The users did not have to look down at it, but still had to explicitly hold it upright with both of their hands. This was so that the part that rotated with the arrow engraved pattern could point to the correct direction. The cube seemed like a magical device that guided users to where they needed to go.

The installation space was in complete darkness and this little magic cube was all they had. Because the users needed to hold the cube in a specific way, it felt even more precious.

I can see its value in the immersive theatre installation. Imagine how scary it would be for the participants who usually have perfect sight. All of a sudden they were put in total darkness, and also have to move around. They had no choice but to trust this cube to navigate them in the dark space. It is interesting to think of how much trust they would have for that cube. It reminded me of how much people rely on GPS in their daily navigation, even in broad sunlight.

Spiers was trying to develop this cube so that it worked with the GPS satellite signal and worked outside as well. I personally don't think this particular cube would be a practical navigation device for people with normal sight. It required them to hold it in a certain way, which might be too limiting because they couldn't use their hands to hold other things. They also didn't actually have to be in the dark, and the feeling of the cube was probably going to be different. People didn't need to hold this cube in that precise way anymore. It was also quite explicit and might be awkward to always have to hold that cube around in the city.



The Animotus

Haptic sensation is what I'm interested in when it comes to navigating because people don't have to sacrifice their visual perceptions. It is very dangerous to have to keep looking at a screen especially when they are on the road. For me, voice notification doesn't always work either, especially when I have my music on. It can get annoying. Even when I was walking outside on the street, the outside noise was always too loud for me to hear what my phone said.

Haptic Navigation

Smrtgrips is the first bike grip system that provides haptic navigational feedback. This smart bike grip can be installed on any bike. Apart from eye-free navigation, the smart grip also has the feature of bike finding, bike tracking, connected biking, and separation alert. All of these features work by the 32-bit Bluetooth chip that is embedded in the smart grip. This smart grip works with a mobile app where users can assign their destinations, or choose functions within the smart grip. The haptic feedback that tells the users left and right directional information is very useful. I like the fact that it is seamless and not an intrusive notification method, especially when people already have to pay attention to all the scary road elements.

However, the functions of bike tracking or bike finding do not work that well since Bluetooth can only work within a certain distance. Unless their phone is near the bike, the smart grip is basically not functional and not very smart at all. For example, if somebody stole their bike and they want to use the bike-tracking feature, they won't be able to track where their bike is until somebody else who happens to have the Smrtgrips rides past their stolen bike. I think that is going to be pretty rare.

The haptic feedback of Smrtgrips eliminates the distractions that screen-based or voice navigation devices give. However, I still don't believe that haptic navigation devices can ever be that precise, especially when there's only left and right directional information. At the end of the day, not all intersections are perfect right angles.



Smrtgrips: bluetooth bike grip

Lost

I was first interested in the idea of being lost when I sarcastically approached a project on the current use of GPS. That project was called 'Navigation Watch'. I chose to display location information with latitude and longitude numbers with the intention of getting the users confused and lost. I believed that when the users get lost, the situation would automatically force them to explore in order to find their way out of the situation.

In a *New York Times* article called "Reclaiming the Age-Old Art of Getting Lost", Stephanie Rosenbloom wrote about her experience of allowing herself to be lost when she travelled. Rosenbloom wrote about how she let herself wander in different spaces and how one place led to another. Freedom for her was to be guided by a mood, not by maps. Some touristy spot could be personal and spontaneous without navigation tools to tell her turn-by-turn directions. Rosenbloom also wrote about her trip in Paris and how she found her way to the Eiffel Tower by just following it from afar.

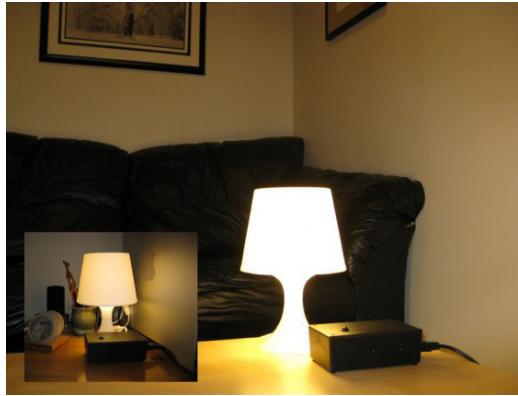
Not everyone has time to wander, but allowing oneself to get a bit lost can enrich the experience of spaces. Anxiety makes people more attentive of what they are surrounded by. It can help them explore spaces more deeply.



'No Place Like Home': Beautifully designed navigation shoes

Indirect Directions

A friend of Jan Kubasiewicz, Professor Ewa Satalecka, introduced me to project called "No Place Like Home" by an artist and designer, Dominic Welcox. He designed these fascinating navigation shoes that were inspired by Dorothy's shoes from the Wizard of Oz. Dorothy could click her shoes together to go home. The top of one shoe shows the level of GPS signal that the shoes are getting. The top of another shows the directions for the user to follow to get to their destination. Apart from the beautiful craftsmanship of the actual shoes, what really interested me about this project was the ambiguity of the directions the shoes gave. It only pointed out the direction of the destination, not each of the turns the user needed to make. I don't think this was the intention of the shoes, but this would allow the user to wander around and explore a little bit more than with turn-by-turn directions. I liked how it is a navigation device that people wear and not hold — something that they unnoticeably incorporate in their lives, even though, ironically, they have to stop walking every time they want to get information from it. The directions were given with LED lights. The users always needed to look at the way down to their shoes to read the signals. They needed to stop walking every time they need to check the direction. As far as practicality goes, I don't think these shoes were the best navigation tools, but I don't think they meant to be anyway. I, however, think it is metaphorically beautiful to use shoes as a navigator since they are the vehicles people wear when they want to walk to places.



'Light On' by Alex Wang

Poetic Communication

Alexander Wang, a former DMI student, did a project called "Light On". I found this project very inspiring and a great example of a simple gesture that conveys a very powerful message. The project derived from his childhood memory. His family always left the light on for the family members who came home late. Wang made a pair of lamps for people who live apart to make them feel like they are not alone. The lamps were network-connected so that when one person turned their lamp on, another lamp will also be turned on as well. Even though his focus was on using light as a medium, he touched on very interesting points of how an object can make people feel, especially when they are apart from their loved ones. He used a very subtle gesture, like turning on a lamp, to communicate such a powerful message like love.

Those two things are not particularly related, turning on a lamp and loving someone, but the metaphor behind it made the project so powerful. Knowing that the light was turned on by someone that they care about allows people to know that the other person cares about them too. That was why they turned on the lamp. It also let people know and feel relieved to know that the other person has arrived home safely. There's something interesting about the location of the lamps. Both of the lamps were located at home or the place that the person lived at at the time. The two people didn't carry them everywhere. Both of the people would only see the lamps, either when they were on or off, only when they were at home.

It made me think about how I associate my family with my home. There have been times when I came home early and none of the family members were there yet. It felt different. Home felt less like home without my family members there. Wang's lamps were representations of people's loved ones being home when they get home.

Simple gestures can convey powerful messages to people: to show people they care about them and that they are safe even when they are separated by a long distance. I'm interested in how simple navigation gestures or signals could deliver a more powerful message than just location information. How could navigation become communication for people and how could dynamic media be used to make that happen?

Navigation Technology

A non-tech life

I was born in 1992. I was born early enough to experience the world without smartphones. Being without a smartphone wasn't a problem for me before I was introduced to them because I was very young. All I cared about was food and play.

My parents gave me my first mobile phone when I was around 10 years old. It was for only one use: to contact them. Before that, everything needed to be so well-planned when it came to the location and where to meet my parents. The school that I went to was in Bangkok. Everybody drives in Bangkok and there was never a parking spot at school for my parents. The school was also located in the central area of the city and the traffic around the school was pretty bad. The school had a driveway where parents would drop off and pick up their kids.

At the time, school students did not own mobile phones. We didn't have a way to know when our parents were coming. Parents also weren't allowed to park the car at the pick up spot, not even for one minute. How it worked was, high school students would volunteer to be the name announcers. Every parent would have the name of their kids on the windshield in front of their cars. The name announcers would be standing at the beginning of the drive way and read the names in the front of the cars into a microphone that everybody in the school could hear. It's funny to think about it now, but at the time, it was the only way to let the students know that their parents were there. It took around 5 minutes after the name was announced for that car to get to the pick up spot. If the student couldn't get to the pick up spot within the time that the car took to get there, the parents would have to just drive out of the school and make a really big turn and drive back into the school again.

Again, the traffic was really bad around the school. It could take up to 15 minutes to get back in the pick up line. I'm not sure how the other parents did it, but what my parents and I agreed on was to set up a pick up time. It was at 3:00 p.m.. Of course, they didn't always come exactly at 3:00 p.m. because who can predict Bangkok traffic.

Sometimes my sister and I would just wait at the pick up spot at 3:00 p.m. sharp, and my mum would show up at 3:30 p.m.. 30 minutes was long when you were young and just wanted to run around all the time. Sometimes, I would hear my name being announced at 2:45 p.m.. I had to sprint from wherever I was to make it to the pick up spot before my mum had to make the drive turn. There was also my sister. Even if I made it this time, my sister might not make it, and we would have to make the drive around anyway. It was kind of fun but sometimes really annoying.

After I got my first phone, things got a lot easier. She would just call me when she was near the school, then I just had to run around a little bit to look for my sister, and then both of us would always make it to the pick up spot by the time she got there.

The phone that I had at the time was not a very smart phone. I think the company was called "Hutch". It doesn't exist anymore. I could only call and text from that phone, but I didn't know how to text, so I just used it to call. I was, and still kind of am, quite a paranoid person. I didn't like it when I didn't know where my parents were when we went out to places. Having a crappy phone and being able to call them gave me so much comfort.

GPS

Nothing felt quite as smart as my first iPhone. I was able to connect to Wi-Fi via my phone for the first time. This really comes in handy when my family went on trips abroad. My phone didn't work when I was out of the country, so I couldn't call anybody obviously. My paranoid self really appreciated the fact that my phone worked with Wi-Fi because if I lost my family, I could just find a cafe and use their Wi-Fi to contact them somehow. I could also just connect to the Wi-Fi and use the GPS on my phone to get back to the hotel.

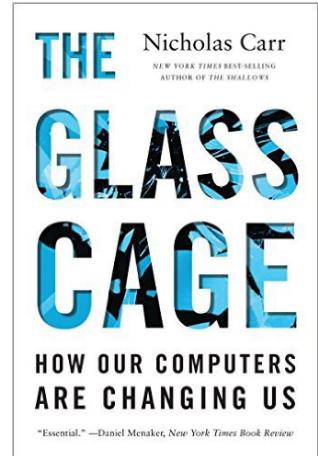
Communicating with my parents, or friends, about locations became super easy even when I started to drive. Meeting them somewhere that was not a regular location was easy. They could just send me their location on GPS and I could just follow the GPS directions to get to them. GPS also predicted the time of arrival. It wasn't hard to estimate when I would get to places anymore, even in the crazy Bangkok traffic.



I remember becoming familiar with GPS around the time I started to use iPhone, in 2011. However, GPS had been around since the 1960s. GPS or Global Positioning System was originally designed for military and intelligence applications during the Cold War. GPS uses a network of satellites that orbit the earth at fixed points above the planet and beam down signals to anyone on earth with a GPS receiver. The signals carry a time code and geographical data point that allows the user to pinpoint their exact position, speed and time anywhere on the planet ("History of GPS."). As I've mentioned, before I got access to a phone or GPS, my life was kind of difficult when it came to locations. I honestly think GPS was one of the best inventions developed during my childhood, at least for me. GPS is now used for many navigation applications. It does route finding for drivers, map-making, earthquake research, climate studies, and many other things.

I was never good at navigating myself to where I needed to go — mostly because I was so paranoid about not being able to find my ways to my destinations. I never really allowed those situations to happen when I was alone. I made sure to let my parents know where and when I was going to be, and the location I picked would always be the ones I definitely knew how to get to. I don't think I will ever be better at that now since I have the option of using my GPS.

I don't really have to face my fear of getting lost anymore.



The Glass Cage by Nicholas Carr

Not Perfect

I've recently read a book called *The Glass Cage* by Nicholas Carr. The author mainly wrote about how technology changed people in different range of fields from medical, transportation, and everyday products. He wrote about the how auto-pilot had decreased a tremendous number of plane crashes, and also how many accidents happen from the use of GPS. He wrote about the time that a 1,500-passenger ocean liner named Royal Majesty that was sailing from Bermuda to Boston. An hour after departing, the antenna of the GPS cable came loose which caused the GPS information to be inaccurate. After more than 30 hours, as the ship slowly drifted off its actual route, the problem became obvious to the captain and the crew. At one point, a mate on watch was unable to spot an important locational buoy that the ship was due to pass. He failed to report the fact because he trusted the GPS and just simply assumed that he didn't notice the buoy. Nearly 20 miles off route, the ship finally ran aground on a sandbar near Nantucket Island. Luckily no one was hurt (68).



The Igloolik community

He also wrote about how people's navigation skills had changed after the GPS became accessible. There is an Igloolik community in Canada where there is an extremely cold climate. People there are hunters. They used to be able to navigate themselves in the snow using natural elements around them. They were able to read the wind directions, the sun, and the curvature of the snow slopes to get home. After the year 2000, GPS devices became accessible. They also became cheaper and cheaper. Those hunters started to use cheap navigation devices, which completely changed the way they got around. Unfortunately, the devices couldn't really function accurately in the extreme climate. Signals received were not good during heavy snowstorms, and the devices froze under really low temperatures. This caused a lot of injuries and death to the Igloolik people since they had already lost their abilities to navigate using natural elements (125).

To have good navigation skills, it doesn't only require a good sense of direction, but it takes training, practice, and familiarity as well.

Sometimes, one needs to put themselves in an uncomfortable situation in order to learn. Sometimes, one just needs to be put in a situation where it forces them to learn.



CASE STUDY

"Navigation Watch"

Design Symposium

In the Spring semester of 2015, I had the pleasure to be a part of the Design Symposium class that was instructed by Jan Kubasiewicz and Gabriel Schaffzin. The class was a graduate-level studio elective that focused on unconventional approaches to communication design with the use of dynamic media.

The main project that we worked on in this class was called "Useless Machine". We were introduced to the project at the very beginning of the semester and I was really excited to work on it.

Here's the project description we were given:

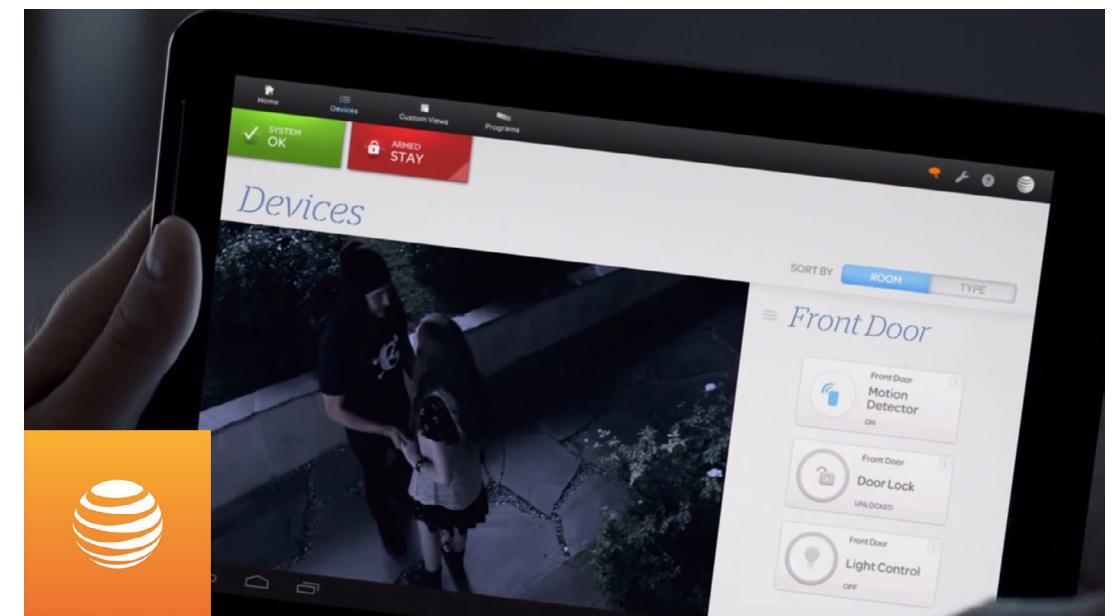
A useless machine can be a great way to, as Munari put it, "revive our imagination, daily afflicted by useful machines." At DMI we spend a lot of time considering the purpose of our output from a usability or applicability standpoint. This project seeks to free you of the burden of usability while simultaneously adding a goal that holds much more gravity: reflecting your recognition of the ritual view of communication, as outlined by Carey. Your machine needs to be built in reaction to the belief that communication technologies cannot be interrogated as simply tools that move messages. They are, instead, objects that embody belief systems, prejudices, and more.

This sounded quite complicated at the time, but it also sounded very fun. It was almost as if we were asked to build a communication toy, especially because we could be a little imaginary with the machine. There were a few requirements for this machine, which I will list below, but one of them was that the machine must react to gender, religion, language, sex, economy, politics, art, social structure, or another more specific element of culture. We were asked to refer to the class reading materials when we addressed these topics.

The Inspiration

We were assigned weekly analytical readings around the topic of dynamic media. We discussed the assigned readings the first hour of every class. I remember one particular discussion that was my favorite. We were discussing "The Lights are On but Nobody's Home" by Jacob Silverman. The author talked about the Internet of Things. He explained the concept as,

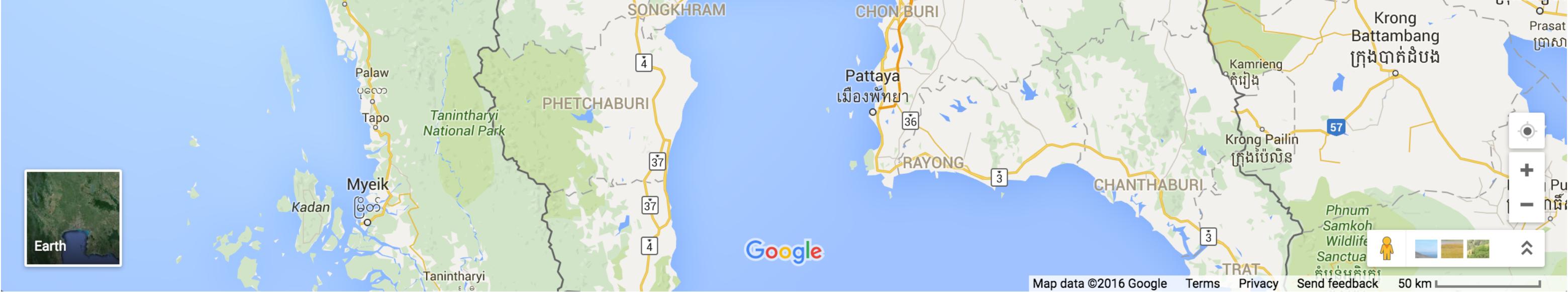
"Smart devices, sensors, cameras, and Internet connectivity will be everywhere, seamlessly and invisibly integrated into our lives, and it will make society more harmonious through the gain of a million small efficiencies. In this vision, the smart city isn't plagued by deteriorating infrastructure and underfunded social services but is instead augmented with a dizzying collection of systems that ensure that nothing goes wrong."



AT&T commercial

Silverman gave an example of an AT&T commercial advertising its home security system: a father gets a notification from his tablet in the middle of the night that someone is in the territory of his house. He found out that it was his daughter, about to kiss a boy who seemingly just dropped her off at the house. He observed this through the surveillance cameras that are installed around the house from his tablet. He then turned on the front door lights from his tablet to freak the boy out, and he made sure that the boy left by watching on his tablet ("AT&T TV Commercial - "Security Camera" | AT&T").

With this technology, will the daughter ever get to kiss anyone in the territory of her house? Is that safer? Data collection devices like the AT&T security system are very alert and accurate and people are constantly working on making them even more alert and accurate. The idea of having things to collect data about everything that people do or everywhere that they go might make them feel like it is a smart and safe thing to have. However, Silverman questions whether they actually need all of this Internet connectivity. Are they unnecessary and just marketing strategies to make more money?



This AT&T advertisement was very thought provoking and I became more interested in the topic of people's reliance on technology. I was not against technologies in any way, but I agreed that people were becoming more and more reliant on them. Do they even need all of these technologies to help them get through the day? If technology can make things easier and more convenient for them, what's so bad about relying on it?

I was pretty sure there was no scientifically proven answer to whether technology is good or bad. I am probably one of the people who are too reliant on their devices. I use it for almost everything from communicating with my friends from across the world to using the light on the screen to find things in the dark. This topic of technological reliance was very familiar to me, so I thought I would use it as the core idea for my Useless Machine project.

Other requirements for the project included the following:

- Clearly be a machine.
- Hold cultural value. That is, one should be able to look at it/use it as more than just a silly toy.
- Networks: It must connect to a network via an API
- Algorithms: Its output must be different from its input
- Self: It must reflect your own introspection and/or encourage it in your user/viewer.
- Internet of Things: It must be a thing. Not an app or an "immersive" experience.
- Data Visualization: It must have and observable change that is affected by the algorithmic output.

Going Back to Space

After settling on the core idea, I needed to find a concept for my project. I was focusing on reliability and my personal interest on the topic of space. I chose an API that millions of people rely on every day:

the Google Maps API.

My concern was with how people became careless about their surroundings after the invention of GPS. Based on my own experience and those of people I know, they don't go to new places without the help of GPS to give them directions anymore. This applies to both walking and driving. GPS tells them exactly where to turn, how far away until the next turn, and how far away they are in terms of time to our destination. They don't even have to look at the street signs anymore, which of course, makes it so much easier to get to their destinations without getting lost. However, because they don't have to look at their surroundings, they don't get to appreciate and explore new surroundings, not to mention our decreasing sense of direction.

For my initial idea sketch, I decided that my machine would be in the form of navigation goggles. I wanted them to be used by people who use GPS in their cars. I felt like the problem with the current car GPS was that drivers needed to look up and down to make sure that they will make the right turn. I made a collage of what the user would see when wearing the navigation goggles to explain the idea to the class. For this initial idea, we were told to not worry about the feasible constraints; we could get as creative or crazy as we wanted, so I did. The collage was an image of what people would normally see on their GPS devices, which is the road in front of them, and an arrow showing them where to turn next. However, this was supposed to be a "useless machine", the rest of the surroundings were totally irrelevant to anything in the world. There was a Disney castle, a unicorn, rainbows, etc. I was trying to be sarcastic about how people do not care about their surroundings when they have their devices telling them where to go. I had fun making that collage but it was clearly not going to be my final idea.



Wearables

Later on in the semester, we were assigned articles about 'wearable' devices. Some of them track their active activities, like the Nike fuel wristband, and some of them track their sleep patterns, like the Jawbone. People trust these devices to take care of many things such as their houses or their bodies because the devices are so accurate. Companies are working hard on new technology to make it even more seamless to incorporate these devices into people's lives. Advertisements also make it seem more necessary for people to own these devices.

The article "Hearables- the new Wearables" by Nick Hunn talked about the success of wristbands such as Fitbit, Jawbone or Nike's fuel band. The large market of these smart wearable devices on our wrists, that track our health related activities, is expanding. In this article, the author introduced a new device called Bargi. It is an ear bud that is connected with Bluetooth to track and show information about people's health activities. The device claims to track activities such as heart rate, blood pressure, temperature, and pulse oximetry even better than wristband because of its minimum movement distractions. It is also wireless and full of options such as voice transparency and water resistance, allowing users to wear it without feeling like wearing anything ("Hearables – the New Wearables" | Creative Connectivity).



Jawbone wearable



Nike Fuel wearable

The product description makes it sound like whoever owns it will turn into the healthiest person in the world. But, do people actually need all of those super precise measurements of their bodies all the time to be healthy? Do most people even know what pulse oximetry is or what it does for their bodies? Instead of making people more healthy, that data might even overwhelm people, which is actually unhealthy.

I wanted to incorporate this idea into my useless machine design because I believe it is important that people think about the utility of precision. Are these accuracies really necessary, or are they just for business purposes? It is also important to think about what may have been lost when people rely so much on their devices. In the New York Times article, "Real Adventurers Read Maps", the author, Steven Kurutz, wrote about his road trip in a foreign country with his wife. They chose to ditch the GPS and used physical maps to find ways to get around. They got to experience different landmarks, street signs, beautiful architecture, and the challenge of finding the right routes together. Without the technology, they got to see many things that they wouldn't even notice if they were to use GPS.

It was the things along the way that counted.

Again, in the article "Reclaiming the Age-Out Art of Getting Lost", Rosenblom mentioned,

"My iPhone finds the most direct route to anything I wish to see, which is why I turn it off. Keeping it on would mean missing out on countless small streets and dead-ends, all those quiet, beautiful lanes and impasses with names I don't remember."

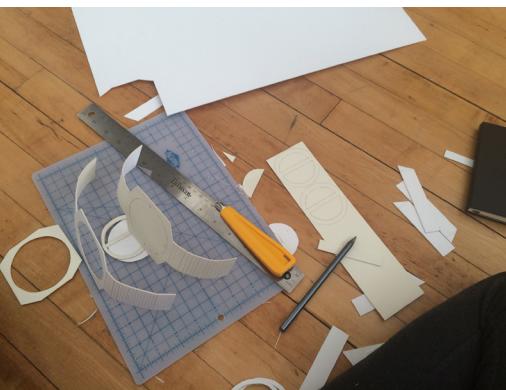
I realized that I should design the navigation device for pedestrians rather than people who drive since exploring the surroundings was my main concept. Getting to places on foot allows you to enter smaller streets that vehicles can't access. Additionally there are no fixed routes, like a one-way road, that you have to follow.

The Prototypes

I decided that the device was going to be a watch that people can wear all day and seamlessly blend into their lifestyles without being too visible like goggles. For my first physical paper prototype, the watch was designed to be strapped to the users wrist as a wearable device. It gave people information about where they were and directions to where they wanted to go. That information was shown in two different screens on the watch. This device gave the users very precise information about their location. I thought there couldn't be anything more precise than displaying the user's location using latitude and longitude numbers with very accurate digits. The watch was connected to the Google Map's direction API and it allowed the user to put in the location of where they wanted to go. It would calculate a step-by-step route for the user and display it on the screen.

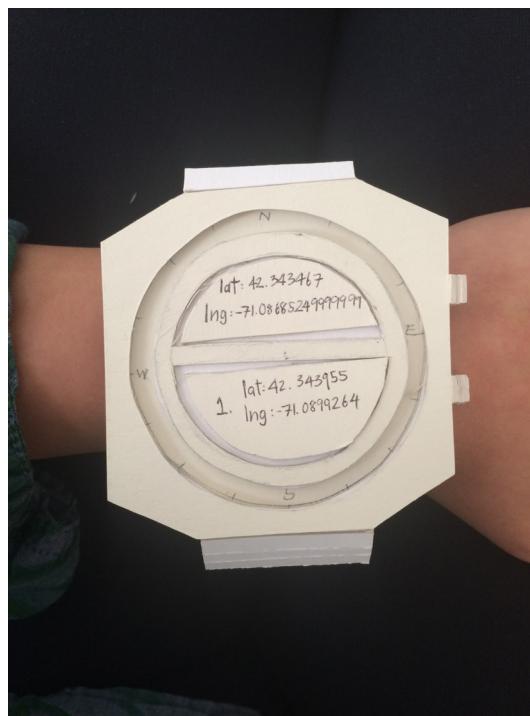
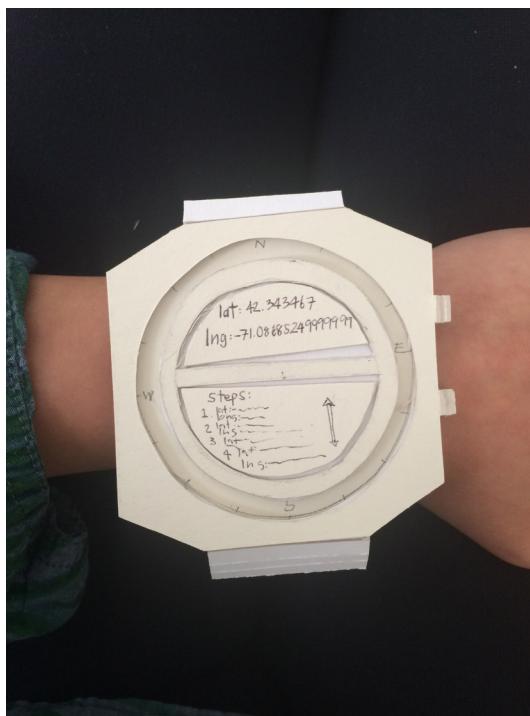
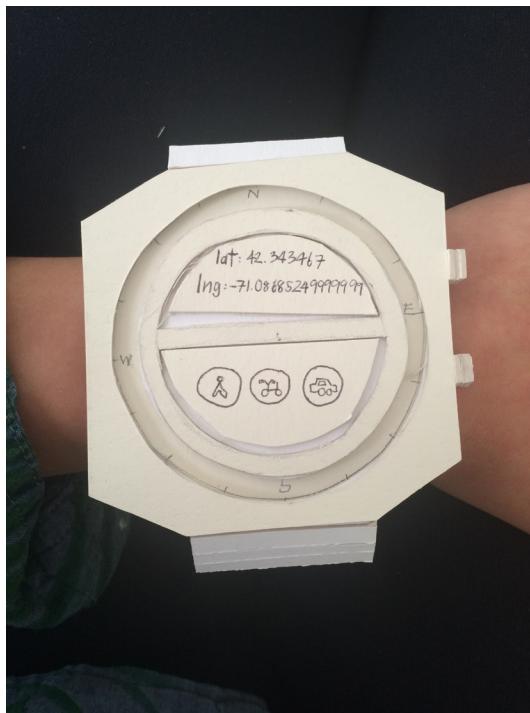


3D prototyping using Rhinocerus



The making of the first paper prototype

I used hard paper to make this model. It was the same type of paper that I worked with when I needed to make architectural models. I made a model of the watch with two hollowed out parts on the screen for testing different interfaces. I made these interfaces with the same paper material and put them in those two hollowed areas to show the different stages of how the device works. The hard paper prototype of the watch let the users choose their method of transportation. Then they would ideally use voice command to tell the watch where they want to go. The user had to match the numbers on the upper screen, which always displayed the user's location, to the lower screen, which displayed the numbers of the destination locations. They had to do that step-by-step, until they reach their final destination.

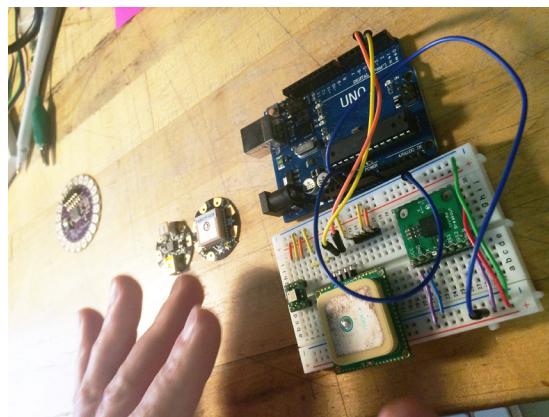


The first paper prototype for user testing

I did some user testing with people in the class with the prototype. The comments and feedback were really good. People thought the idea was clear and it was clearly displayed and translated to the device as well. They particularly liked the fact that I built a model of the watch for this user testing. It gave them more of a real experience of walking around with this watch on. Happy with the feedback, I decided to go ahead and start on the final product. The project requirements also asked for a video abstract, so I thought I would build another prototype model with real LED screens and hopefully I could get the device to somehow work as well.

My plan was to build a navigation watch that actually functioned. Unfortunately, I don't have any engineering skills. I turned to Fred Wolflink, Adjunct Professor, for help with electronic components. We discussed embedding GPS chips onto the watch and connect it to LED displays. We met several times to work on getting the GPS Arduino to work. Unfortunately, the GPS didn't work inside the building at all because it needed a satellite signal. Fred also took the GPS home to see if it would work outdoors but it didn't.

Being really close to the project deadline, I decided to give up on trying to make the device actually work and focused on making the video abstract which is the requirement of the assignment instead. Despite the GPS failure, Fred and I had some interesting conversations about GPS. How Google Maps calculates routes for people, for instance. How did the Google people decide whether to turn left or turn right when the distance to the destination is exactly the same? Neither of us had a conclusion for our discussion, but it was something interesting to think about. He also gave me 2 LED screens to use for my final prototype model. I thought I would at least build an actual watch that 'looks' the same as how it would be if the GPS actually worked with the LED screens.

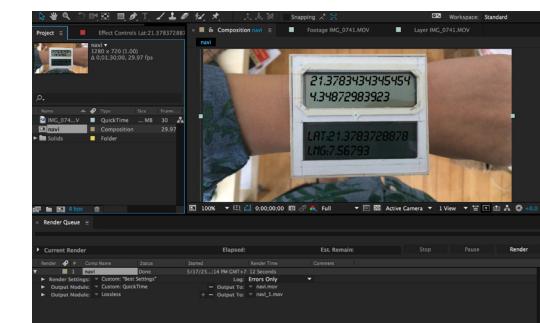
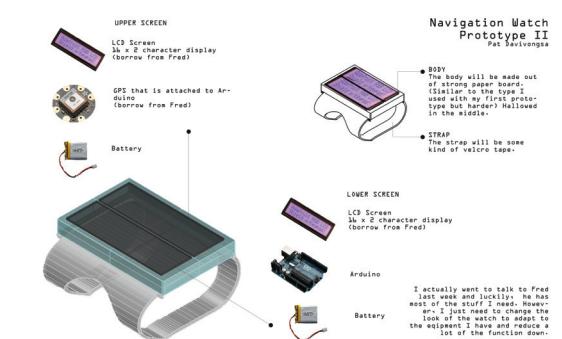


Fred, testing the GPS chip

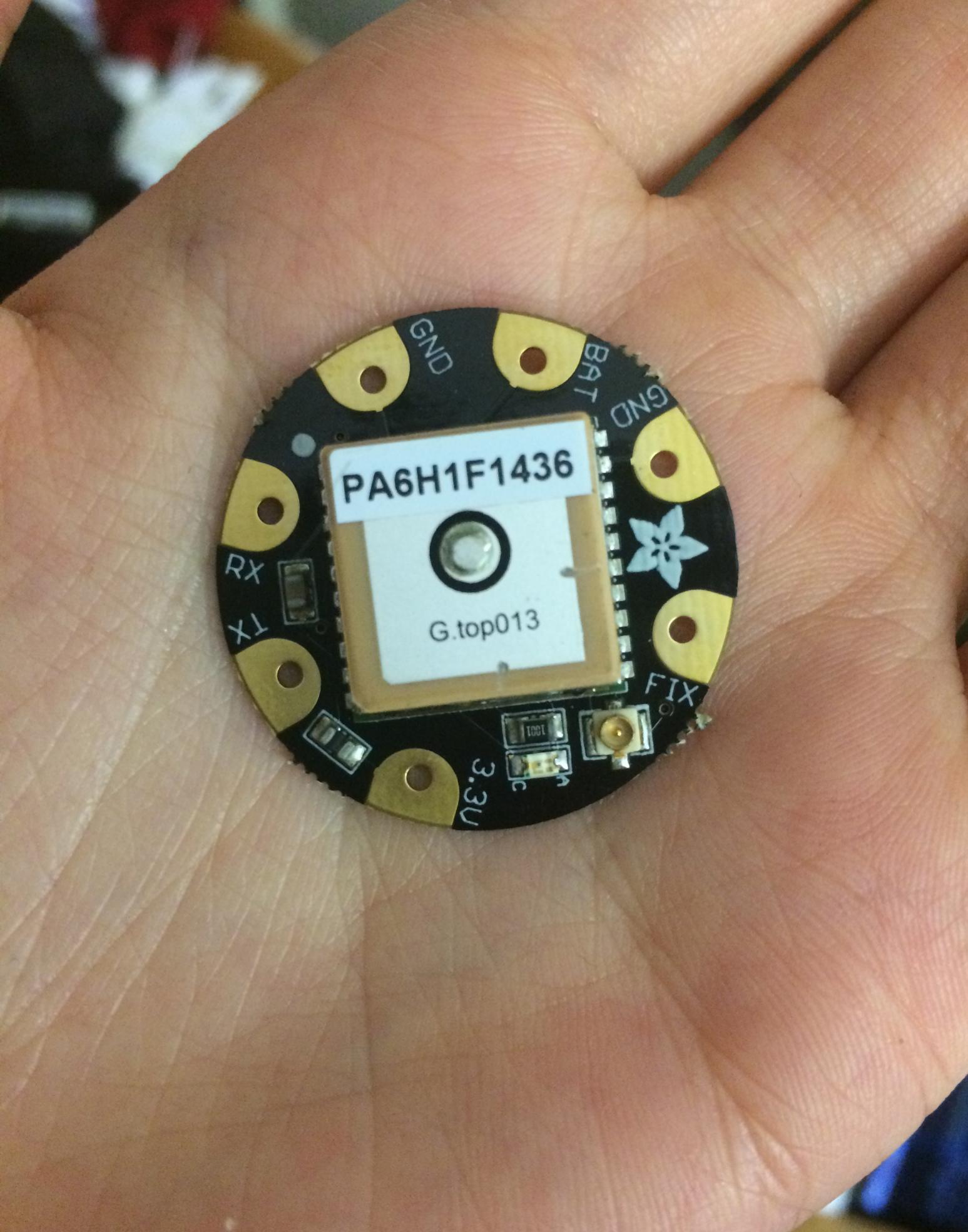
Working with the same paper prototype material and 2 LED screens from Fred, I built another navigation watch that looked more practical than the first one. I had a very fun moment trying to measure everything precisely so that all the pieces would come together nicely. The idea was for the final prototype to look really neat and manufactured. The 2 LED screens fit perfectly on the body of the watch, and the adjustable wrist strap helped to hold the watch firmly to anyone's wrists. Even though the actual function of this navigation watch didn't work, the watch prototype model looked real. With the help of Photoshop and After Effects, I was able to make the watch "function" in my video abstract.

The message that I was trying to convey in the video abstract was that the actual aim of the watch is not to get the users to their destinations, but instead to not get them there — to get people lost. With the unnecessary and exaggerated degree of accuracy of the latitude and longitude numbers and digits, the watch aims to confuse the users and get them lost. Hopefully, once the users realize that the navigation watch is actually very 'useless' in helping them get to where they want to be, they would look up and around them to acknowledge the surrounding area. As they are trying to get out of that area, they would get to explore it, something they would never get to do if they were to use the GPS on their phones. At this point, they already figured the watch is useless, they wouldn't even have to look or be distracted by the watch itself anymore.

The users would learn much more about the areas in the process of trying to get out of it. Being lost is not always fun, but being lost might turn out to be one of the most adventurous experiences that a user would ever get in this Internet of Things era.



The second paper prototype and the video abstract



Thoughts

I believe people would feel a little bit handicapped if they ever have to go a day without their phones. From the time they wake up, without the alarm clock feature on their phones, they would never get up on time for anything. After waking up, they would never know what is the right thing to wear without the help of the weather forecast on their phones. Then, their phones find them a ride wherever they are, find the fastest route to get to where they need to be, and then pay for the ride from their credit cards without having to get out their wallets. There are numerous other examples of how lucky people are to have their phones and other devices with them all the time to help with every aspect of their lives. However, the fact that they have these devices to always give them such accurate solutions to anything that they need to do, some valuable human experiences might be lost, such as the experience of being lost itself.

I did not get to do real user testing for this project because the watch was not functional. However, I became more interested in how technology can help people in a way that is not replacing what is already valuable to them as human beings. One of those things is their sense of curiosity to explore. I believe that ambiguity allows for curiosity in people, making them explore more intuitively. It also creates rooms for interpretations that make every experience more personal. Exploring also allows people to learn and discover new things that they can later appreciate.

While making this project,

I realized how ambiguous information could enable people to explore intuitively.

They get to experience their surroundings with their own eyes, pulling themselves out of the overloading information of the virtual world. I was interested in doing more research on the area of exploration and how ambiguity could enhance people's experiences with their surroundings.

Ex(In)ploration

Exploration

My family bought two puppies five years ago. They were Pomeranians. One was PickMe and one was Tah Toh. I didn't name them. We got them when they were two weeks old. I was actually the one who persuaded my parents to get them because I thought I was a dog person. It turned out that dogs are too excited for me, but I still love them. I remember the first day we came home after picking them up from a pet store. They were terrified. They wouldn't leave the area under my coffee table, not even to go to the bathroom.



Pickme and Tah Toh on the first week that we got them

After the first few days, they weren't so scared anymore. They started to run around the house and interact with us more. We slowly taught them some basic dog manners such as where to go to the bathroom, and how to wait. I'm sure most people know that dog training requires rewards and punishments. When they do what they were told, they should be rewarded with some treats to let them know they did something right. When they don't do what they were told, they get punished.

Of course, no puppy knows everything right away. My puppies certainly didn't. They experienced everything once before they knew what things were. For example, Tah Toh got slightly electrocuted once from chewing the fan wire before my dad pulled the plug out. Chewing wires made her hurt, so she never did it again. However, my dog didn't live in fear. She didn't stop chewing all together just because one thing that they chewed electrocuted her. After the incident, we bought them a lot of other rubbery chewy toys and my dogs still loved them.

I'm jealous that my dogs are so fearless. If I were electrocuted by chewing something, I don't think I would ever chew anything ever again, unless it was food. My dogs are unafraid to explore unfamiliar things and find out whether they are pleasurable or painful things. Even if they have to get punished sometimes, it is probably worth it for the rewards.

Curiosity

My dogs explore new things all the time because they are always curious. If they have already found something that they like, they still explore. If they like the new things more, they would stay with the new things, if not, they would just go back to the old favorite. This way, they always find better things that they like.

I believe that curiosity is a personality trait and not everybody has the same amount of it.

Being curious makes people's minds active. It makes their minds curious for new ideas. When people are curious about something, their minds expect and anticipate new ideas related to it, making them more creative. It takes curiosity to see the world beyond its surface and also brings excitement to people's lives. ("4 Reason Why Curiosity is Important and How to Develop it")

Curiosity opens new possibilities in people's lives because it enables them to explore and discover new things. It is probably the motto that my dogs live by. I also think that curiosity leads to excitement of learning new things. Trying new things and exploring new possibilities is always a concept that I like to incorporate into my projects.

Again, when I was an architecture student, I was in a studio called Dencity where we did experimental study of extreme urban density. During the early research phases, we were challenged to really understand what it was like to live in a very limited space.

Working in pairs, we were given the area of 16 sqm or 172 sq ft to create a full functioning house within that area. The house would be made in real scale with cardboard. I was working with Phakthana Preedawiphat (Kla). Since the area that we were given was so limited, the space needed to be transformable.

Kla and I decided to make a house that would allow the dweller to customize their own spaces within the space we created. One of the case studies that we looked at for the project was the Gary Chang house in Hong Kong. Chang is an architect that transformed his own 344 sq ft in Hong Kong into a space that can change into 24 different designs by using sliding panels and walls. We liked the idea of foldable furniture and sliding walls, but we only had 172 sq ft to work with. However, we later realized that we actually could make more space happen. We were only limited by the square footage, but we were not limited by the height.



House On Cables
Diagrams of how this house operates

Phakthana Preedawiphat
Patlapa Davivongsa

Scale 1: 50

Taking a full advantage of that factor, we decided to extrude the height of the house to store everything above the ceiling. We created a blank square space with the area of 172 sq ft with cardboard. We filled up the space with a bed, a closet, a small bathroom, a kitchen, a table, and a chair. We arranged all the furniture in the space so that there was no empty area left on the floor plan. The framing structure of the house was built using L-shaped metal slabs. The house was tall enough to store all the furniture in the ceiling. Essentially, what the dweller would be able to do was select only the furniture they need to use to be on the space.

We made this 1:1 scale prototype by tying ropes very securely to all the cardboard furniture that we built, and hung them all down from the ceiling. We then wrapped the end of the ropes to a metal slab that was within our reach. People could choose the furniture that they wanted to use by unwrapping the associated ropes, and slowly bring down that particular item to the floor. The fun part was that they could bring down more than one item at a time. It could really change the way people live and behave in the space. For example, the person could have the kitchen and the bedroom in the space at the same time. They could eat while lying in bed or have breakfast the second that they wake up. If the person has their closet and the bedroom in the same space, they probably would wake up and get dressed before they do anything else. It depends on the person's schedule as well. Not everybody has the time to eat breakfast in the morning.

This house allows people to customize their house according to their preferences. It allowed them to explore their choices and what they like in their space. They could discover what works best for their life style and get excited by it. The system of this house was designed to encourage curiosity. Since the space began with a blank space, it automatically suggested that people explore the possibilities of what it can be. I believe that everybody has a sense of curiosity to some degree. When they see an open opportunity to be creative, they would automatically be curious of what they can possibly create. The more curious and explorative they are, the more possibilities they will discover. The more they discover, the more they get to choose what's best for them.



Kla in our 1:1 prototype house

Encouraging Exploration

During the summer of 2015, I took "Prototyping Lab" taught by Ceren Paydas. The class explored small-scale prototypes and what we can learn from making and breaking them. We were given a project to design an ATM machine for MassArt.

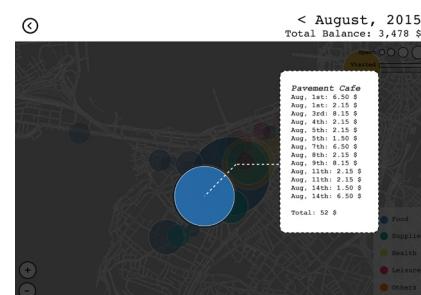
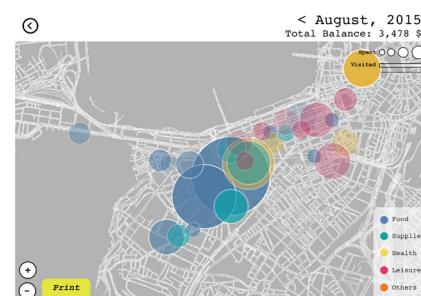
I wanted to incorporate the idea of encouraging exploration. The challenging part was that the project was about a money machine. How do I combine the idea of money and exploration? The site for the ATM machine was specific as well. It was supposed to be at MassArt. When I think of students and money, I think of struggle. As a student, it is kind of hard to manage my spending while having to buy school supplies, groceries, etc. I have the Bank of America app on my phone and I can check what I've purchased, but I don't think it helps me with money management. It doesn't show me the whole picture.

People go to an ATM to get cash. I hardly use cash. It's such a hassle to get the right amount of cash out when you need to pay for something quickly. Plus, you will get a bunch of heavy coins back for change.

I decided that my ATM would have to be something more than just a cash machine for that reason. I wanted this ATM machine to be able to help the students with their money management.

To please my target users, I wanted to make a product that reflects creativity and aesthetics that art students can relate to.

Visualization was what I came up with to help them keep track of, what might seem to be boring, money and numbers. I also wanted to incorporate the idea of encouraging people to explore since I believe it's important for creativity. As an art student myself, I know how busy we are with school projects. It is very rare for me to go out and enjoy the city even when I have the time to. I get really lazy and tired from all the work I've done. However, when I do occasionally go out and see different parts of the city that I've never visited, I always feel good afterwards.



MoneyMap interface prototype

Seeing the same environment everyday can be repetitive and draining for their minds. When I got stuck with my projects or couldn't think of good ideas, seeing new things is a way to refresh my mind and open it up to new possibilities. To promote exploration, I decided that the visualization would be in a map form as an info-graphic of their monthly spending.

The aim of the project was to develop the design through prototyping. I started to design how the visualization was going to look on Illustrator. Since the visualization was about money, I wanted it to be very informative and official, yet also very easy to understand. The information was overlaid on top of the map around the school and extended out into the city of Boston. Different colors were assigned for each spending category such as groceries, leisure, school supplies, etc. Circles of the corresponding colors appeared on the map where the card was being swiped or where money was being spent. The more money spent at a location, the bigger the circle gets. The more frequent the money spent at a location, the more opaque the circle gets.

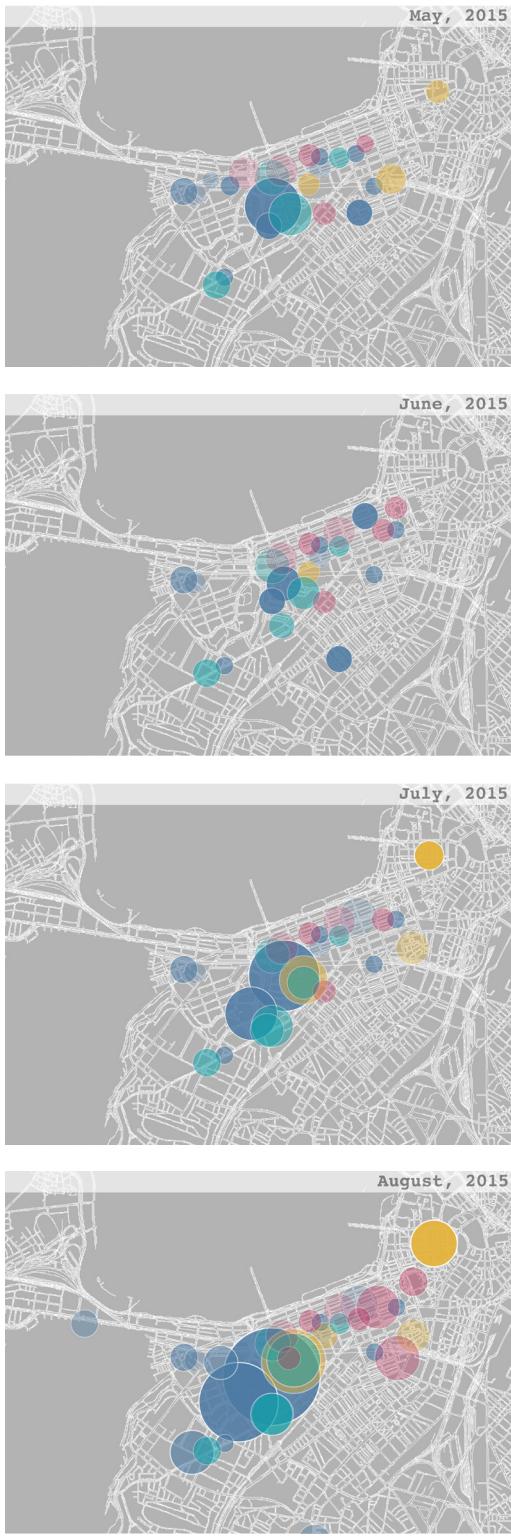
Because things were represented in different colors, sizes, and transparency, students could see the whole picture of what they have spent and understood it better than just a list. Students could tap on the circles to see the details of each transaction as well. They also had the option to print their visualizations.

I believe that, by instinct, art students love to create beautiful visuals. By knowing that the visualizations were something that they were able to manipulate and create, it triggers them to make changes to how they spend money and where they spend it.

This is a way to encourage the student to explore different areas with their busy schedules as they learn to spend money wisely. They could create more interesting artwork by trying new restaurants in different areas or just adding value to their subway cards at a different spot. They could get creative. Apart from creating an art piece, they would also get to discover new areas of the city and also know exactly where it is located on the map. In other words, by creating the artwork, they will have to study the map in order to create exactly what they want. The map interface would help them learn how to get around.

Knowing where places are also makes them better at exploring new places since they don't need to walk around in fear of being lost.

The ATM would help the students to both manage their spending and also discover their new favorite places to go to around the city.



MoneyMap monthly visualization prototypes

In the process of creating this project, I realized how little I go out of my area. I was planning to use my own data for my interface prototype then I realized how boring and repetitive it was. However, it was kind of eye-opening for me. If I was actually using the ATM, I would definitely try to branch out to more places to go spend my money, especially in the food department.

After realizing that, I made a goal for myself to go to different areas in the city more. I tried to do the things that I was already doing in the same area everyday like going to the same coffee shop to work. I've been going to this coffee shop around the corner from my apartment to work on my laptop everyday for over a year already. Recently, I decided to take the train to go to another coffee shop called Crema in the Harvard Square area which is around a 30 minute train ride away from where I live. While I was working on my laptop there, I met a few people I hadn't seen in a long time. It was a pleasant surprise. They said they come to this coffee shop all the time.

After the coffee shop, I walked around the area and bought some more delicious food. It was very nice to get to do that after 5 hours of working on my laptop. I felt refreshed, taking my mind off of all the projects I was working. I got to appreciate beautiful Harvard Square before I went back home.

Internal Exploration

Being in a new environment is exciting because people get to explore and discover new and interesting things. Contrastingly, when it comes to something that they are so familiar with, and that they think they know everything about, exploring becomes tricky.

The human brain is so complex and I will never understand everything about it. How do brains produce thoughts, or how do they make decisions? One of the things that I'm always curious about the brain, though, is how it produces dreams. Unfortunately, even though scientists have been performing sleep and dream studies for decades, we are still not 100% sure of how and why we dream. They know that everybody dreams, though the frequency in which dreams are remembered varies from person to person. ("Why Do We Dream?") I'm one of the people that doesn't always dream, or I don't remember my dreams a lot of times. But when I do, most of them are super random. Every time I have weird dreams, I need to tell it to someone right away before I forget about them because the images were so vague. I usually miss a lot of details when I do because my dreams are so random. It's hard to tell the story in detail and have it makes sense.

I found it very odd that my own brain produced something that I didn't even know about or have never experienced before in real life.

I found it even more odd that I was able to experience new things through dreaming. For example, my house always looked different in my dreams. I got to experience living in different spaces every time I dreamed in a home setting. Again, dreams are so blurry. The images and stories do not connect. Even though I got to experience things in my dream, the ambiguity of dreams always left me only vaguely remembering things. It was also impossible to retrieve that information again too since I couldn't just go back to sleep and have the same exact dream. However, the fact that people could experience each dream only once makes exploring in dreams precious and ironically memorable.

Digital Exploration

Dreams allow people to experience things that never actually happened or will ever happen. However, some technologies today allow people to experience those things and be in control of it — things that they will never even experience with the human physical abilities.

Last year, I was randomly given Google Cardboard as a gift. It is basically a virtual reality headset made with cardboard. It works with smart phones and a few apps including one I downloaded called Vrse. Users pick out the story that they want to see, put the phone in the socket in the cardboard, and hold it up to their eyes. In the app, there were, at the time, 6 stories that I could choose to see. I remember the very first story that I saw was called Walking New York. I think I chose to see that one because it was produced in collaboration with the *New York Times Magazine*, and I assumed that it would be good.

"Vrse and the *New York Times* come together to capture the birth of a new large-scale street art installation in New York. Renowned French artist JR, famous for posting massive photographs in urban environments, attempts to create a poetic awareness of New York's storied history as a city of immigrants. The monumental portrait was conceived as a cover for the NYT's Walking New York issue." ("NYT MAG VR: Walking New York.")

I was watching this, standing in the middle of my room, with the Google Cardboard on my eyes. The start of the story was mostly about the artist and his inspirations. It was shot in his studio. When the first scene came up, the artist was standing in the middle of the frame in his studio, talking to the camera about himself. It felt like watching a documentary about an artist on Netflix. I listened to him talk for a while until I realized that this is a virtual reality story and I could look elsewhere too. I looked down and saw his feet. I looked around and saw all of the art in his studio. I looked up and saw the ceiling. It felt weird. It felt like I was there. I could look around while listening to him talk about the art and felt kind of nervous like he was really talking to me.

In my mind I knew that I was in my room, but still, I also felt pretty much like I was in his studio. The story went on, and I continuously felt weirdly amused. took my breath away. To let myself completely enjoy that scenery that without my fear of heights, I had to also remind myself that I was actually just standing in my room. My favorite part was towards the end of the story when they got onto a helicopter to view the final art piece from a top view.

I'm absolutely terrified of heights. There's no way I would go on a helicopter in real life. But I was on the helicopter there in the story. I looked down to the city of New York. It was such a beautiful and breathtaking city. I've been to New York City more than 10 times in my life but I've never seen it from this perspective. It was absolutely amazing. We were so high up that I started to feel nervous in my stomach. Of course, I was actually just standing on my room floor. It was really weird. I felt like I was at 2 places at once. I completely felt like I was on the helicopter because the image that I was seeing was so mesmerizing and it definitely took my breath away. To let myself completely enjoy that scenery that without my fear of heights, I had to also remind myself that I was actually just standing in my room.

It's very valuable how technology has been developed to let people explore and experience things that they can't physically do easily. They allow people to experience the scenes that they would never get to do without the technology either because of their physical or financial constraints. I wanted to experiment with exploring by using technology as the medium. How would the experience of exploring be different, and how would people perceive what they explored differently?



The Google Cardboard



CASE STUDY

“You Are Here”

Exploring Spaces

The first project that I was ever assigned to do in DMI was called “You Are Here”. It is the traditional starter project that most DMI students do.

Naturally, I thought of the project in physical terms. The city of Boston was still pretty new to me. I decided that I wanted to compare Bangkok and Boston in terms of their environment and the city infrastructures, so I started off making a list of Bangkok elements that I’m familiar with:

- Tuk Tuk motorbike
- Cars
- Building signages
- Vendors

Bangkok is a very vibrant and busy city.

There's so much going on on the streets all the time. Compared to Bangkok, Boston seems to be a peaceful and quiet city. I wondered how it would feel if I put all of the businesses from Bangkok into Boston.

I took photos of Bangkok through Google Map street view and used Photoshop to cut out those elements from the scenes. I made different layers of different elements and then printed each layer out on clear films. I layered those elements on the photo of a Boston street.

Honestly, I didn't know what I was supposed to think of what I made. I showed my experiment to the class and explained my concept. A few of my classmates who have been living in Boston for many years suggested that I should explore Boston more.

They didn't think Boston was a quiet city. I realized how right they were. How could I compare the city that I've been living in for the passed 22 years of my life to the city that I just moved to a month earlier. I shouldn't have defined of the cities with just 'busy' or 'not busy' anyway.



66 Ambiguity, the New Accuracy

Putting Bangkok elements onto Boston environment

Known and Unknown Spaces

After the class, my interest shifted. I became interested in the idea of familiar and unfamiliar places: the places that I've known and experienced versus the places that I've yet to know and haven't experienced. The idea of collecting experiences is something that I can relate to since I love to travel and see different things. I couldn't agree more with the article that I read about how experiencing things make people happy. Jay Cassano explained in "The Science of Why You Should Spend Money on Experiences and not Things" that money can actually buy happiness, but not from materials. This is how he explained it:

"It's counterintuitive that something like a physical object that you can keep for a long time doesn't keep you as happy as long as a once-and-done experience does. Ironically, the fact that a material thing is ever present works against it, making it easier to adapt to. It fades into the background and becomes part of the new normal. But while the happiness from material purchases diminishes over time, experiences become an ingrained part of our identity."

I thought that if experiencing things makes people happy, how can they keep making themselves happy if they don't always have money or time to go to different places and do different activities? Thinking of my life as a student, when do I find time to do that? Not even to make myself happy, but just to be excited about seeing new things and feel new feelings.

Space Manipulation

Again, as a former architecture student, I began to think of this idea in terms of space. What if people can experience the same space over and over again? How can the same space be experienced differently? Using the DMI seminar room as my case study site, I began to explore by creating a series of small experiments. I actually didn't have a name for that series when I was working on it, but I'm going to refer to it as the 'SpaceMani(pulation)' series now. As the title suggests, the series is about manipulating a space to create new experiences of that same space. The first experiment of the SpaceMani series was to manipulate the space by 'adding' different things to the space. Let's call it SpaceMani:Addition.

In the first collage, I added flowers everywhere in the room. I put vases full of flowers everywhere on the tables, I hung flowers from the ceiling and ceiling lights, and I put flower bouquets around the walls. In the second collage, I put food: pizza, salad, curry, veggie plates, and even Cherry Coke. I also put a huge fridge at the back of the room. In the last collage, I put powerful and influential people in the room: Barack Obama, Bill Gates, Donald Trump, Oprah Winfrey, Hillary Clinton, and Mark Zuckerberg.

I showed all of the collages from the SpaceMani:Addition series to the class. I put them side-by-side to see the comparison. The feedback that I got included:

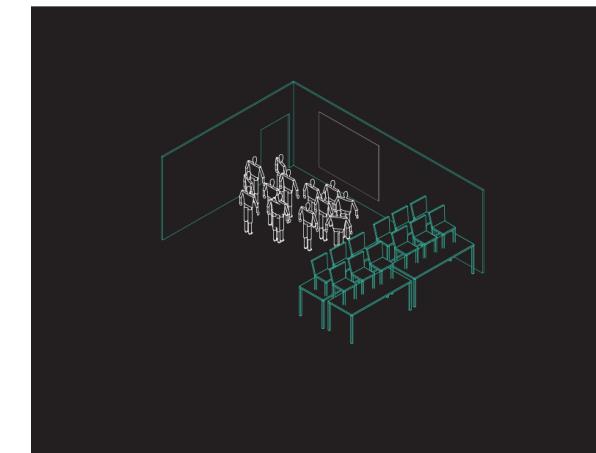
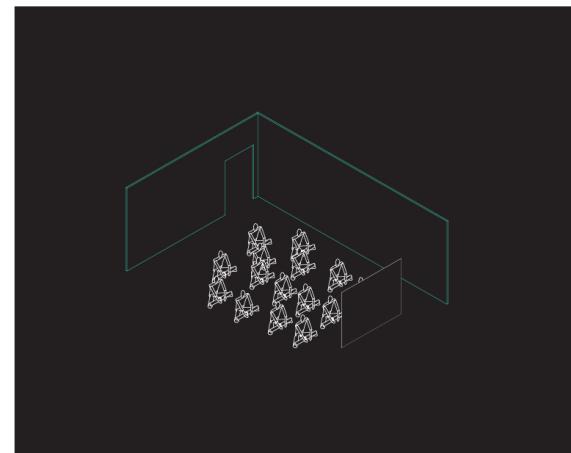
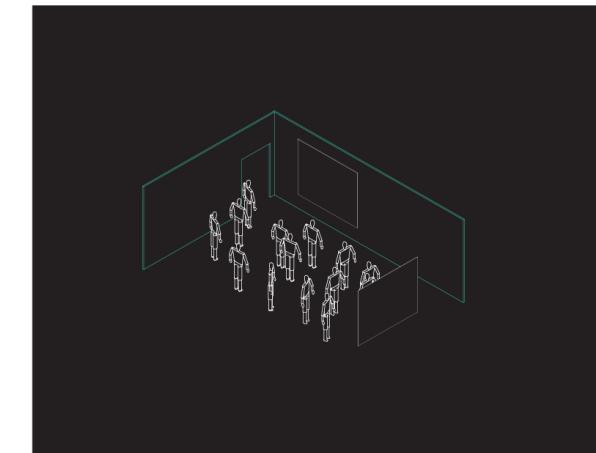
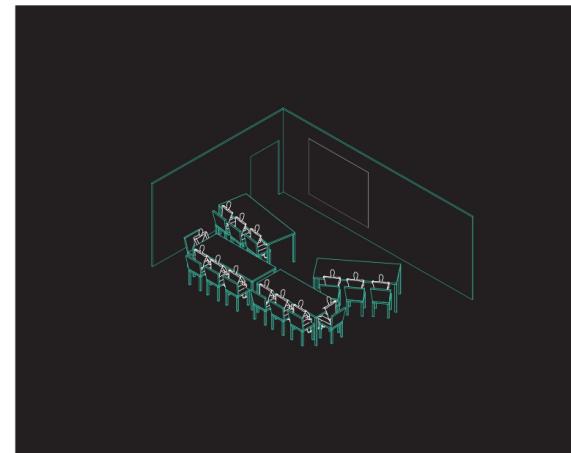
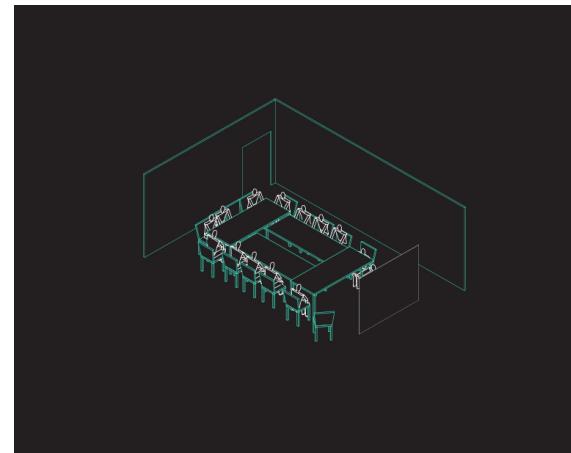
"The room would smell so good"
"I would live in that room"
"I wouldn't want to be in that room"
"I feel intimidated by that room"

SpaceMani:Addition

The intention of SpaceMani:Addition was to see how objects, people, or any temporary items in the room would give the room new atmospheres. I took a photo of the DMI seminar room one day before class. The photo mainly just consisted of the empty tables, and three of my classmates who arrived to class early that day, sitting on the table at the back of class. I put that photo in Photoshop, and made collages.

The feedback was as I expected. Items in a space would definitely influence people's feelings of being in that space. Who doesn't like being in a space that smells good? However, different people would still get different experiences with the space, even if the items in the room are the same. It depends on the relationship the person has with them. For example, some people might love the smell of flowers, but some might find it too overwhelming.





SpaceMani: Rearrangement

SpaceMani:Rearrangement

The second experiment of the Space-Mani series is about 'rearranging' things in the space. This sub-series is called SpaceMani:Rearrangement. Still using the DMI Seminar room as my study site, I built a 3D model of the existing room with the existing way of how the tables were arranged in a 3D modeling program called Rhinoceros. With the same number of chairs and tables in the room, I then rearranged the layout of the room and came up with multiple outcomes. I also put stick people in to visualize the possibilities of people's behaviors in the space. By working on the SpaceMani:Rearrangement series, I learned that within the same space, we can manipulate people's behaviors by changing the layout of it.

For example, the room immediately looks less discussion-friendly when all the tables are facing the front of the class and not each other. Also, when I moved all the chairs and tables out of the room, the room became so much bigger that it almost seemed inviting for people to sit on the floor. The layouts of the space manipulated people to behave differently, would it also manipulate people's experiences of being in the space too? I think it is safe to assume that it would.

For example, people would feel more casual and relaxed to sit on the floor than on chairs. They can lay back more and not be restricted with how they sit. They would also interact with each other more since the spacing between them is not constrained with the frames of their chairs. The result of SpaceMani:Rearrangement is quite obvious and straightforward for an architecture student, but it is still important to know.

SpaceMani:Scope

The next experiment in this series is called SpaceMani:Scope. I studied how the experience of the space is different if you can only see a tiny bit of it at a time. I went in to the DMI Seminar room when nobody was there and turned off all the lights so that it was completely dark. I then took a video of the room using the flashlight on the back of my iPhone.

The flashlight was not powerful enough to light up the whole room, which was perfect. You could only see things when the flashlight was right next to it. By doing this, I could only see a very small range of things at a time. It forced me to be very focused on that tiny spot that I could see. I never realized how many small pen marks were on the tables, and also where the light switch really was. Limiting the scope of how much space I could experience at a time made me more conscious of what I was experiencing and the space itself.

SpaceMani:Perspective

The last experiment of this series was about 'perspective'. The SpaceMani:Perspective was all about seeing things in different angles and how that effects what people think about the space they are in. I connected Skype on my phone and my laptop together so that my phone became a webcam that projected the live video on the screen. With the phone in my hand, I walked around the room, projecting what the phone was seeing on the screen. The idea was to see the reaction of my classmates seeing themselves from a different perspective that they would normally see themselves.

They were looking at the back of themselves, the side of themselves, and just seeing themselves on the big screen right in front of them. Out of all the experiments of the SpaceMani series, this one seems to be the one that had the most unexplained impact on my classmates. People said it felt creepy and weird to see themselves on the screen, but they couldn't explain why. They didn't feel like it was themselves that they were seeing.

After finishing the SpaceMani series, I was still curious about feedback that I got from SpaceMani:Perspective. I decided to explore the idea more. People didn't feel weird because of the space. They felt weird because what that they were seeing in the space was themselves in the perspectives that they don't normally see. If that experiment were to take place in some other spaces, they would still feel weird. They would still feel like it wasn't themselves that they were looking at.

Disembodiment

According to the dictionary, the term 'disembodiment' means to divest (soul, spirit, etc.) of the body. However, according to the book *Technoself* by Antonio Garcia-Gomez, if disembodiment is referred to in a digital content, it would be described as "the idea that once the user is online, the need for the body is no longer required, and the user can participate separately from it. This ultimately relates to a sense of detachment from the identity defined by the physical body".

The fact that my classmates watched themselves on screens, in the angles that they don't normally see, made them feel detached from their own bodies.

They didn't feel like it was them on the screen, even though they knew it was.



The 'You Are Here' experiment set up

I decided to create another experiment to get more reactions around the idea of disembodiment. I called it the "You Are Here" experiment, which was actually the name of the project. I set up 4 computers and placed a chair in the middle. I logged on to Skype on all 4 computers, used it to call the computers that were facing each other, and turned on the video cameras. When a person sits on the chair in the middle, what they would see was only the back view of themselves on the screens, no matter which direction they turn to. I set this experiment up in the old DMI studio room and got people participating during studio class time.

The feedback that I received was again, creepy, weird, uncomfortable. People didn't feel like they had control of themselves. People were trying to turn around as fast as they could because they thought they might be able to see their own faces on the screens. They turned around over and over again to really observe what they were seeing on the screens, making sure that it was really themselves.



"One consciously experiences while being disconnected from conscious thought in a form of an aesthetic experience. The conscious thought as a subjective experience in virtual environment can lead to disembodiment via disconnection of thought and body. Body is in-fact existing and experiencing while the thoughts attached are disconnected." (Akter)

Getting to explore yourself as another person through the use of dynamic media was an out of body experience. Even though the participants couldn't really describe exactly why they felt the way they did, they felt like they got to know themselves a little bit more. They got to see how people actually see them — they actually look from another person's eyes.

It's Personal

Again, I will never understand how the minds work. The minds are very personal. Like dreams, scientists couldn't really pinpoint what happens in our minds when it happened because each person is different. The experiment that I conducted was very simple, yet everybody found it weird and creepy.

Maybe it had to do with the familiarity of their minds. People don't feel strange when they see things for the first time like going to new places or seeing new movies. However, when they see something that they are so familiar with like themselves from the perspective that they don't normally see, they feel strange. It is strange to see something so familiar but so unfamiliar at the same time.

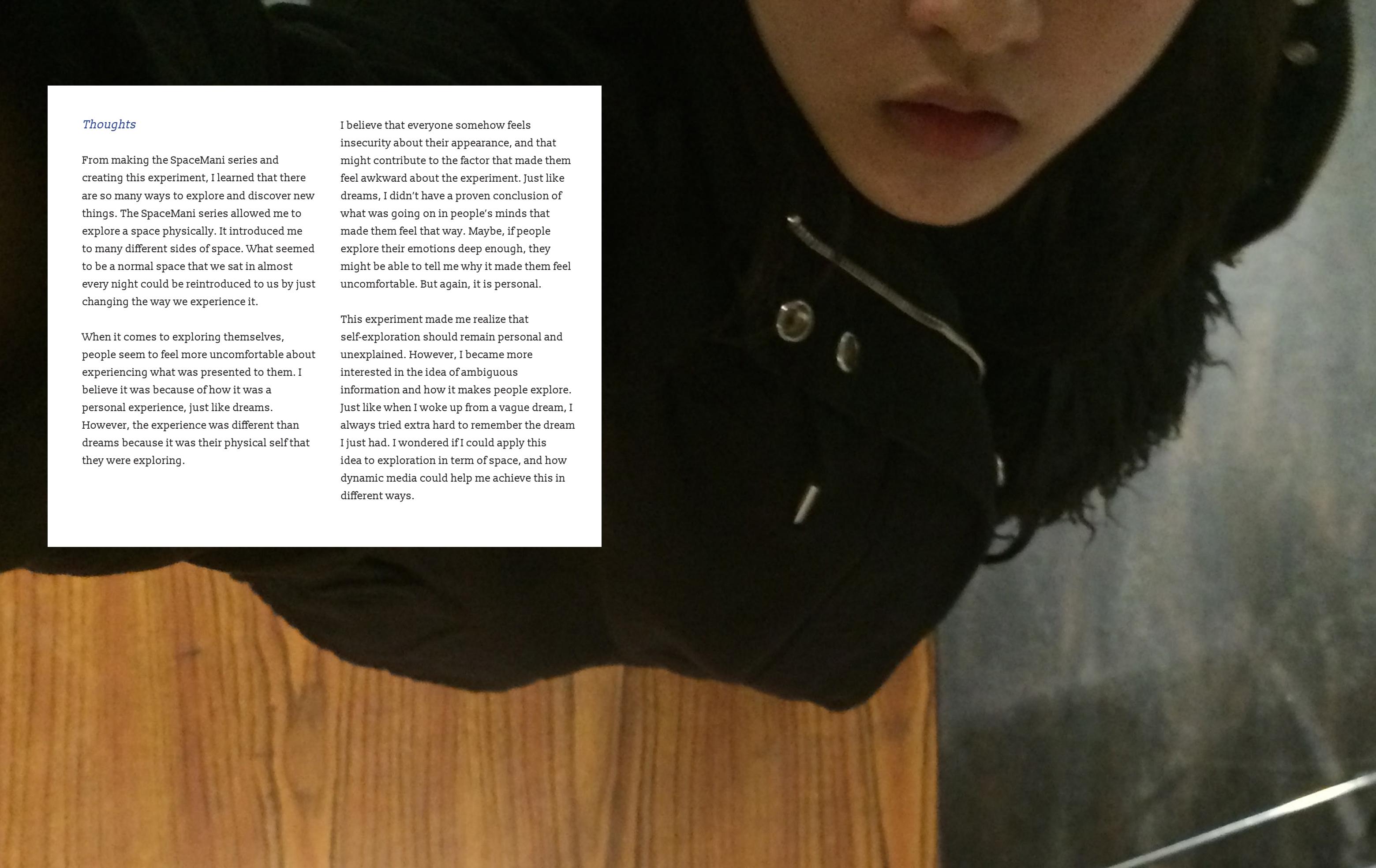
Thoughts

From making the SpaceMani series and creating this experiment, I learned that there are so many ways to explore and discover new things. The SpaceMani series allowed me to explore a space physically. It introduced me to many different sides of space. What seemed to be a normal space that we sat in almost every night could be reintroduced to us by just changing the way we experience it.

When it comes to exploring themselves, people seem to feel more uncomfortable about experiencing what was presented to them. I believe it was because of how it was a personal experience, just like dreams. However, the experience was different than dreams because it was their physical self that they were exploring.

I believe that everyone somehow feels insecurity about their appearance, and that might contribute to the factor that made them feel awkward about the experiment. Just like dreams, I didn't have a proven conclusion of what was going on in people's minds that made them feel that way. Maybe, if people explore their emotions deep enough, they might be able to tell me why it made them feel uncomfortable. But again, it is personal.

This experiment made me realize that self-exploration should remain personal and unexplained. However, I became more interested in the idea of ambiguous information and how it makes people explore. Just like when I woke up from a vague dream, I always tried extra hard to remember the dream I just had. I wondered if I could apply this idea to exploration in term of space, and how dynamic media could help me achieve this in different ways.

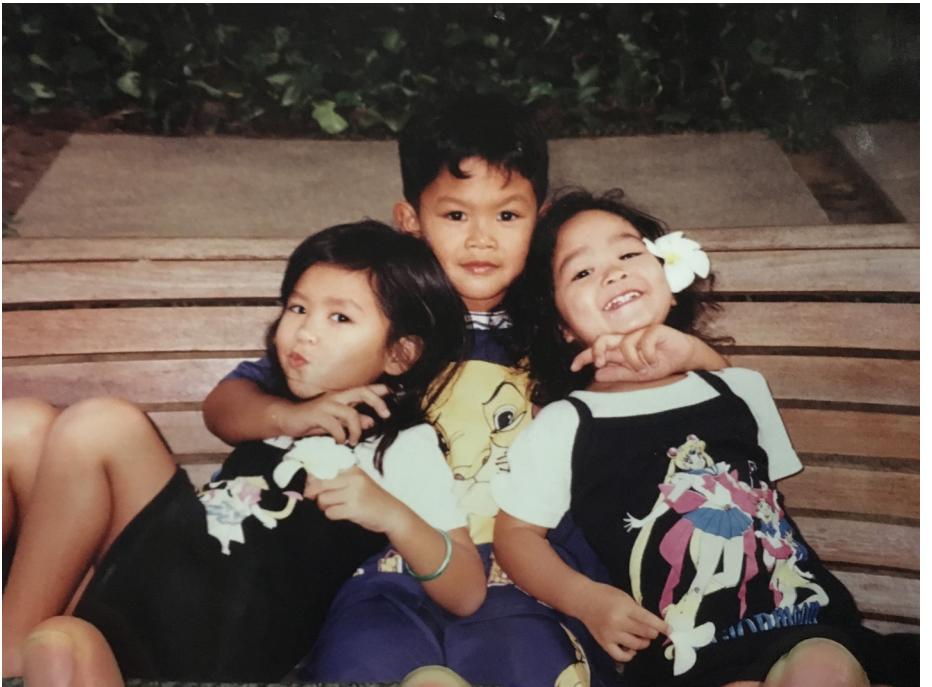


Collaborative Exploration

My First Team

I grew up with an older brother and a younger sister. We are similar in age. We were always together as little kids. If one had to go somewhere, my mum would have to take the other 2 there to wait. We shared most things: food, toys, bedroom, bathroom, dogs, cats, rabbits, hamsters, goldfishes, etc. We did, basically, almost everything together. The adults around us thought it was cute, but we disagreed. Our collaboration skills weren't the best when we were 8, 7, and 5 years old. Me, the middle child, struggled the most since I could pick a fight from both sides.

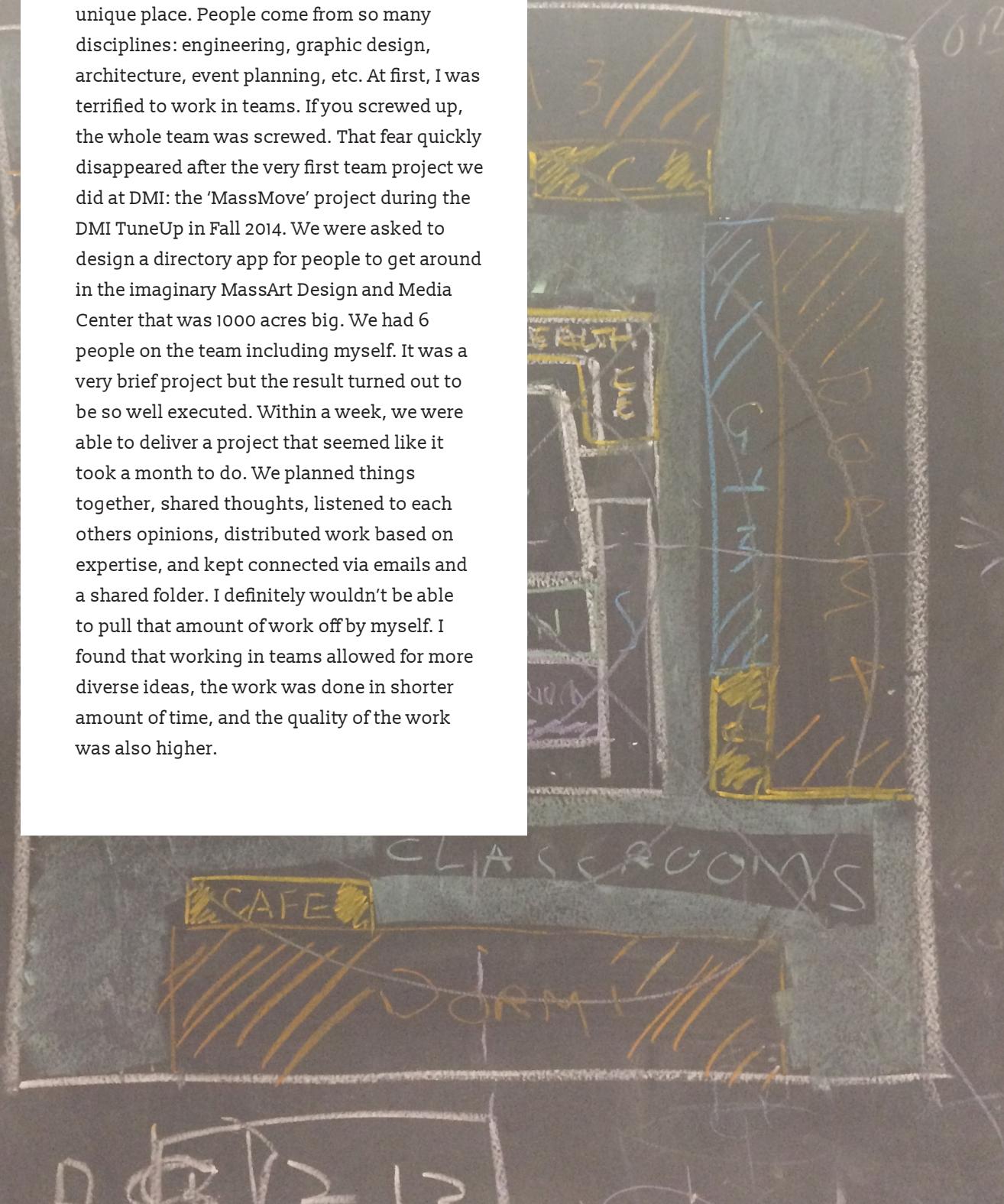
Being close in age to my older brother, our passion for the GameBoy was similar. My parents' plan was to buy only one because, as the name suggested, they thought only boys would be interested in it. They were so wrong. I couldn't remember how many times we fought, physically, over that thing. My brother came up with a sharing strategy: we would switch turns when we lost a game. Of course, my brother got to play for about 20 minutes and I got about 1 minute because I was so bad at it. I was so mad at my brother for getting to play all the time, and mad at myself for being so bad at it. That strategy obviously didn't work for me. Eventually my parents had to buy a new one because they felt bad for me. There was no collaboration whatsoever at that age.



The siblings and I

With my sister, even though she's 2 years younger than me, she always wanted what I had. I, of course, wasn't proud to be anybody's role model at that time. I didn't like to be copied. Overall, we fought around 75% of each day. Our teamwork skills were in the negative. However, as we got older and less selfish, we treated each other more like friends than enemies. When parents were away, my brother would offer to drive my sister and I to places since he was the only person who could drive. I would wake them up when they needed to get up early since I was the only morning person. My sister would do my math homework. We learned to compromise which made having siblings a privilege.

Not until I graduated from architecture school and came to DMI did I experience being in a collaborative environment. DMI is a very unique place. People come from so many disciplines: engineering, graphic design, architecture, event planning, etc. At first, I was terrified to work in teams. If you screwed up, the whole team was screwed. That fear quickly disappeared after the very first team project we did at DMI: the 'MassMove' project during the DMI TuneUp in Fall 2014. We were asked to design a directory app for people to get around in the imaginary MassArt Design and Media Center that was 1000 acres big. We had 6 people on the team including myself. It was a very brief project but the result turned out to be so well executed. Within a week, we were able to deliver a project that seemed like it took a month to do. We planned things together, shared thoughts, listened to each others opinions, distributed work based on expertise, and kept connected via emails and a shared folder. I definitely wouldn't be able to pull that amount of work off by myself. I found that working in teams allowed for more diverse ideas, the work was done in shorter amount of time, and the quality of the work was also higher.



Dream Team

When it comes to exploration, working in teams is most effective when people have diverse skills because it opens up more ideas. However, exploration is not a profession that people learn in school. I remember when I was around 12, my friends and I started to hang out at the mall. I hated the mall and so did my friends, but it was the only place that parents would feel ok to drop their kids off at. There used to be game kiosks located around the mall and we liked them. The touch screen game kiosks usually had multiple games you could choose from such as Word Find, Match Cards, Hangman, etc. The only game that we played was Photo Hunt. No matter how big of a group we were, we always played Photo Hunt on the same machine. The game was basically to find 5 differences between 2 photos that look very much the same. If you found them before the time was up, you moved on to the next photo, otherwise, you lost. There was one friend who was so good at this game that he would find most of the differences every round. There was another friend who never found anything. If that one person who was so bad at the game was playing this game alone, it would be like intentionally throwing 10 baht in the trash. However, the person who was so good at the game told me that he never went as far in the game when he played alone.

One obvious reason was that other people helped to find the differences too. But another reason was because I tried harder when I played with other people. I concentrated so much more. I think it was because I wanted to impress them that I could find more things than they could. To be the Photo Hunt king was my life goal at the time. I'm sure that everybody wanted the same. I could feel the tension from everybody when we played that game. However, it wasn't really a competition between ourselves. Every time we passed a level, we were so obviously happy about it. We would scream, high-five, chest bumps, and all that. I feel like the support that we had for each other to win Photo Hunt drove us to become better at it.



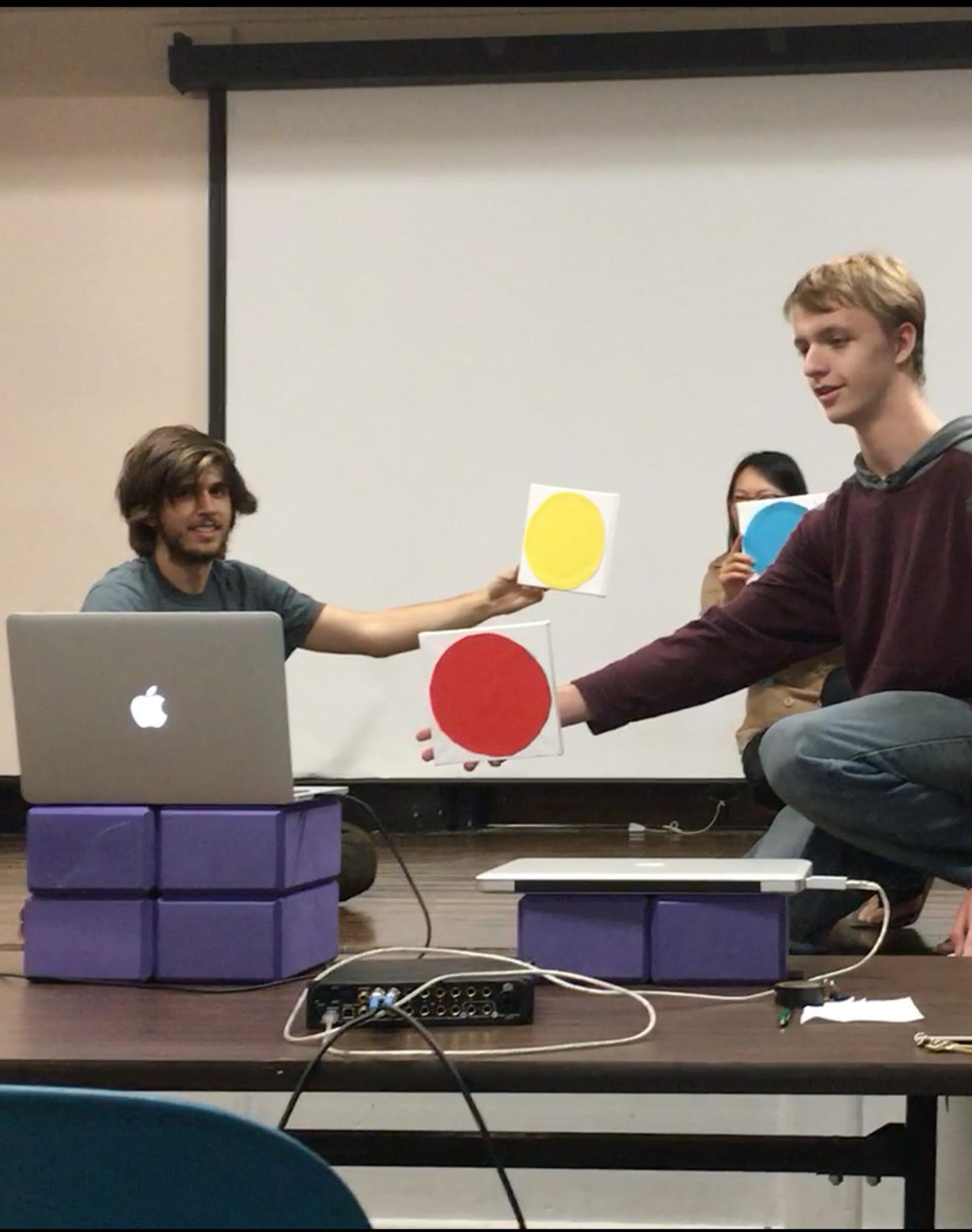
Photo Hunt game

I know I became so much more strategic and attentive of every little detail on the photos. I would search from left to right, top to bottom, far and close, until I found the differences. I knew my friends did the same because we all planned to do that. We later finalized our strategy and came up with the best solution. In the game, there were 3 help options: pass this round, extend time, and free answers. The options would only work if the player presses those buttons before the time was up. Our strategy was to have that one friend who was so bad at the game watch the time and press one of those buttons before the time ran out. One person would look at the photos from a further perspective, and one would look from a closer perspective. The friend that was good at the game had to always be in the middle. Using this strategy, we were finally able to get enough points to be one of the best top 10 players list on the machine. We got to put our team name along with our photo on there. It was our proudest moment. We achieved that on other machines as well.

I believe, just like working on projects in groups, exploring in groups requires good teamwork as well. Not only to explore more effectively, but for the support and the feeling of achievement that everybody shares.



Game kiosk at the mall



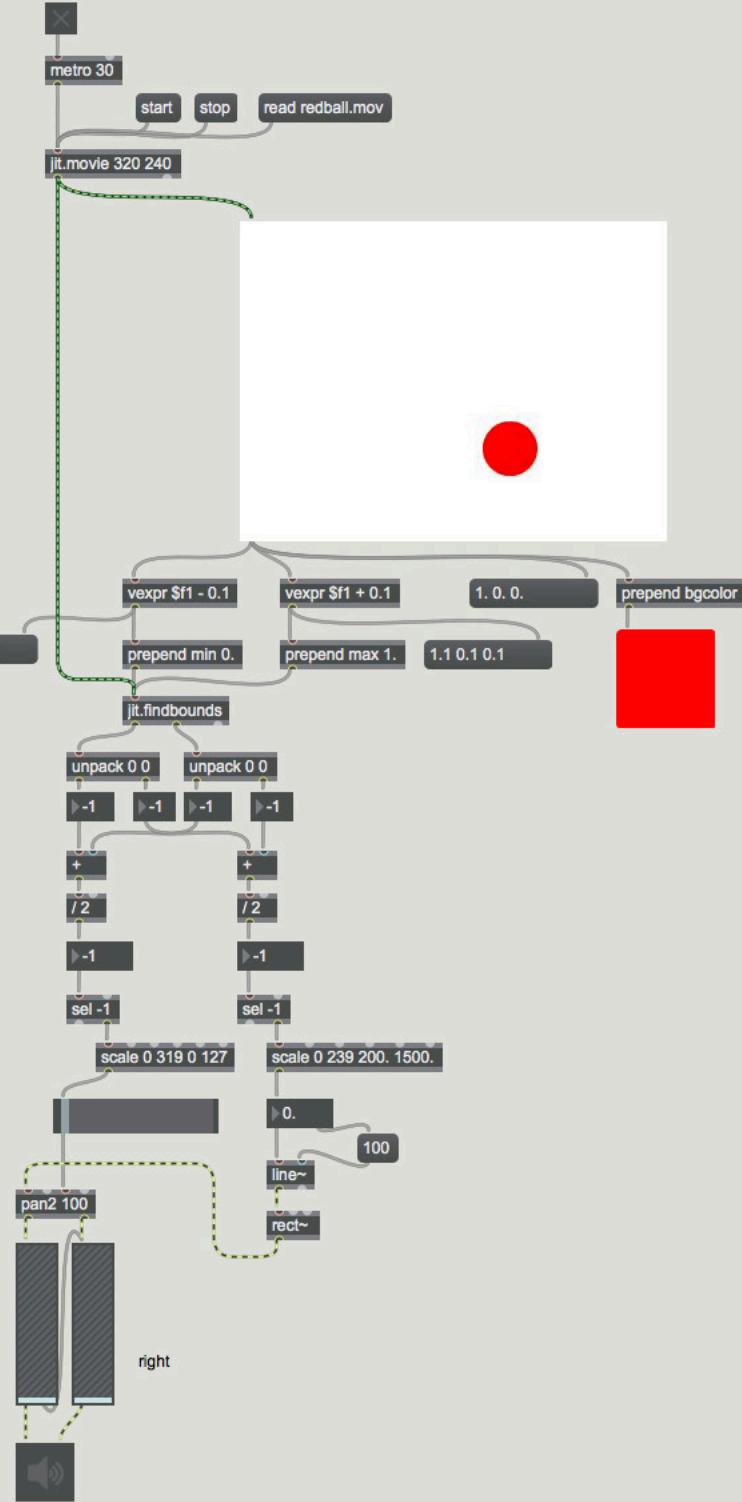
CASE STUDY

“Manipulative Colors”

Learning Sound Program

Apart from my interest in the academic subjects that I've been working on, I also have a strong passion for music. Music has always been my hobby and I grew up playing various instruments. I'm in a band in Bangkok called New Mandarin. I'm the bass player and an occasional vocalist for the band. During the summer of 2015, I went home to Bangkok for the break. I got together with my band and we produced another song while I was there.

During that same break, I also took an online course for MAX. MAX is a visual programming environment for working with sound and I wanted to be able to use it for my projects. The online class was instructed by Judy Dunaway, a part-time professor at MassArt. I took both beginner and advanced courses.



In MAX, the tools are referred to as objects, and the files are referred to as patches. I learned about different objects and what they did, and also made small exercise patches every week. MAX allows you to use numbers to generate sound, make drum tracks, make sound effects, and so much more. You can make visuals with it, connect it to other software like Processing or Arduino, and make interactive patches. For the final project of the beginning course, I made an interactive patch where I assigned different beats and notes to each of the letters of the alphabet. People were able to type in anything in the patch and it would generate music according what they typed in.

I moved on to the advanced course right after the beginning course was finished. I learned about many more useful objects that were a little bit more complicated to use, among them, The Jitter object. It allowed for video input and output. Using the Jitter objects, I made a video color tracking patch, which tracked the location of a given color in the video. The video that I used for that patch was just a bouncing red ball on a white screen which came with the program as a sample video. After learning how to track a color on the screen, it was easy to track multiple colors on the screen.

Later on in the lessons, I made another patch that connected the video input to sound output. I used another one of the sample videos that came with the program. It was a 3 second video of a person bouncing a basketball ball and walking away from the screen. I tracked the color of the ball, his shirt, and his pants. Using the locations of each color on the screen, I was able to use the numbers it gave to manipulate the sound connected to it too. For example, I linked the color of the ball to the pitch of the sound. When the ball was being bounced up and down, the pitch of the sound went up and down, corresponding to the ball in the video. Same with his shirt and pants, they manipulated the sound as the person walks away from the screen.

I was then introduced to another Jitter object that allowed me to use live video input. I tried doing color tracking with live video from my laptop camera and it worked. I tested the patch by tracking my lime green pen and had it manipulate the pitch of the sound based on its location on the screen. I felt a little like a conductor, being able to manipulate the sound by swinging my pen around. It was a fun and very engaging way to make different sounds.

Interactive Performance

After the courses ended, I received an email from Judy asking me if I wanted to participate in a show that she was curating called "New Ideas in Music and Sound". It was a concert series featuring cutting-edge original music and sound art. The work in the show would be created by students currently enrolled in the Colleges of the Fenway/Mission Hill neighborhoods in Boston. The concert was held in the Parker Hill branch of the Boston Public Library.

I was skeptical to say yes at first because I had never done a sound art piece before. I had definitely not performed an art piece to a group of people before. She later informed me that it was to be a very small show and casual with only 20 audience members maximum. I thought it would be a great opportunity to get real user feedback for my project so I said yes. I began to think about how people explore and learn together and what they would get out of it that exploring alone wouldn't give to them.

There are countless resources talking about the benefit of working in teams. For me, the most valuable aspect of working in teams is that the job gets distributed to more than one person —

one person doesn't have to do everything on their own.

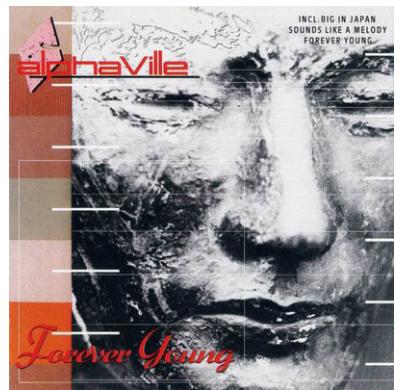
I wanted to bring that aspect of teamwork to the idea of collaborative exploration. Being in a band, I know how important collaboration is. Everyone is responsible for different instruments, but together, we make one song. I'm the bass player of the band. Apart from creating and making sure that the bass line sounds good, I also have to make sure that it also combines well with all the rest of the instruments. Communication is the key to making collaboration effective. Sometimes when the overall song sounded off, all the band members sat down together and helped each other to determine what needed to be adjusted.

Sometimes it could be hard to be critiqued on something you worked hard on. I had to compromise. At the end of the day, the product of our hard work was one really good song that all of us made together. I wanted people to experience having their own responsibility in making one successful thing as a team. I wanted the people to feel the rewarding feeling after achieving things together.

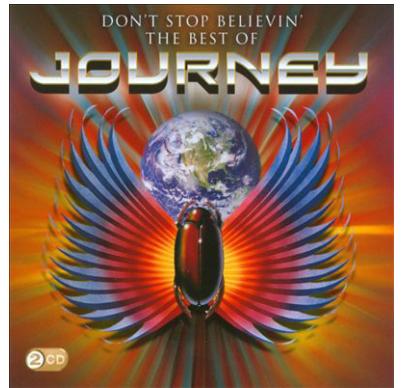
As MAX is a sound program, I had to come up with a project that had some sort of sound element whether it being an input or an output. How could I make people explore sound? Moreover, I only had less than 10 minutes to show this project to the audience. Making a good song can take months. How could I make people explore sound and feel accomplished after only 10 minutes?

New Mandarin music video shooting





'Forever Young' by Alphaville



'Don't Stop Believin'' by Journey

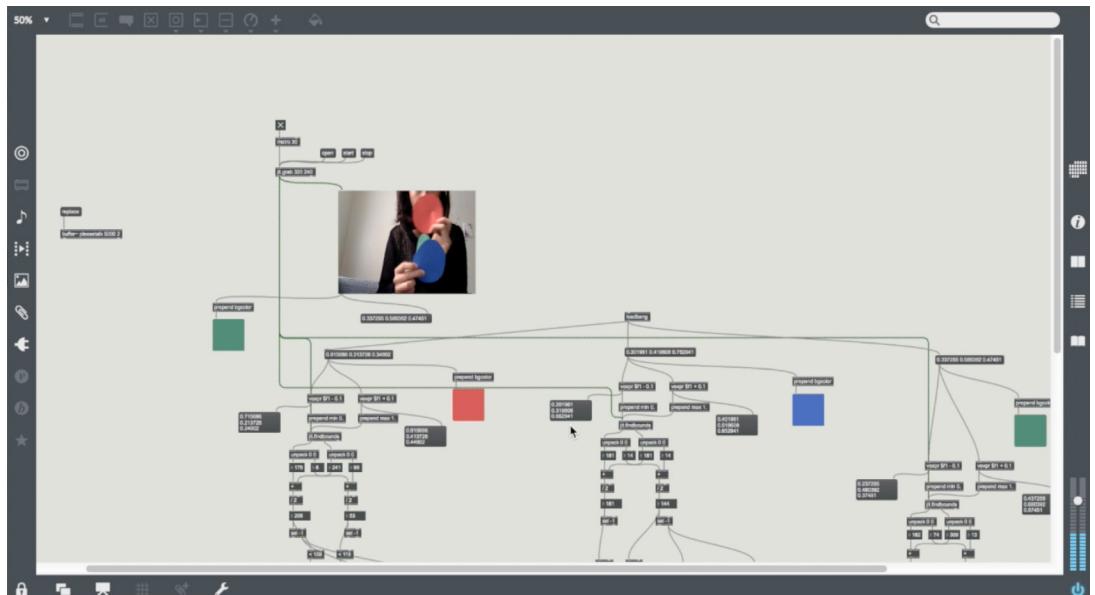
Conceptualize

I thought of an alternative. What if the song is already good? If I take a song that is already good, and only manipulate it a little bit, people could spend less time to make the song good again. That was my naive thought. I chose a few all time famous songs that most people would know to manipulate. One of the songs was "Forever Young" by Alphaville, and another was "Don't Stop Believing" by Journey. I then, made a patch that allowed me to change the numbers for their sound elements. I decided to start with manipulating their speed, pitch, and volume — the easiest qualities in which to hear differences.

After changing those elements, the songs didn't sound understandable anymore. They sounded something like a really high-speed chipmunk sound or really slow zombie talk. However, it wasn't hard to figure how to make the song normal again. For example, if the sound was really quiet, people would know to turn the volume up. If the pitch was really high, they would know to lower the pitch. If the speed was too fast, they would make it slower. It might take sometime to adjust all of them but it was pretty straightforward. People didn't have to be a musician to figure it out.

I decided that by having different people controlling the different elements of the song, they could help each other figure out what to adjust. To me, adjusting things is a form of exploration. By hearing the abnormal sound, people would automatically be curious of what may cause that sound to be distorted. Exploration derives from curiosity. When people get curious, they would explore how they could manipulate the sound by adjusting it in different ways. As they are adjusting the sound, they would hear the different possibilities that the sound could be manipulated.

They will eventually learn from exploring how they could adjust each of the elements. If all of them work together without clearly assigned responsibility, some of them might not get to participate in the exploration as much. They might not feel the pressure to try as hard since they know the other people in the team might somehow figure something out. If each person is assigned to each element, they would feel more sense of responsibility and feel that they have equal contribution to the accomplishment once they succeed.



Interactive color tracking patch

Engaging Collaborations

I wanted the patch to be more interactive than just having people changing numbers on the computer. I decided to use video input with the Jitter object for my piece instead. I wanted people to feel engaged the way I did when I tested the Jitter patch with my pen.

Using the color tracking object, I made the patch to track 3 colors from the live camera input. I decided to stick with the pitch, speed, and volume of the song since I wanted the patch to be easy to figure out within 10 minutes.

One color would manipulate the pitch of the song, one would manipulate the speed of the song, and one would manipulate the volume of the song. Instead of having them sit down in front of the computer and play with the patch like I did when I was testing it with my pen, I decided to make it a bigger scale experience. The 3 participants had to work together at the same time since each of them is responsible for each element. It would be impossible to have 3 people squeeze into the frame if they were just to sit in front of the computer anyway. To make the patch recognize the colors from far away, I made 3 color canvases around the size of 12" x 12" in blue, red, and yellow colors. I set 3 locations for each of the colors on the screen and each of the locations were for each of the colors. When those colors were located on their correct locations, the song was played in its original form.

About a week before the show, I went to visit the site and tested the patch. I put my computer in front of the stage and had the camera facing the stage. The patch recognized the colors well on the stage, even though the lighting made everything turn a bit more orange than usual. At the day of the event, there were several other 'performers'. They were performing various type of music. For example, the first show was performed by a pottery artist who projected tribal music from a speaker inside of his piece. The second performance was a student from Northeastern University who placed speakers around the room and performed a surround sound of objects as if they were moving around the room. Then it was my turn. Judy introduced me a little and handed me the microphone.

I talked briefly about what I was doing for my thesis and explained how the patch worked. I asked for 3 participants from the crowd. Two men and a woman volunteered. They didn't know each other. They seemed very excited. People in the audience also seemed excited. I gave them one color canvas each and I turned on the patch. Distorted sound happened. Everybody panicked. The distorted sound was actually "Forever Young". I told them that the goal for them was to find out what song was being played. I briefly explained to them that each of the colors that they were holding represented one of the sound elements of the song. Of course, as they moved around, they would hear how the sound changed. One of them controlled the pitch, one controlled the speed, and one controlled the volume. For example, if the person who controlled the volume moved to the right, the sound might become louder. If he moved to the left, the sound would become quieter.

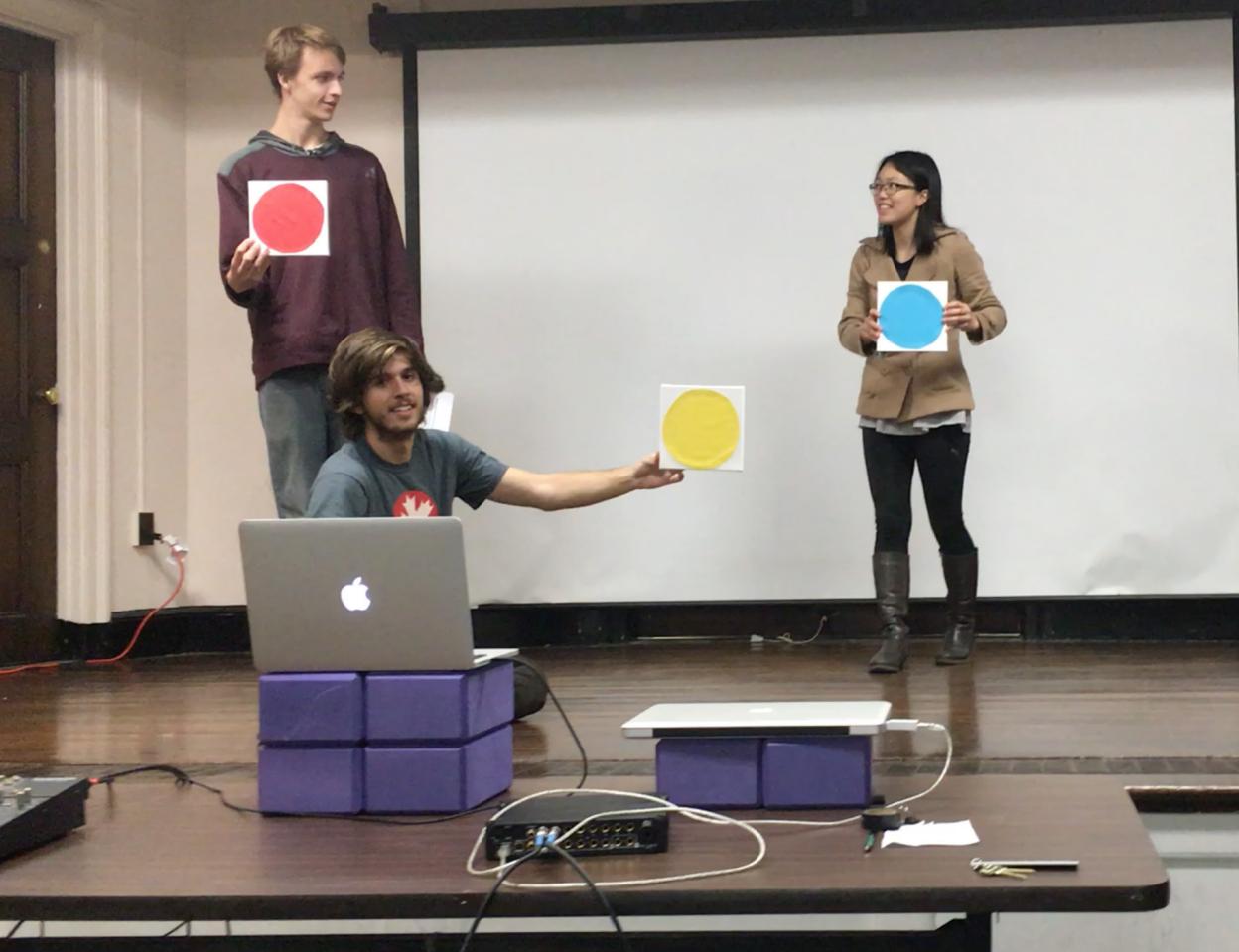
Communication in Exploration

While they were moving around, trying to figure out the song, it was clear that they were communicating. They came up with a strategy to figure out which element of the sound each of them were controlling. They did that by letting one person move at a time and the other two had to stay still so that they could hear what the color was manipulating. I was surprised that they were able to come up with a system that worked for them as a team. I was also surprised that they took this experiment quite seriously. It was because there was a set reward. It became almost like a game for them to win, and people get competitive when they play games. They were talking to each other, listening to the sound being manipulated together even though it wasn't their turn to move. It didn't take long until they figured out what the colors were controlling. After that, they started to move around the stage, listening to the distorted sound, and talking to each other:

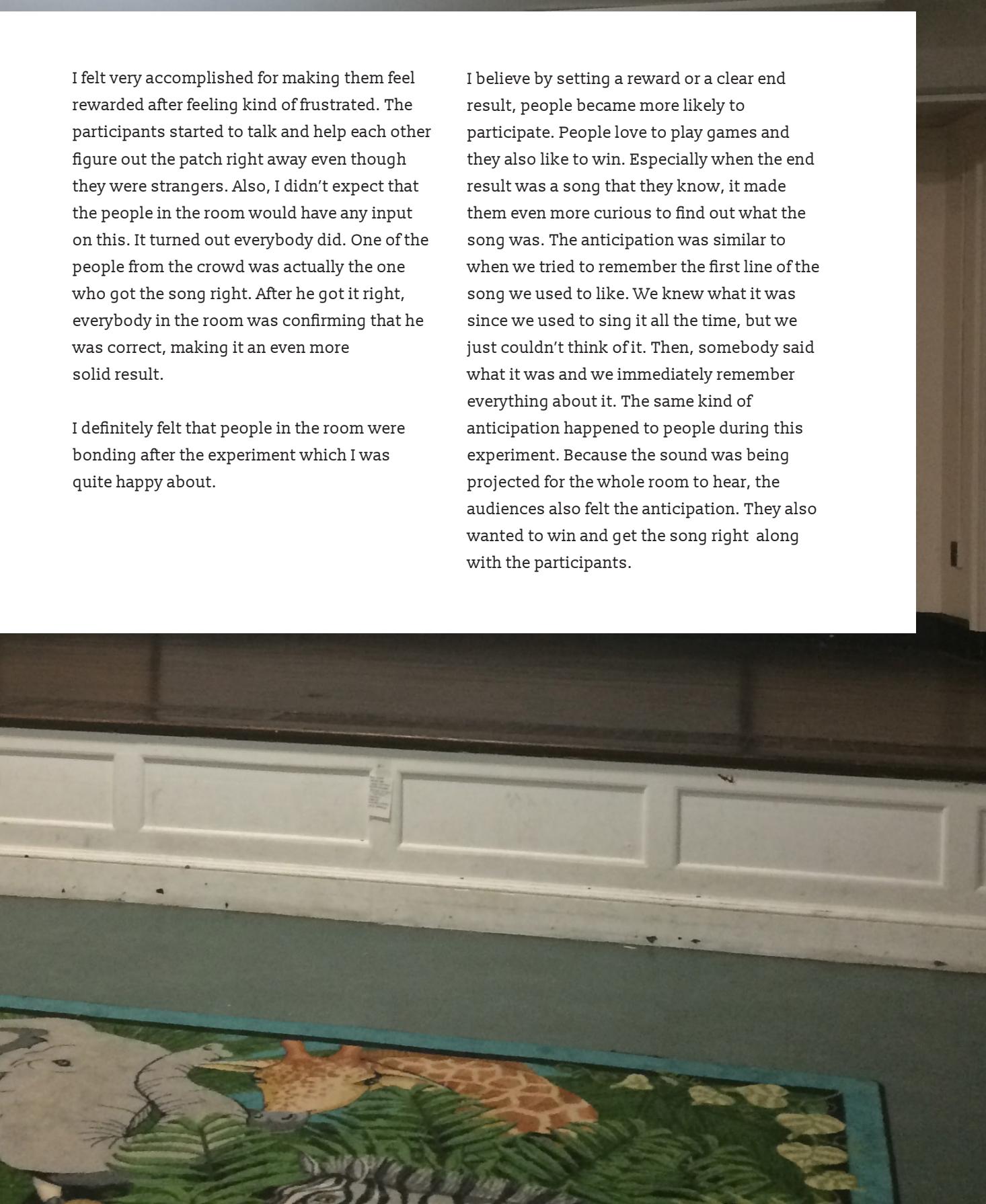
Should I move more to the right?
I think you should stay there.
Maybe move up a little bit?
I can hear it a little bit now.

The song acted like a clue for them to get a little bit closer to guessing what song it was. The ambiguity of the clue made them listen very closely to the smallest change of the sound. I could tell that they were taking the game quite seriously but they seemed to really enjoy it too. The crowd was helping them as well. As the song became more and more apparent, the crowd started to shout out random song names that they thought could be the song playing. Towards the end, there were no big movements anymore. They only had to move very small amounts to perfect the sound, every little movement counted to make the song sound right. Everybody in the room was listening very hard at that point. I could also hear the song at the time because I knew what it was, but they couldn't. The song sounded like a very fast chipmunk song. After about 6 minutes of moving around and figuring the song out, one of the person from the crowd shouted, "Forever Young"!

Everybody in the hall was clearly hearing it too after that. The participants and the people started to nod and approve that it was "Forever Young". They started to sing along with the song, even though the song was still pretty fast. They were a lot of smiles and laughter in the room after such concentration. The participants gave each other some good high fives and let me know they had fun. After that, another group of participants came up on stage and tried to do it again with a different song. Similar things happened. I thanked Judy after the show for inviting me to participate. I had a good time.



The Manipulative Colors experiment



I felt very accomplished for making them feel rewarded after feeling kind of frustrated. The participants started to talk and help each other figure out the patch right away even though they were strangers. Also, I didn't expect that the people in the room would have any input on this. It turned out everybody did. One of the people from the crowd was actually the one who got the song right. After he got it right, everybody in the room was confirming that he was correct, making it an even more solid result.

I definitely felt that people in the room were bonding after the experiment which I was quite happy about.

I believe by setting a reward or a clear end result, people became more likely to participate. People love to play games and they also like to win. Especially when the end result was a song that they know, it made them even more curious to find out what the song was. The anticipation was similar to when we tried to remember the first line of the song we used to like. We knew what it was since we used to sing it all the time, but we just couldn't think of it. Then, somebody said what it was and we immediately remember everything about it. The same kind of

anticipation happened to people during this experiment. Because the sound was being projected for the whole room to hear, the audiences also felt the anticipation. They also wanted to win and get the song right along with the participants.

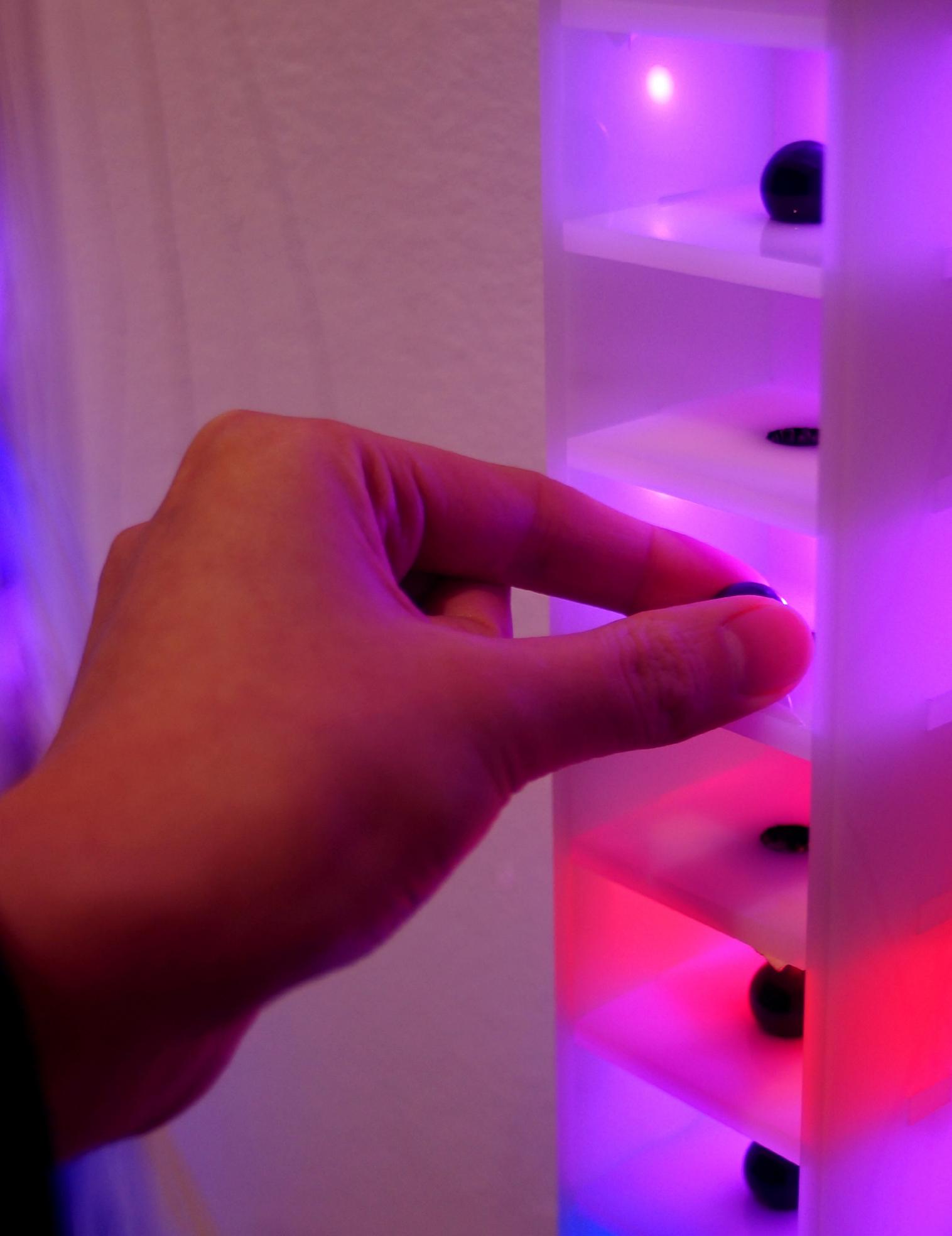
Thoughts

Conducting an experiment with a live audience of strangers was nerve wracking. I was relieved that the experiment went well. I was very happy to see the amount of collaboration that went beyond my expectations. The participants on the stage were communicating, verbally, with hand gestures, or even facial expression. They were able to come up with a method to help each other with the task even if it wasn't their own responsibility. For instance, the guy who was responsible for the volume helped the guy who was responsible for the speed to listen to where he should move. By having the same goal, they were more willing to help each other succeed. It was also engaging for them since they kept getting closer and closer to getting the song right. It was a constant engagement as the clue that they got kept changing as they moved around.

Even the people in the audience were helping as well. The interaction between the participants and the audiences was heart warming. At the time when the participants seemed very confused and didn't really know how to move, the audiences offered to help by giving suggestions and urging them to keep trying. I was glad that they were able to get the song right before the time limit. They deserved to. I believe that they were able to do it because they were working as a team. People put in the effort to help which sparked even more people to put in the effort too. This could be applied to a larger group of people as well.

I imagine if this experiment were to happen in a bigger space with a bigger group of people, I could make the system more complex. I could have them manipulate more elements of the song instead of only the pitch, speed, and volume. I could have them manipulate the tone, effect, key, etc. The possibilities are endless. It would be more difficult if more elements were to be manipulated since they would have more things to get right. However, there would also be more people to solve this puzzle. By using the same method of using the song that they already knew, I believe that people would still be engaged and want to succeed even if the task is difficult. Even the people in the audience wanted to succeed since they knew the song too. Also, because it is a group task, people would feel responsible to participate and help the whole team to achieve the goal. That's why I believe that collaborative exploration encourages empathy. It allows people to bond over discovering new possibilities and succeeding together.

This project really made me realize that I could integrate my interest in music into my schoolwork. I hadn't thought that the idea of exploration and music could go together. This project inspired me to try to incorporate more music in my projects since I really enjoyed the design process when music was involved.



CASE STUDY

“Sequencing Marbles”

Every year, DMI students curate an event called 'Fresh Media' where we showcase our interactive projects. Since this year is my last year in DMI, I thought I would participate in the show too.

With the amount of work I already had to do, I wanted to make a stress-free fun project. Being very into sound sequencers at the time, I wanted to make immersive sequencers. Sequencers are naturally interactive since people have to push or click on buttons to activate or deactivate the sound, but I wanted to make it even more interactive. I wanted it to be a full body experience and not just a click of the fingers.

There are many types of music sequencers that come in different interfaces whether it's a software or a hardware program. One reason that I really liked the idea of making music sequencers for a public installation setting was because anyone can play with it even without music skills. Essentially, a sequencer is a program in a computer or stand-alone keyboard unit that puts together a sound sequence from a series of Musical Instrument Digital Interface or MIDI events. ("What is Sequencer?") I proposed a sequencer wall — a gridded LED sequencer wall that is activated by people's movement in front of it. I was planning to build a passive interactive piece that people would be creating music without having to press buttons. I wanted the sound that it made to be an ambient, gallery friendly music.



A music sequencer app called Beatwave



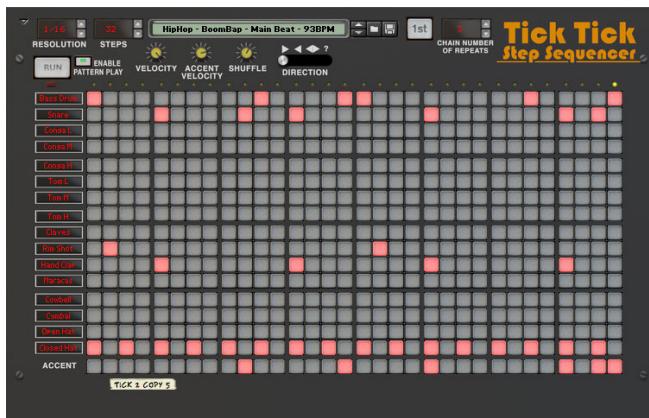
My initial sketch

Later at the Fall 2016 final review, Katie Liguori, my classmate and show curator, suggested that my proposal and Andrew Ringler's proposal could work together. She thought we should collaborate. Andrew is another classmate and is from an engineering background. He told me about his proposal which was on creating visuals by triggering musical instruments that he would make. I told him about my proposal and we both agreed to collaborate. We agreed to meet after winter break with an idea that combines both our ideas. After a few meetings, we settled on the final idea: to create tangible sequencing instruments.

Tangible Instruments

Keeping Andrew's initial interest of creating instruments and visualization, and my obsession with sequencers, I implemented the idea of collaborative exploration into the project. I started to realize how relevant this project is to my thesis.

To achieve the idea of collaborative exploration, we started by looking at how the existing sequencers work. Normal sequencers usually come in grid forms, with horizontal rows representing one sound and the vertical rows representing time signatures. There is usually a time cursor that runs vertically from left to right to play the activated sound on the grid. We decided to separate the sequencer grid into each sound. Each of the sound strips would be divided into 16 sections for a 4x4 music time signature. The plan was to make those strips into 'instruments' that look like shelves with 16 cabinets each. We wanted to avoid flat interfaces. We wanted people to be able to touch and interact with this digital 'instrument', just like how they would interact with real musical instruments.



A typical music sequencer interface

Participants should be able to understand how the instrument works by interacting with it physically. Each cabinet represented a sound for each of the 16 measures, meaning that, there would be a time cursor running through the cabinet and it would play the sound if the corresponding cabinet is occupied. The idea to activate the sound was when people put an object in the cabinets instead of just pressing on and off button. Participants would be able to hold that object as they decide where they want to activate the sound. They would get to almost feel like they were holding the sound itself since wherever they put that object in, it's going to make sound.

One of the hardest parts of this project was to make sure that we could actually build it. I was aware that it was kind of an ambitious project with a lot of hardware and software engineering required. Lucky me that Andrew was my teammate. We were able to come up with an engineering solution quite quickly. We decided to use light sensors to track whether there was an object in the cabinets or not.

Collaborative Instruments

By breaking the sequencer grid into different parts, we were able to locate the parts away from each other. This makes it impossible for one person to control all of the instruments at the same time. I was interested in how people explore making music together, and also how a person explores making music with scattered instruments on their own. It might be difficult especially when the project is about making music, all the instruments need to sound good together. Since the show was going to go on for the whole weekend, I figured the gallery is not going to be full all the time. I gallery sat at the Cyberarts last year and during the day, only one or two people would come at a time. I was curious to see how a person would interact with all these instruments by themselves.



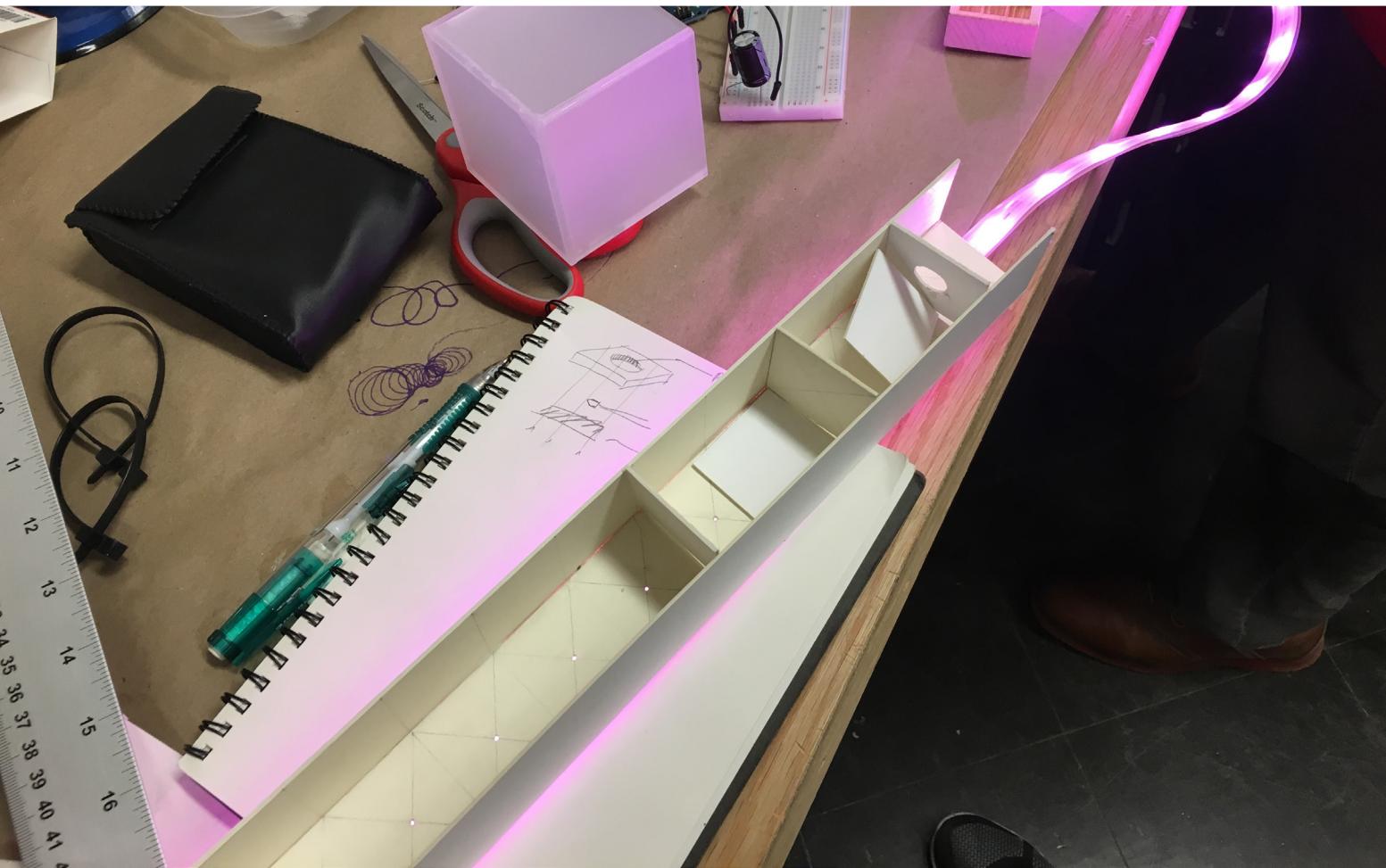
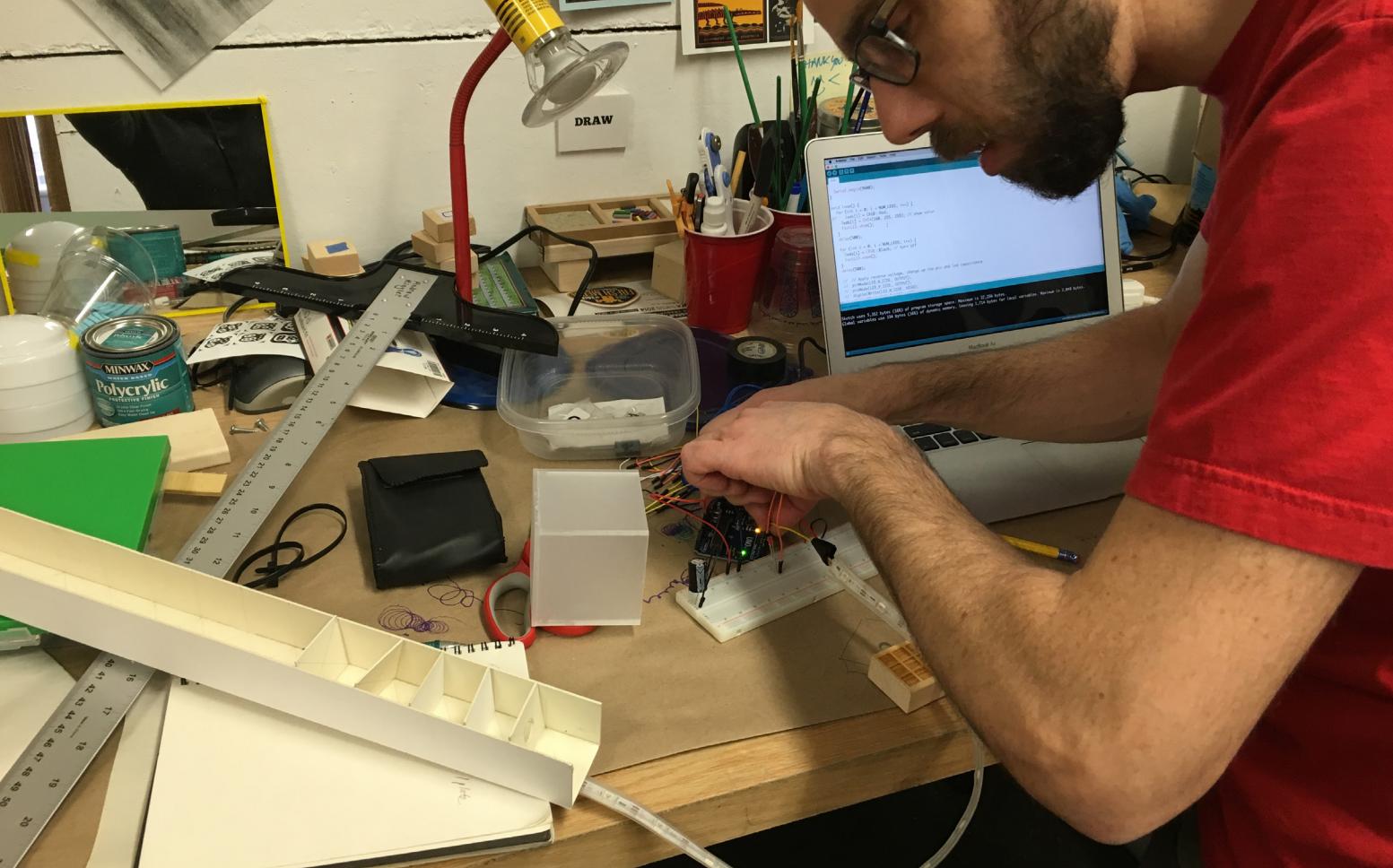
The marbles I ordered from Amazon

We decided to use marbles as the objects people would use to put in the cabinet because we needed to carve a hole in the bottom of each shelves to put the light sensor in anyway. Round objects like marbles fit perfectly on top of the hole. We also wanted the object to feel somewhat delicate when people hold them. We wanted it to feel almost like a sound in their hands. We figured glass-like objects like marbles would be great to represent that feeling since they are more fragile than wood or metal. We put an LED strip at the back of each instrument so each cabinet could light up. The LED light was also used to communicate the status of each shelf. For example, if a cabinet is activated by a marble, the light behind that cabinet would be in one color, if it's not then it would be in another color. There would always be a time cursor running through the beat just like a normal sequencer. In this case, the time cursor was represented in LED lights running down through the cabinets. This let participants know which sound was being played. We chose to use blue for the cursor. If there was a marble in a cabinet, that cabinet would turn purple and would stay purple until we removed the marble from the cabinet. However, if the cursor runs down to meet a cabinet with a marble, the purple light would turn red and the sound of the corresponding instrument would be played.

We planned to have 10 instruments with 16 cabinets each in total, and locate them around the gallery. People would definitely have to walk around and look for them before they got to interact with them. However, there would be no instructions. It requires curiosity and minor navigation skills in the gallery in order for people to find all of them. As people walk around looking at the projects, they would notice the instruments located around the space. My thought was that once they realized a few of the instruments, they would become curious to explore if there's anymore around the gallery. The outcome of their interaction with the instruments would obviously be in the form of sound that would come out of the main speakers. There were no signs or identification of what sound each instrument makes, so the only way the participants could find that out is to listen carefully to the sound and see which sound matches with which instrument. Once participants explore and experiment with how the system works, they can begin to create the music that they want by moving the marbles around.

I was hoping to see different layers of exploration.

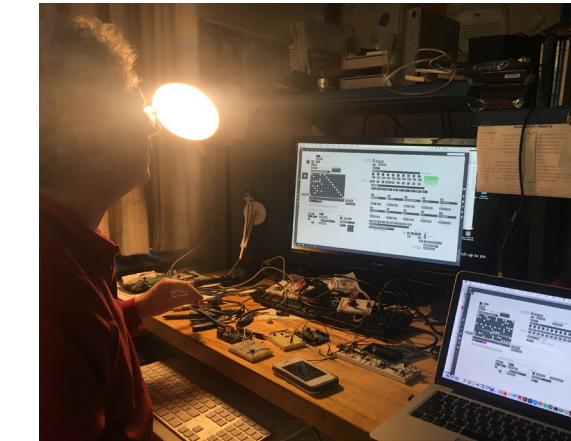
One was when they explore where the instruments are, one was when they explore how the instruments work, and one was when they explore the possibilities of music they can make. All of these require them to listen carefully to sound outcome. They need to listen to the sound to figure how many different sounds are playing so that they can figure how many instruments are there in the gallery. They need to listen to the sounds to figure what specific sound each instruments make. They need to listen to the sound to hear the different music that they create. Since the instruments would not be located next to each other, they would also have to navigate around the gallery as they listen to the sound as well.



Production

After finalizing the concept and idea of the project, we started to actually build it. Andrew was in charge of most of the coding and electronics, and I was in charge of the fabrication and the sound. We started by testing out the LED strip since we needed to design everything based on that. After connecting the LED with the Arduino and we had it working, I measured the dimension of the LED strip and started working on the first prototype of the instruments. I used that thin cardboard paper that I used in architecture school again to make the first prototype. I measured and hand cut everything. The prototype turned out to not be very neat looking but at least we got a correct dimension shelf that we could work with.

As Andrew went ahead and worked on his part, I started to work on MAX sound program to develop the sound. I got a lot of help from Fred again to build a MAX patch that could communicate with Arduino. At that early stage, I only needed a MAX patch that I could test different sounds with and Fred helped me make that happen very quickly. I moved on to building a second prototype for the shelves. I wanted to build a neat prototype that could potentially be the real measurement for the final one. Andrew and I agreed that the real material for the shelves should be made with white plexiglass since it can diffuse the LED light well and also look clean and solid. We drove to what looked to me like a plexiglass factory in South Boston to choose the exact type of plexiglass that we wanted. We settled on off-white, 3/4 thick plexiglass. However, we didn't order them from the place we went to since they didn't have enough.



Figuring out MAX with Fred



Choosing plexiglass material

Once we determined the dimensions of the plexiglass, I was able to start making a laser cut file for our second prototype. In Illustrator, I designed parts of the shelves that could be attached together in the most secure way possible. Instead of gluing every part together, I built sockets so that each part could support one another. We laser cut that file onto the same cardboard material again one more time to make sure everything worked. At that time, three weeks until the show, we still hadn't got all the electronics to work yet. The light sensor idea didn't work so well since it was too sensitive to light and couldn't work accurately. Fred advised us to use phototransistors instead. They work the same way as the light sensor but were more accurate. Andrew worked very hard to find the best kind of phototransistors that could perform precisely for our project but this process took a lot of time. After he selected the best ones, it still took time for them to arrive.

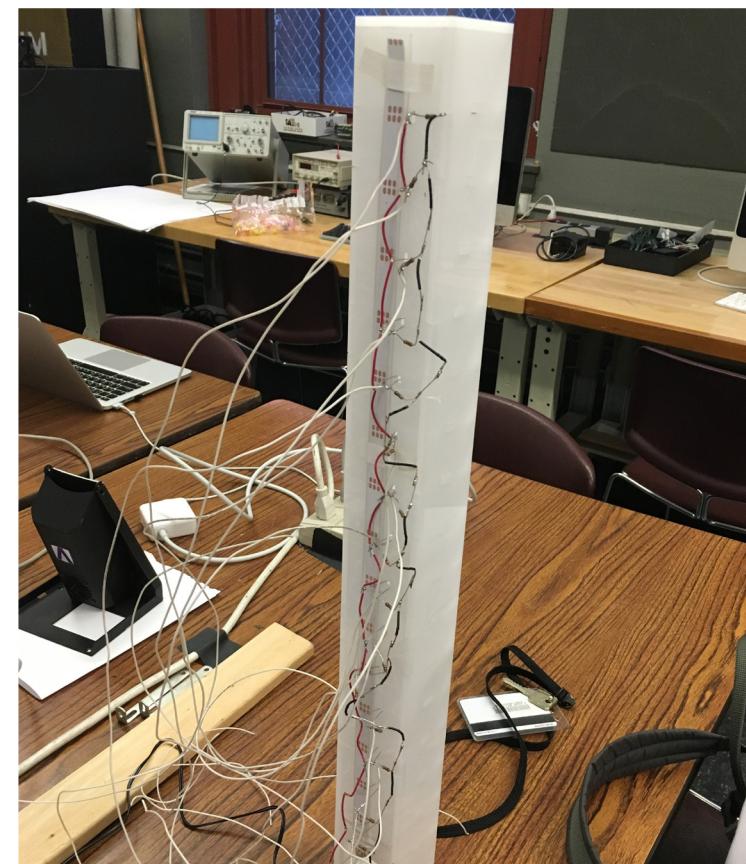
Around 2 weeks before the show, our plexiglass finally arrived. I adjusted the laser cut file slightly and went ahead to cut all the pieces for the 10 instruments. We assembled them and secured them with tape right after. The pieces fit perfectly. We spent another whole day doing a little bit of painting in the inner part of the hole to be dark, glued some main parts, and attached the LED stripes to all of them. The phototransistors arrived 3 days before the show. We spent two whole days soldering and tried to make each instrument work properly.



Laser cut prototype on paper material



The first plexiglass prototype



Even with help, we only got seven instruments done and working by the installation date. I wasn't too upset about that. We just had to make some changes to the sounds a little. At first, we planned to have 4 percussion instrument sounds and 6 melody notes. I chose to use a bass drum sound, a clap sound, a shaker sound, and a closed triangle sound for the percussions. I thought they sounded good together and were not too aggressive for the gallery. For the melody sound, I used MIDI sound that had a lot of echo and reverb effects so the notes wouldn't be too harsh for gallery settings. All the notes were in the F minor scale which sounded softest and most complex in my opinion. It made a good tone for ambient type of music. After only getting 7 instruments built, I decided to cut down to only have 3 percussion sounds and 4 melody notes so that the music still sounded complex and not flat.



More soldering at the gallery

At that point, we were super late to the installation. We were supposed to have everything installed at the gallery by 5:00 p.m., but we arrived at the gallery to start installing at 5:00 p.m.. Good thing was that other people were still installing when we arrived. We unpacked all the instruments from the box we put them in. It turned out that almost all of them didn't work anymore. The soldering was very delicate and we thought we probably jammed the wire on the way to the gallery. We spent a lot of time trying to test and fix them but they still weren't working properly. At that point, we figured that we needed to start putting them up on the wall despite how broken they were. We could at least make them into just sound visualization for the show. It was almost midnight and we could only put 5 of them up. We put three of them on the wall in front of the gallery, and the other two on the other wall. I was hoping to spread them out more, but the wiring was more difficult to do than what I thought. To locate them closer to each other, it saved us a lot more time on soldering the power cables and other wiring work we had to do. I thought at least people could interact with the instruments from 2 different walls. After putting them all up and dealing with all the messy cables, we cleaned up and went home.

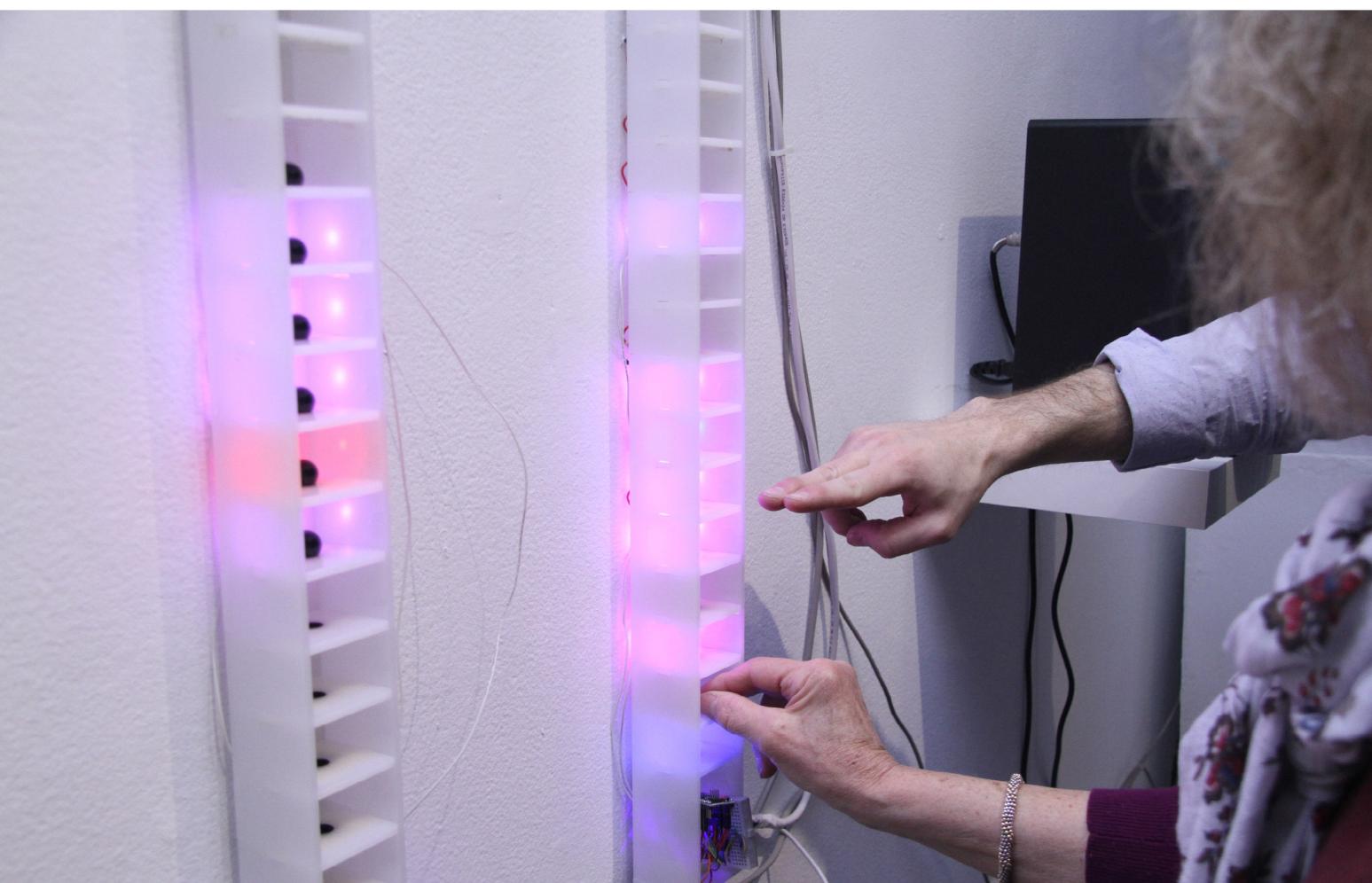
The Opening Day

The next day was the Fresh Media opening day. Andrew signed up to gallery sit that afternoon before the event started. I received a text message from him around 2:00 p.m. that all of them were working almost perfectly again. It turned out that the lighting in the gallery at night was too dark for the phototransistors to recognize. I was very relieved at this point. I came in briefly to the gallery to fix a little bit of the MAX patch so it worked with the 5 instruments that we had. We ended up with 2 percussion sounds and 3 melody notes. It sounds better than I thought it would with only 5 instruments so I was happy about that. I came back to the gallery for the opening event and the instruments were still working properly. I was relieved.

The gallery was packed with people. It was hard for me to have conversation with people without feeling like I was screaming at them. The sound that the instruments made couldn't be heard. You could only hear the sound of the instruments if you stood next to the speakers. Luckily, we set up speakers right next to all the instruments so the people would hear it as they interacted with the piece. I noticed people were trying to listen to how the sound changed as they moved the positions of the marbles. However, I realized most of them were more interested in how the light changed colors than the sound. It was probably because it was the easier way to see, than to hear, the changes when they moved the marbles.

Most of the people at the opening weren't by themselves when they interacted with the instruments. However, I didn't see people actually talking to each other much as they were interacting with the piece. I didn't see a lot of collaboration. From observation, most people were just trying to figure out how the piece worked by moving around the marbles and observed how the LED changed colors. They didn't try to compose music. That might due to the fact that the gallery was very loud which made it hard for people to hear the sound properly. Most people I talked to that night thought the project was 'cool'. I didn't really get any critical comments on the project. I was happy with how the project turned out in term of its functionality, however, the outcome of the interactions didn't go as planned.

My goal for this project was to see how people would collaborate with the medium of sound. I was hoping for people who came together to interact with the instruments from different spaces. I wanted to see if they would let the sound communicate to them what the other person was doing. That didn't happen and I believe it was because the gallery was so busy that night. People couldn't walk around casually or hear things clearly. By the time I came to the gallery again that weekend to observe more when there were fewer people, the instruments were already not functioning well anymore. It was a risk on our part to rely on such sensitive hardware like the phototransistors as the main element of the project — especially for a place with uncontrollable lighting such as the Cyberarts gallery.



Thoughts

Even though the project didn't really turn out the way we planned, I learned a lot during the process of making it. In a busy gallery setting, people were too distracted to concentrate or explore. People were busy catching up with their friends and family. People tend to move from project to project quickly since they didn't want to block the flow of people waiting to see the projects. Our project required time to explore. For the participants to only have limited time to play with the piece, they didn't have enough time to immerse themselves to understand the piece more.

Again, people were only exploring the light colors and how they changed when they moved the marbles around. I thought most of them didn't really have time to even figure out what the lights were doing. They just thought it was cool that the lights got activated when they put a marble in there. They didn't understand the cursor part since they weren't really listening to the sound. The problem with the sound was that it was an ambient sound which was more difficult to hear than songs with clear notes. It was also more suitable for a calm and peaceful environment since the sound is very subtle. The gallery at the opening day was not calm or peaceful, people weren't in that right mood to listen carefully to the subtle sound. I wish I had another set of instruments on MAX patch for a busier environment. I could have used for distinctive sound that people could hear clearly. I could also make it a more upbeat song by increasing the tempo so that it suits a fun busy space.

Time management was another thing I wish to improve. I still believe that if we had a few more weeks, the project would have turned out better. However, this was actually one of a few projects that I helped to build that actually functioned and was not just a prototype. I have to thank Andrew for making this happen. We are planning to show this project again at the Thesis Show in April. We are planning to eliminate the phototransistors since they are unreliable in different lighting. Instead, Andrew came up with an easier idea of using conductive tape. We are going to put open-ended wires in all the cabinets and tape them on with conductive tape. We changed the object from marbles to be metal objects. When people place the object into a cabinet, the metal will complete the circuit which will notify Arduino that the cabinet is activated. We are planning to change the name of the project slightly too, since we won't be using marbles anymore. We will also give each of the instruments their own power supplies so that we can located them separately from each other without having to connect them to the same power supply. Hopefully, we will be able to install more than 5 of them and have them working properly for the Thesis Show. The show will be up for around 2 weeks. I hope I will get to see real interactions and people spending more time to explore the projects during those times.

Poetic Navigation

Precision is what people crave from technology. Of course, technology existed to replace human labor work, physically and mentally. For example, people have ovens so that they don't have to make fire every time they want to cook, and they have calculators to solve their daily mathematic problems. People use these technologies because it is more efficient, accurate, and faster than if they have to do things by ourselves. When it comes to information technology, accuracy is definitely the number one factor to determine whether people want to use that technology or not.

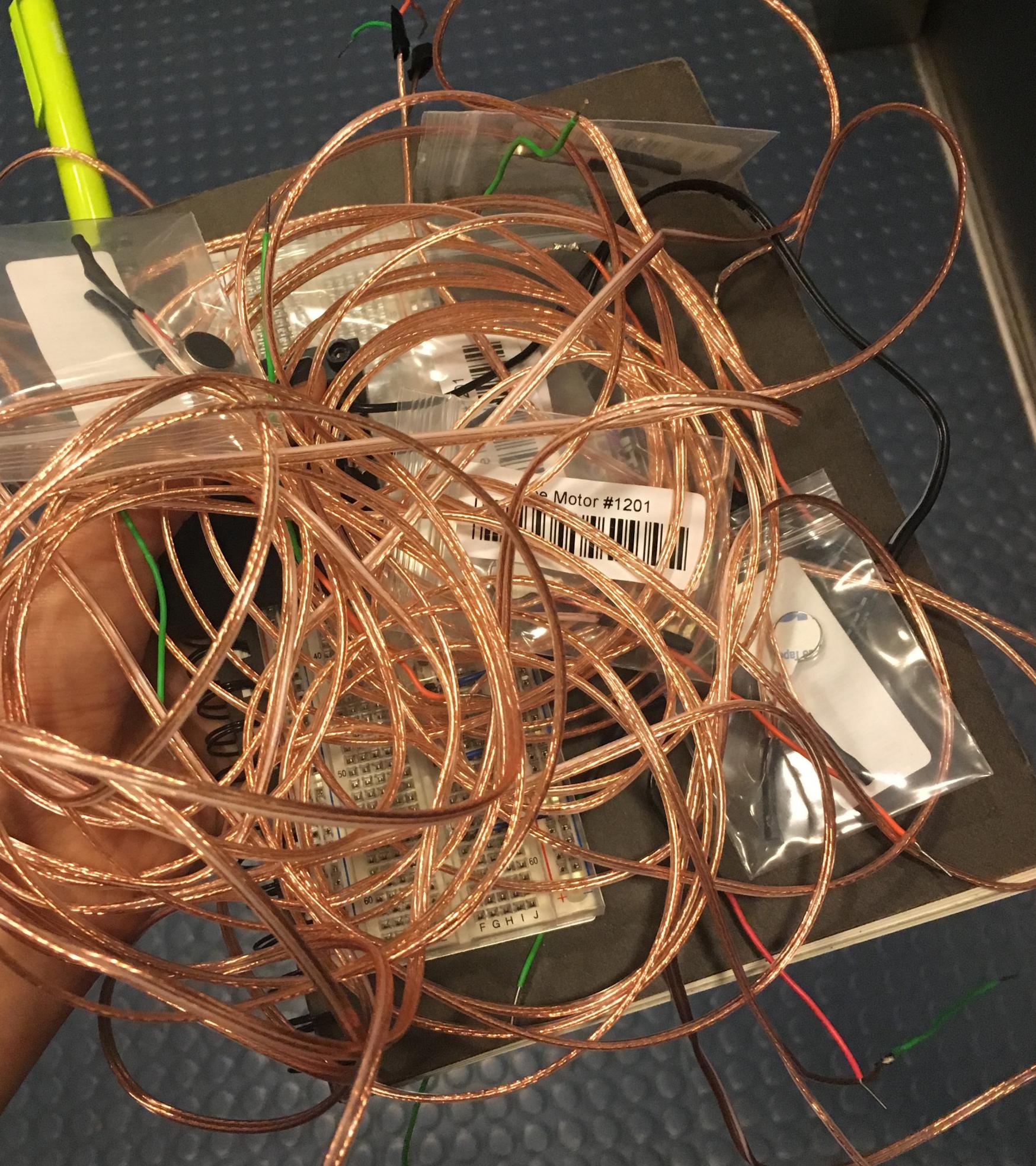
Especially, when it comes to information about themselves. People use technology to keep track of their fitness, finance, sleep cycle, food intake, etc. Everything about technology is so precise and detailed. People's only job is just to keep track of all those technologies and make sure they own all of them to keep their lives in check.

Sometimes technology makes me feel less of an authentic human. By interacting so much with computers and technology, I feel like I'm only interacting with numbers. It is emotionless. Of course, the main job of technology is to give us information as precisely as possible. Emotions are complex. I don't think I can even explain exactly how I'm feeling at any time. Everybody also has different minds and emotions. That's why there are personalities and characters. Even if technology in the future is able to duplicate the complexity of its living creator's emotions, it would still be generated by numbers.

Inventions like Siri try to give technology a personality, but every Siri on every IOS phone has the same personality. It's not even a personality, it is just numbers. Siri would never be able to replace the interaction humans have to other humans. However, technology is now widely used as a medium between people to interact. Social media platforms such as Facebook, Twitter, and Instagram allow people to share their information and personalities to their 'friends' online. However, more than 50% of the people who see my Instagram photos are people I only kind of know. They are either people who I only have met once, or people who I have never met. They still feel unauthentic and not very intimate.

When it comes to social technology and locations, I still don't understand the point of checking-in on Foursquare and letting all of my 'friends' know where I am. I don't think it is a safe thing to do since my 'friends' are not always my friends.

I believe that technology can be delicate and communication through technology can be used in an intimate, emotional, and poetic way.



8 pockets



CASE STUDY

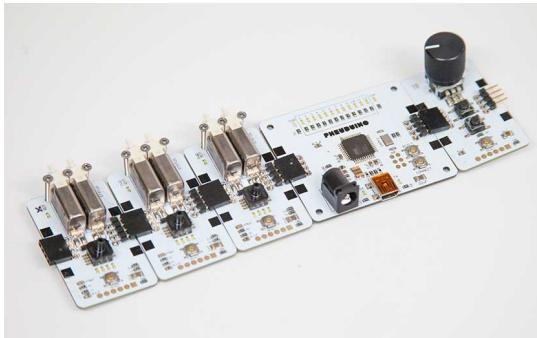
"Poetic Navigation Wearable"

Tangible Interfaces

During the Fall of 2015, I was enrolled in a class called "Tangible Interfaces" at the Tangible Media group, MIT Media Lab, conducted by Hiroshi Ishii. Here's the course overview:

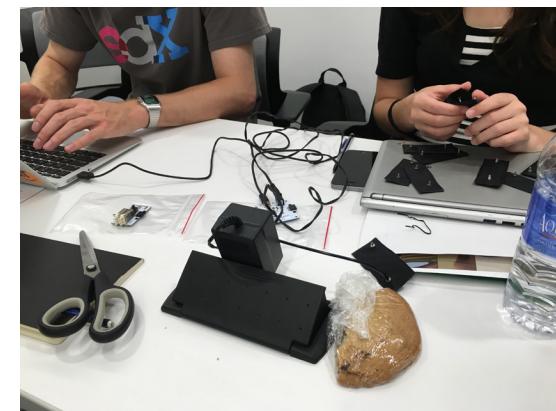
"This HCI (Human-Computer Interactions) course will explore the design space of Tangible Bits and Radical Atoms by giving dynamic physical form to digital information and computation. Our goal is to broaden the bandwidth of interaction between people and digital information & computation through *dynamic tangibles* that help people design, learn, and communicate using the full range of human senses and skills. We will pursue the interfaces that are not only practical, but also aesthetically pleasing and inspiring."

I was very excited to be in this class because my research was in the same area of human-computer interaction and multi-sensory experiences. Most, if not all, of the students in the class were engineers. In the very first class, we were introduced to Pneuduino. It was a hardware platform for kids, students, artists, designers, researchers who are interested in controlling air flow and pressure for their projects. "Pneuduino" could be described as reassembled Arduino. It came in a kit with 2 small pump motors on the Arduino. The Pneuduino came with some command codes to make it pump or inflate. The project was built by Professor Ishii and the PhD candidates at the Tangible Media group including Jifei Ou, Felix Heiback, and Lining Yao.



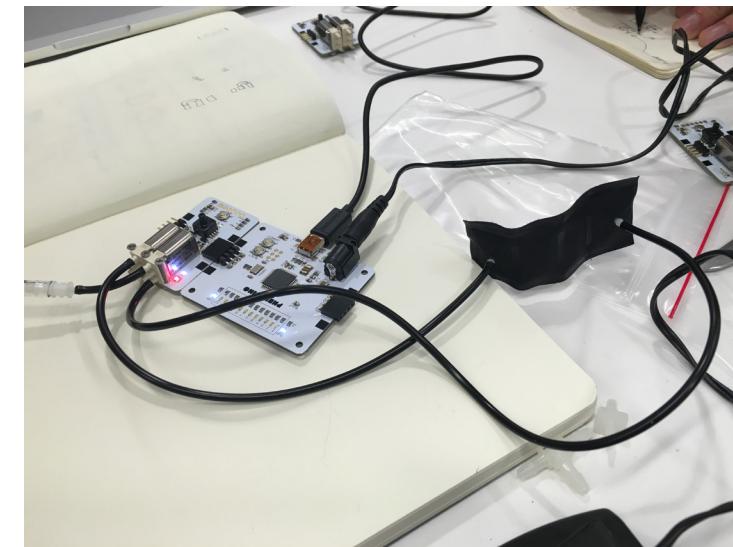
Pneuduino

The first half of that class was a presentation about the design of Pneuduino by Jifei. After the presentation was the Pneuduino workshop. We shared one Pneuduino kit between the team of 4 people. Apart from the actual kit, the box also included small fabric pouches that would be actuated by the pneumatic system. The testing fabric was made with black, thin, and air proof material. The size of the pouches were about 3 x 1". All of pouches came with different seam patterns on them. The seams were done by heat pressing. Some of them had horizontal lines across them, some had diagonal lines across them, and some had only one horizontal line in the middle. All of the lines were not sealed completely to the edges so that air could flow into the whole thing.



The team testing out Pneuduino code

Each of them had tube openings to connect to the pump. My teammates worked out the programming part and got the pumps to work. I picked the first pouch to test. I chose a pouch with simple patterns of 2 horizontal lines in the middle. We plugged in the pump to the nasal and started the pump. I was holding the pouch flat on my hand as it started to inflate and curled up into a U shape. It felt like I was holding a moving worm in my hand. The pouch curled where the seals were. We tried other pouches and used the pneumatic system to actuate them again. They all turned into different shapes depending on the scoring that they had. They also gave me different feelings in my hand.



Experiment with different pouches

This workshop introduced me indirectly to the idea of haptic sensation by pneumatics. When I was holding the pouches as they were actuating, I felt the material tension changing. I felt the change of their shapes. I felt the patterns of how they were changing. I tried looking away as they were being actuated and I could feel it even more. It was powerful how much information I could get on my skin. This inspired me to use haptic communication to give ambiguous information and see what it could enable.

Haptic Sensation

Matthew Fulkerson, a postdoctoral teaching fellow at the Department of Philosophy, British Columbia wrote a paper called "The Unity of Haptic Touch". He talked about how haptic touch is an inherently active and exploratory form of perception which involves both coordinated movements and an array of

distinct sensory receptors in the skin. For that reason, some people claimed that haptic touch is not a single sense but rather a multi-sensory collection of a distinct sensory system. This paper explained that the claim was, what he regarded as, a confusion. He wrote about why haptic touch can actually be regarded as a single sense. What interested me about this paper was that it made me realize how much information people actually get from haptic sensation. We can experience such an extraordinary range of properties including vibration, temperature, pressure, shape, and weight. Thus, despite its simplistic appearance, the typical touch experience is a complex occurrence, involving many distinct physiological systems.

I developed a project to study the idea of ambiguity in navigation technology and realized that haptic sensation was one of the methods to send information. I started to form the idea to create a 'navigation' device using haptic sensory communication, a device that doesn't require people to look at it to get information.

My intention was to use ambiguous information in navigation to allow people to explore their surroundings.

I wanted to focus on the idea of getting people to use their intuition of exploring instead of relying on their tools.



Wearables

Wearable devices are becoming more and more unnoticeable to the wearers nowadays. I want to cite the example of the earphones company Bargi again. I think the company did a good job making the device blend in seamlessly with our lifestyle. Unlike wearable wristband companies like FitBit or Nike Fuels, Bargi gave people the same sort of information without having to be visible to the user's eyes. Their product, the Dash, allows people to listen to music, track their fitness, and communicate to other people. The device has a touch control, you can listen to music by just tapping and swiping it. The company created a few touching commands to use with the device so that people don't need to pull out their phone to change the settings all the time. The device is also waterproof, they can still wear it to a sweaty workout, in the rain, or even in the shower. Of course, the earphones are also synced to the users phones, so they can easily tap the device and talk into it when they get a call. The device has a function called audio transparency. This function allows the user to amplify the sound of their ambient environment while they are wearing the device. They can choose to not be blocked off from their surrounding sound if they prefer. All of these functions were created to let people wear the smart earphones without worrying about them. The device can just seamlessly blend in to the users bodies as if they are a part of the users. They don't have to always be seen and distract the users too.

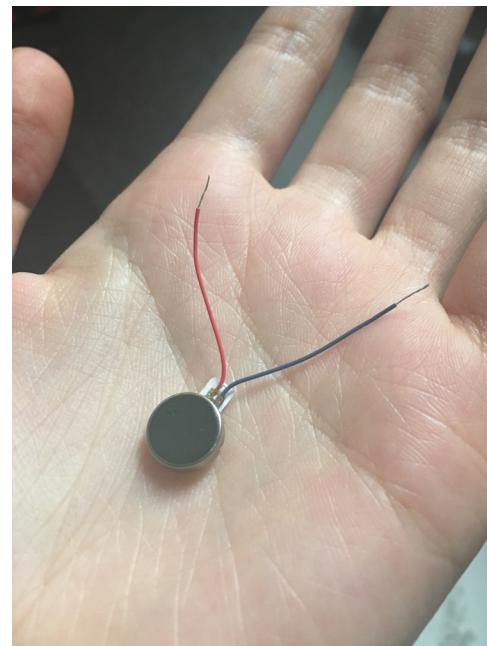
I like the idea of unnoticeable wearables. I think it is an un-intrusive way of giving people information. Even though Bargi let the users wear the devices without really feeling like wearing anything, the amount of information they give is still overwhelming. I didn't want that to be the case for my wearable.



Bargi headphones

Simple Information

I thought of the most basic way to give people directional information: a compass. Compass helps people to orient themselves in relation to the cardinal directions using magnetic. It basically tells you where North, South, East, and West is. I began to think of how I could incorporate the idea of simple directional information into a navigation wearable. I decided to make an ankle wearable device. The device would tell people the direction of their destination, not the directions of how to get there. Using pneumatics to create haptic sensations, people would get a subtle signal on their ankle, pointing at the direction of their destination. In my initial sketch, the ankle device would consist of 8 pockets around the ankle to cover all directions around the user. The pocket corresponding to the direction of the destination would puff up, giving pulses to notify the user of their destination direction. Again, I met up with Fred to discuss about how I could build this device. He suggested that there could be a lot of technical problems with a pneumatic system such as air leakage or the size of the pump. He suggested I use the vibration method to give haptic sensations instead. I wondered why I didn't think of that before.

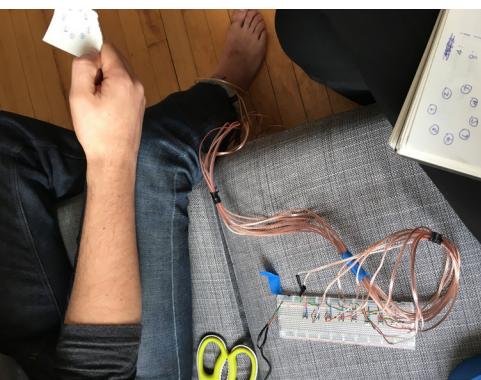


Vibrating Motor

I drew a new sketch. This time each pocket has a hole for the vibrating motor instead of the nasals for the pumps. The corresponding motor to the destination would vibrate. I first ordered 10 vibrating motors. I only needed 8 but I ordered extra just in case I needed them later. I thought that before building the actual device, I should do some user testing to see how well people feel vibrations on their ankle. Fred taught me how to connect the motors to switches, so I could control each of the motors for the user testing. I spent half a day soldering the motors to extended wires; that way I could control the switches away from the actual motors since they would be attached to people's ankles.

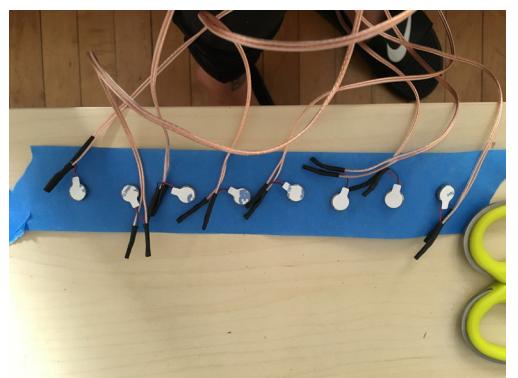
The Testing

Finally, with 8 motors connected to 8 switches, I attached 8 of the switches on the breadboard which was basically an electric circuit board. The breadboard became a remote control for the motors. With that, I was able to make a temporary ankle wearable. I made the ankle strap with 2 pieces of long tape, the size of my ankle circumference, and arranged the 8 motors in between them. I set up a user testing session with a person I know. He wore the ankle device the whole time during the testing session. The first experiment was to see if he was able to differentiate the motors even though they were sitting quite close to each other. The motors were given a number from 1 to 8 consecutively. I had a list of 10 numbers that I activated one at a time, my user then had to tell me which of the motors was on. The first time, he only got 6 out of 10 correct. The second time, he still only got 6 out of 10. I started to worry. 6 out of 10 wasn't good enough. I then tested the ankle device on myself. We switched roles and I was the one wearing the ankle device. I also got 6 out of 10.

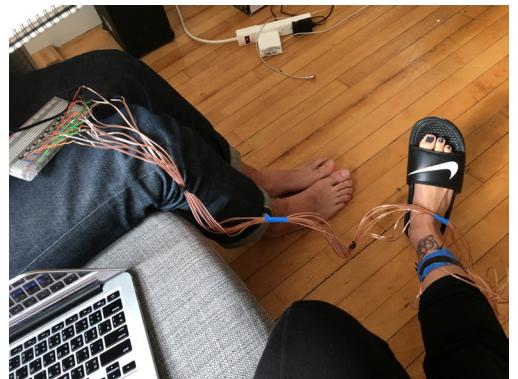


User testing

Both of us agreed that when we felt a motor vibrating, the area around the motor felt like it was vibrating as well. However, because the motors were located so close to each other, the area that was vibrating around the active motor was still a very small range. It was just confusing to tell which motor was being active by calling out its number, but we definitely knew which area of our skin was receiving the signal. I decided that it didn't matter whether the users would be able to identify which motor is active, as long as they know which area of the skin is receiving the signal.



8 motors on the tape prototype



User testing on myself



The whole point of this user testing was to be able to know if the users could use the simple signals they received to get to their destination. It was great to figure out that the user was able to feel which area of his ankle was being signaled even though it was difficult to tell which exact motor was vibrating.

To test whether users would be able to use the signals they receive from the device to take them to their destinations, I moved on the second experiment. In this experiment I blindfolded my user, assigned location A and location B, and then used the switches to control my user to get from location A to location B. Location A and location B were only around 1.5 ft apart. This experiment turned out to be very successful. The user was able to follow the signals and get to the destinations without any problems. We did this experiment a few times.

After knowing that the signals were clear enough for the user to get to location A to location B without any confusion, I then moved location B to be almost 10 ft away from location A. The experiment took place in an indoor area so the user was aware of the layout of the room and the furniture that was located around the room. There was a little bit more tension because both of us didn't want anybody to walk into something and get hurt. Using the same method, I blindfolded the user and used the switches to control him to location B. This time it was clear that he was more nervous to put his foot forward. His steps were shorter. I naturally started to give him signals in pulses instead of a continuous signal. Eventually, without any verbal communication, we were able to understand that the shorter the pulses, the smaller the steps should be. The higher frequency of the pulses, the safer it was for him to move forward. Obviously, he stopped walking when I stopped sending signals. The experiment was successful. We were able to get to location B without walking into anything.

Trust

I blindfolded the user to test the power of the signals. Would he be able to navigate without using his eyes and ears? In one episode of the Metro Connection, a radio show about culture and personalities around the Washington region, the guests talked about how aurally impaired people move through the world. Compared to people who are deaf, hearing people can hear what's occurring behind them, so deaf people are taking advantage of other cues to what's happening in their space when they get around on the street. People build deafspace which refers to space that's been optimized for use by deaf people who primarily rely on vision and touch to navigate the world. An interior deafspace might feature wider stairs and hallways, plenty of light, and seating areas arranged in circles or semi-circles.

I was interested in how subtle signals would work for different people in term of navigation. I believe people who are aurally impaired would benefit from using a haptic navigation signals. They would be able to use their vision in their surroundings more than if they were to use a screen based navigation devices.

Obviously, for people who are visually impaired, it is more difficult for them to navigate in most spaces. Especially if they are totally blind. Arie Anna Farnam, a legally blind mother, said that some people who are not totally blind can mostly see lights. They use lights to navigate. However, people who are totally blind would need tools to help with navigation such as white cane or guide dogs. Guide dogs are trained to remember the regular places that the owner goes so should be able to lead the owner without any trouble. People who use a white cane usually take years to practice. Most blind people are not blind all their lives. They have to keep a very detailed memory and use all other senses to navigate such as feeling common air currents, counting and listening to buildings, and smelling particular trees (Farnam).

I know that it is a much more complex problem to solve to design a navigation device for blind people and I wasn't trying to solve that problem. However, I found it interesting how much trust is required for visually impaired people to navigate. My user wasn't deaf or blind. To be blindfolded and have to navigate around with only the signals he got on his ankle required a lot of trust too. This experiment made me think of how trust plays such a big role when it comes to navigation technology. We trust our GPS everyday to take us to wherever we need to go. We are even starting to trust a car to drive us places on its own with the Google Self-Driving car. In the paper "Trust in Specific Technology" a group of business students at Washington State University explained that trust in specific technology is grounded in users' knowing the technology sufficiently well that they can anticipate how it will respond under different conditions. They proposed that users would be more willing to experiment with different features or to use more features of a technology because they understand it well enough to believe that it has the attributes (i.e. capability, helpfulness, and reliability) necessary to support extended use behaviors.

I wonder if people who are fully blind have the same feeling of trust to their guide dogs, or the trust is more enriched and combined with the feeling of love since dogs are living creatures. However, since dogs have the brains of their own and are not computer programed, there's a possibility of unpredicted behaviors under some different conditions. If you are unable to assist yourself, would you trust the help of robust technology or well trained living creatures more? As these questions came to me,

I realized how navigation could actually be a personal and emotional activity. It wasn't only about getting to point A to point B.

I became more interested in how I could make navigation a more meaningful and emotional experience.

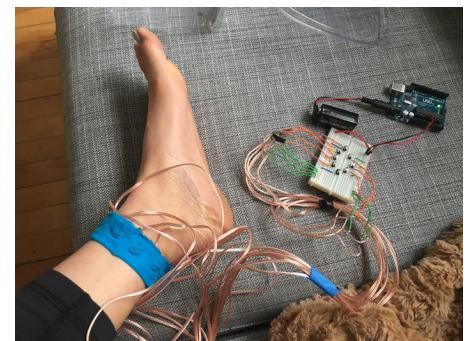
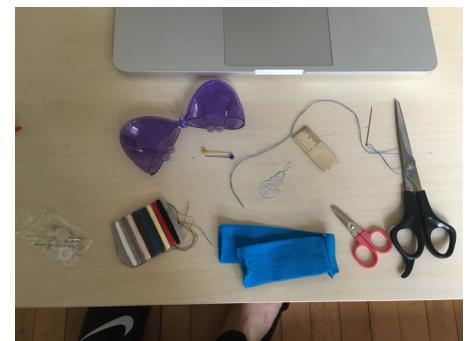
Empathy

During the experiment, I also learned that navigation could enable a sense of empathy. The user didn't only have to trust the device, he had to trust me to control the device precisely too. I also didn't want him to walk into something. I'm putting myself in the guide dogs shoes now. (Dogs ironically don't wear shoes). I felt the pressure of guiding someone to their destinations safely. I felt the sense of empathy. I knew that the user was trusting me to take him to the destinations and I didn't want to let him down. I felt the sense of responsibility. Obviously, technology doesn't feel things. I'm sure your GPS didn't feel guilty when it froze on you or took you to the wrong places. It might say sorry on the screen, but it definitely doesn't actually 'feel' it.

After the experiment, I was still thinking about how having a navigation technology as an extra layer between people could create the sense of trust, responsibility, and empathy. I wanted to expand more into this area as I developed the project. How do I make people feel these feelings when they are wearing the device. How do I make this device into almost a communication tool for people to share their feelings to each other with only haptic signals? What if these devices work together? What if the destination is another person? What if both people get signals from one another?

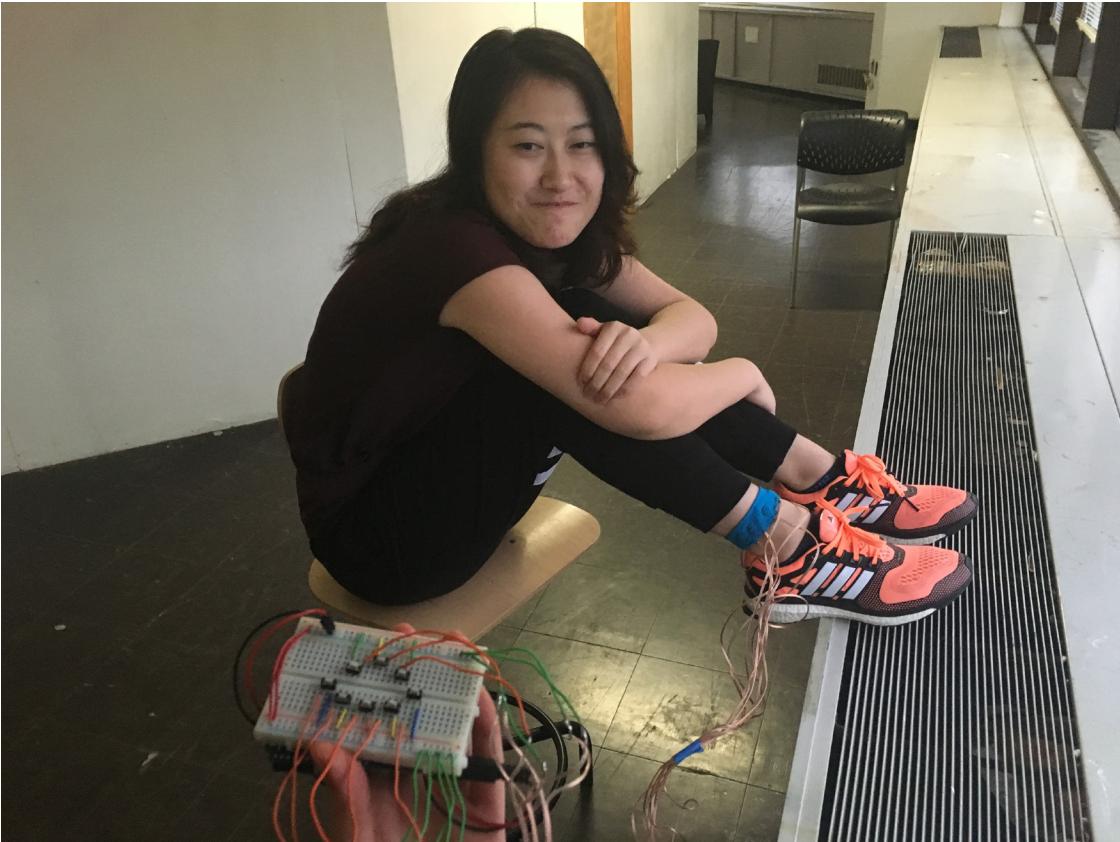
Navigating Poetically

The idea of poetic communication was something that I have never thought of before, especially when it comes to navigation technology. I didn't see how the two could merge. I wanted to find out whether two people could feel the sense of empathy while wearing the devices. However, I still only had one working device at that time. I met up with Fred again to discuss how to build two devices that work together. The technical part of this project would take a lot more time and turned out to be much more complicated than I thought it would be. Both of the devices have to be, somehow, connected to the GPS, and have to always let the other device know their GPS information constantly. While Fred tried to help me figure out the easiest way to make this system work, I worked on making the wearable device more wearable for the next experiment. Instead of using tape, I wanted to use some sort of stretchy fabric so that it fits many ankle sizes. I bought stretchy headbands from CVS and sewed the motors in there to the size of my ankle. The device now fit much better and much more securely. However, I still only had one working device to test. I decided to go back to the breadboard remote control and used it to pretend that the signals came from another wearable.



The second prototype made out of fabric

One of my classmates, Yanjun, agreed to be my test subject. I asked Yanjun to put the device on her ankle and explained to her that there was actually another person wearing the same exact device standing in front of MassArt building right now. The haptic signals that she was getting indicated the direction of where the other person was. The pulse patterns indicated the distance of the other person from her. I sat her down next to the window on the 4th floor studio, looking out to Huntington Ave. I asked her to think out loud as she received the signals, which of course, was actually me controlling the switches again.



Yanjun for user testing

The experiment was about 10 minutes. Among her comments:

- "He is waiting for the T at the station."
- "Maybe, he is going into the cafeteria."
- "Maybe, he is buying food since he is in there for awhile now."
- "He is now on the T, going toward Symphony station."
- "He is walking."
- "He stops walking."

Location-Based Information

Obviously, because we were conducting an experiment on the device, she had to pay attention to it. I thought it was interesting what was going on in her mind with just the signals she was receiving on her ankle. Everything was about the other person in relation to his contextual surrounding. However, the descriptions weren't personal at all. She was just talking purely about his physical locations. Clearly, she didn't personally know the other person since he was just an imaginary character.

During the experiment, I asked her some questions that were not location related including:

- "Why do you think he is walking that fast?"
- "What do you think he is waiting for?"
- "What he is doing in the cafeteria?"
- "Do you think he is standing under the shelter at the train station?"

Again, both of us know that the other person was not real. She didn't know what to answer for some of the things I asked. Some of the things she answered were very generic like:

- "He is in the cafeteria to buy food."
- "He is standing under the shelter at the train station because it was raining."

Intimate Relationship

To answer the questions that I asked, it required some more intimate connection with the person to be able to describe what exactly he was doing. For example, imagine if it was me who wore the device standing outside, and someone who knows me really well was wearing the device that Yanjun was wearing. They would know that I only get food from the salad bar if I go into the cafeteria. They would probably know that I only get the Balsamic dressing too. If they thought I was waiting for the train, they would know that I was probably going somewhere that was not home since I always walk home from MassArt. Maybe I was going to my class at MIT. If we are really close and the person knows my class schedule, they might even come find me after class for dinner. They would know that I like to eat around there if my class ends late.

Again, a person only gets signals of the direction and the distance of the other person in relation to them. They could use the signals they receive to navigate to each other, but clearly there are much more precise navigation technologies to help them do that. These haptic devices, however, became almost like communication devices for two people who always think of each other when they are apart. It became a tool that allows one another to explore the surroundings in the other person's shoes. Without seeing or hearing about it, they experience what the other person is experiencing. The intimacy of their relationship contextualizes the ambiguous information they receive. Unlike screen-based pop up notifications or a ringtones, the haptic signals that they receive are subtle and unobtrusive.

Instead of being a notifier, the devices become like a reminder or a little piece of mind for the 2 people to think of one another.

They are almost like wedding rings. However, unlike wedding rings, the devices don't need to always be seen by other people. If the two people trust and care for each other enough, they should be the only people to receive the signals.

Thoughts

I've learned a lot from the tests that I've done. It was interesting how I started building this project with one intention and ended up with a whole other topic. I didn't realize in the beginning that haptic communication could be so personal. Haptic communication is ambiguous since it is not a language that we normally use to communicate. By using ambiguous language to communicate, people are required to use their own perceptions to receive and process the information. When it comes to navigation, haptic communication also makes people become more attentive of their surroundings and how they navigate as they didn't fully have a functional navigation device to rely on. People need to trust the information they receive, along with trusting their own navigational instinct to be able to succeed in navigating. When it comes to navigating with other people using haptic communication, trust and empathy are also required. Since they don't get the vision or verbal guidelines that they normally get with the current navigation tools, they need to trust their own and their partner's navigation decisions instead of the accurate technology.

As I realized that navigation with other people is such a personal and intimate activity, I realized not everybody can navigate together successfully. That was why I thought that to navigate with other people is such a poetic way of communication because without trust, you won't succeed.

By always getting the location information of their loved one, with trust, the subtle signals become a reminder of the other person that is always there when they realize it throughout the day. They would be able to think of each other and explore together even when they are apart, but it would only happen if they know each other on a personal level.

I unfortunately don't have time to develop this project further yet. I wish I could have made two functional devices that work together within the time that I had. If I had unlimited time to develop this device further, I would definitely try to work with a GPS chip so that it can track real locations. It would be great if I could test them on a real couple or people who really know each other well and see how the devices make them feel. I would love to know if the devices would be able to improve their relationship or prove that they don't actually know each other that well. It would be great if people could really explore the surroundings by imaging themselves in the other person's shoes and improve their navigation skills in doing so.



Vermont, USA



Khaoyai, Thailand

Conclusion

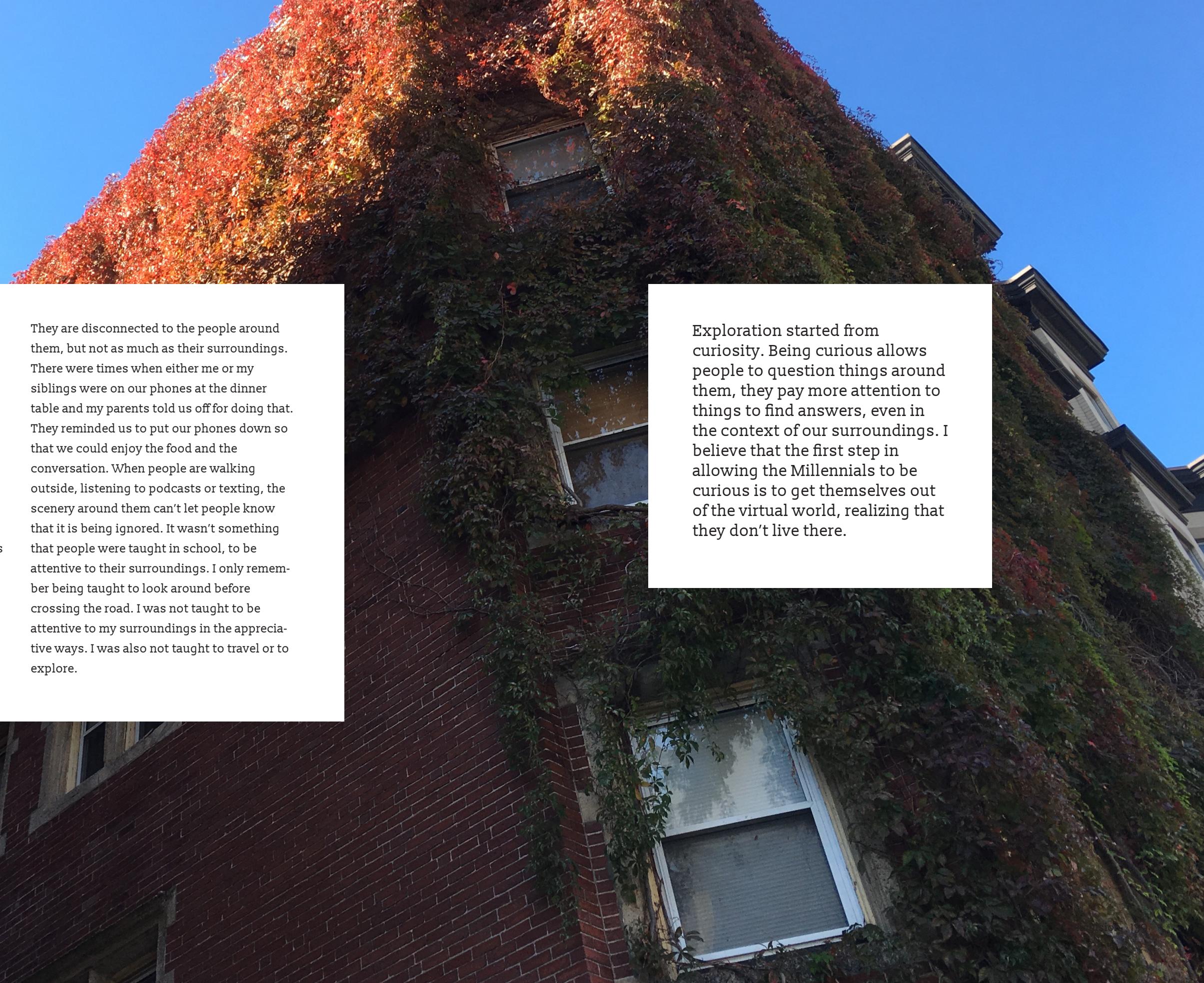
I'm aware that the subject of technology is somewhat controversial and not everyone is a fan of innovation. A movement called Luddite, started by a British man named Ned Ludd in 1812, was an anti-technology movement. The members of the Luddite were mostly working class men. They raided mills and destroyed textile machinery. They were really fearful of technology, only because of the concern that they would lose their labor work to the machines (Gregoire). Their fear of the dehumanizing potential of machine set the stage for future anti-technology movements. Today, I found out from talking to senior members of my family that they don't consider themselves to be anti-technology. They just don't really know how they work or how to use them. However, they are mostly concerned about the loss of human face-to-face interactions and human craftsmanship. People might be too reliable on technology. It is something that they are not used to since they didn't need any of them when they were younger.

During my time in DMI, I have used technology to create ambiguous information in the service of exploration. Again, I am not against technology in any way. Last Fall, I was enrolled in a class at MIT called 'City Science' was conducted by the Changing Places group at the MIT Media Lab. The project I worked on was about autonomous urban delivery. I was on the user experience and interface design team with a student from Harvard. We did projects including an on demand autonomous coffee delivery service in an office building, autonomous self-driving car that dispenses itself into smaller vehicles for people delivery, and also an on demand autonomous package delivery system. It was one of the most innovative projects I've ever worked on and I really enjoyed thinking about the possibilities that technology could bring. I truly believe that technology can improve many aspects of people's lives whether to just make something easier, or make something possible.

I appreciate both, the technology and non-technology world. I think it is obvious that technology is very helpful in countless ways, but there are also things that technology can never replace. I was born in the 90s. I was born just as the Internet was invented but it was not until I was around 13 when I got access to it. I feel truly lucky to be born early enough to experience the world before the rapid development of technology. I grew up without a tablet or even a phone until my late teens. I remember the most innovative thing that I knew when I was 13 was my brother's Play Station. Only 10 years later, now there's flying drones, virtual reality, self-driving cars, artificial intelligence, and so many other crazy things I wouldn't have imagined when I was 13. In fact, the most advanced-technology that I own right now is actually my phone. The definition of a phone is not to only call someone anymore. I can hardly think of anything that my phone can't do. I track my sleep cycle through my phone. I get a ride through my phone. I even have my phone read books for me. Of course, I'm happy how convenient having my phone does all of those things for me even though I know that my reading skills would never improve.

When it comes to experiences, it's not always about the most convenient way to do things. Yes, I would rather request a ride from my phone when it's raining outside, but I would also rather take a little bit more time to just walk if the weather is nice. I found it refreshing to be able to appreciate what I am physically surrounded by whether it's people or the surrounding itself. It always makes me feel more relaxed after working on my computer for a really long time.

I believe people should allow themselves to appreciate their surroundings more. I'm sure most people were told that it is good for them to take a break from technology sometimes. People use the phrase 'Go out and get fresh air' all the time. Even though they know it is good for their mental and physical health to do so, it is not a necessity that they have to do.



These days, people spend a lot of time working on their computers everyday. They also spend most of their free time on computers for entertainment. There's endless possibilities of things that they can look at on the Internet without having to spend any energy on it. Going outside requires them to get up of their couches, and that takes energy. People become so consumed by what's on the screens. Even though, their knowledge on things happening around the world might expand, they became so closed up from what's actually around them.

They are disconnected to the people around them, but not as much as their surroundings. There were times when either me or my siblings were on our phones at the dinner table and my parents told us off for doing that. They reminded us to put our phones down so that we could enjoy the food and the conversation. When people are walking outside, listening to podcasts or texting, the scenery around them can't let people know that it is being ignored. It wasn't something that people were taught in school, to be attentive to their surroundings. I only remember being taught to look around before crossing the road. I was not taught to be attentive to my surroundings in the appreciative ways. I was also not taught to travel or to explore.

Exploration started from curiosity. Being curious allows people to question things around them, they pay more attention to things to find answers, even in the context of our surroundings. I believe that the first step in allowing the Millennials to be curious is to get themselves out of the virtual world, realizing that they don't live there.

People are also very reliant on those technologies. They rely on GPS to take them to places. They also trust their health to their wearable devices. The more detailed the information is, the better.

The 'Navigation Watch' gave people information about how they could get to their destinations. The location information was displayed with latitude and longitude numbers with a super precise string of digits. It might seem that those numbers were the most accurate location information possible, but they were actually the opposite. It was unnecessary and definitely too difficult for people to understand. That information became ambiguous for people to read, making it impossible for them to only rely on that information to navigate.

The real intention of this Navigation Watch was to trick people into the real experience of space that they deserve. As people tried to follow the long confusing string of numbers, they would eventually get lost. That's when their curiosity kicks in. They would need to find the ways out on their own without the help of technology. They would need to become attentive of their surroundings, the landmarks, the signs, and the buildings, in order to navigate their way to their destination.

Even though it might be considered a bad experience to be lost, they would get to explore along the way and feel rewarded once they finally found their way out. It might also improve their navigation skills so that they would no longer need to use GPS to get around. This would result in them being able to walk around and get to places without the distraction of their phones, allowing them to clear their minds completely from the virtual world.

When people explore, they also get to learn. Getting to learn new things allows them to be more creative since it opens up more possibilities of things that they know. In the process of creating the 'SpaceMani' series for the You Are Here project, I realized how many ways I could keep discovering new things and new experiences from the same space. By visiting the space at different times, looking at it from a focused view, or arranging the elements in the space differently, the experience of the space was different. It made visiting the same space over and over not repetitive. Again, that space was just a small classroom with tables and chairs. Imagine how many things people would discover from exploring their everyday outdoor space in different ways.

People usually only associate exploring their surroundings when they travel to a new city or country that they've never been to before, but I believe that doesn't always have to be the case.

Their everyday surroundings could be a new discovery too if they pay attention to them.

Interestingly, I believe that this theory also applies when it comes to exploring themselves. As I conducted the You Are Here experiment, people still feel unfamiliar with their own body by looking at it from a different perspective. They felt trapped but not being able to feel familiar with their own bodies. I realized that conducting an experiment where people feel uncomfortable with their own bodies was something that I did not like to do. Exploring their bodies should be something that they do in private. People have insecurities and to put them in a situation that forced them to explain those feelings might be wrong.

I learned about empathy from doing different projects in DMI. I also learned the value of working with other people from doing a few group projects. When it comes to sharing thoughts with other people, having a common goal makes it effective. It doesn't matter if people are from different backgrounds or disciplines, as long as we have the same vision for the outcome.

The 'Manipulative Colors' project showed that even strangers can become a good team. With the common goal of what they were working towards, they knew right away of how they could achieve the task. Communication allows people to share what they know, or give suggestions to other people — the more people, the more ideas.

By giving them some clues in the form of sound, everyone in the audience could hear the clues and could participate in the performance as well. As I used the sound as an ambiguous form of clues, people had to really listen carefully to hear the differences that the sound was making. They had to be extra sensitive with their hearing and be very attentive. It was engaging because everyone in that room wanted to succeed, not only the three participants on the stage. Everyone was communicating and helping each other which eventually led to success. Being supportive of each other while trying to figure out the clues allowed them to feel a greater sense of achievement.



When it comes to collaboration in term of space, trust is the element that makes navigation personal. I experimented with how bringing other people into navigation could be a personal experience by making the Poetic Navigation Wearable ankle wearable device that two people wore together. It told the user of the other person's location in relation to them using subtle vibrating signals. Obviously, the vibrating pulses on their ankles would mean nothing personal to them if they didn't know the other person. To be able to put themselves into the other person's shoes, they have to know the other person well. They need to know what the other person likes to eat, where they like to go, or even their general day-to-day schedule. The ambiguous signals were there to guide you of where the other person might be, but they have to be the one who contextualizes the rest of the information using the intimacy of their relationships. It also took trust to wear those devices. Without trust, the devices could bring users anxiety every time they get signals that were slightly unexpected.

Obviously, ambiguity played a big role in my research. I was able to convey ambiguous information by not giving direct information, changing the interface, or giving only clues. I truly believe that exploration derived from curiosity and people are curious when they don't know. With all the automation technology nowadays, people just don't get a chance to not know things anymore. Technology can tell them anything they need to know in a very short period of time. No effort. It is obviously not a bad thing that technology is so fast, smart and so accurate. It makes things so much more convenient for people. But again, exploration is a personal act and technology will never be able to replace that.

Ambiguous information stands in between the line of knowing everything and not knowing anything at all. It tells enough to provide some convenience for people, but vague enough to let them think. Ambiguity allows room for curiosity, imagination, and perception. It makes experiences more personal and even emotional. In the age of information technology, it's unavoidable for people to rely on those accurate informative devices for every aspect of their lives. My research showed that by using ambiguous information, people were encouraged to explore. It let them be curious, let them think, and let them feel rewarded from putting effort into doing so. It also reminded them to appreciate what they are physically surrounded by, whether it's the people around them or the environment. It allowed them to take some time off from the virtual world they were living in.

During the process of working on this thesis, I've not only learned a lot about the subject of exploration, but about myself as well.

Coming from an architecture background, I was all about practicality and precision. Now, I am able to bring my initial interest of space and tie it to something personal like exploration and feel comfortable doing it. I learned from talking to other DMI students about their projects — how they approach their projects, and what they make the projects valuable to them. Everybody has their own interests, and their interests didn't just come out of nowhere.

Each of the case studies that I put in this book have been done prior and during my time in DMI. As I reflected on my life during the time I made these projects, I found myself reflecting on common ideas: experience of the people, innovation, and exploration.

As I organized this thesis book into chapters and categories, I was able to understand even more of how those topics resonate to my personal experiences in life. From getting my first phone, going through the school pick-up system, and even being in a band. After finishing this thesis book, I plan to carry on with using what I've learned about myself to continue doing what I'm interested in: researching users, space, and technology. I also plan to branch out into areas that are out of my comfort zone, exploring new areas that I might enjoy doing even more. I don't have plans to stop being curious anytime soon.



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