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Project Proposal – Haptic-Freq

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PART ONE: OVERVIEW

I decided I wanted to explore the domain of interactive tangible user interfaces. I have always been intrigued by the concept of manipulating objects in the physical environment to create impact and effect in several environments. Therefore, I decided I wanted to create a device that physically interacts with the user, but that is guided by the virtual environment.

I essentially plan to create a handheld device that horizontally translates back and forth. The physical principal characteristics will resemble an accordion like object. The user's objective will be to stretch and compress the object in relation to an auditory que. A spring will be used as the backbone for stretching and compressing. Thus, the resting position of the object will be compressed. A random tone in the octave range will be played, and with the guidance of stretch sensors and haptic feedback modules, the user is to pull the device to the point at which the horizontal motion resembles the frequency being played through the auditory device (headphones). Several tones will be randomly selected from an array, and the user must physical create said tones in a timely fashion. Once the sequence is complete, the combined tones, or jingle will be played aloud for the user to observe what they have played.

In addition, the physical body of Haptic-Freq will incorporate a headphone port where the randomly selected tone will be play backed. The user will wear headphones to allow for the experience to remain contained and individualized. The headphone experience allows Haptic-Freq to become mobile and be used in the setting decided by the user.

PART TWO: RESEARCH QUESTIONS

Think of a context and an environment where you would like to intervene. Where will you present your project? Who is it made for?

Haptic-Freq is deigned to argue the notion of a musical instrument and provide realization that an instrument does not have to fit into the traditional roam of popular culture. The entire purpose of Haptic-Freq is to allow users to explore an inverted musical device that requires audio input, rather the create audio output. Its purpose is meant to make people realizes that a digital instrument may not create sound at all, rather it may use human interaction for frequency sequences, or modulation of prepared sound.

I would present this project in two ways. Firstly, I would propose my project to interactive multimedia exhibits, which would allow visitors to learn about the concept and try it for themselves. I believe further research could arise in the realm of guided auditory experience through tangibility and haptic sensations. I may secondly propose my project as a children's game where they need to stretch and compress the object in a timely matter to recreate the tone. The tones would increment, and the user would have to locate the additional tones in a timely fashion. Said tones could be segments of jingles, where when all segments have been played, the jingle would then playback for the user to hear. Therefore, children would learn about tangibility interaction through series of audio games.

Think about the kind of relationship you wish to foster among and between your users and the artifact or installation. What will your project afford users and how would the experience make them reflect on themselves, their environment, society, and your intentions?

The concept of the project is to interconnect unusual interactions and vary the preconceived notion of what a virtual instrument is. I would like the users to disregard their sense of vision while playing this instrument and truly focus on vibration and distance. The user needs to foster their relationship of sound and touch, and trust that it is possible to create an auditory experience by using tangible material that do not create auditory output.

I believe my project will afford users by its physical traits and sensorial experience, as well as excite and hook users to the always changing experience. Every user will have a slightly different experience with this project since every user has different in physical and mental traits. One may find it difficult to stretch and compress the spring mechanism, while others may find the haptic feedback interval bursts provide a physical shake that triggers internal emotions, and or memories. The point being – the device will allow each and every user to think and relate to the world around them differently when they manipulate the object, as there is no set way or predetermined emotion that correlates to the experience. I believe the best user experience will occur if the user closes their eyes. This will allow them to escape their physical and societal environment and embrace their inner sensorial self. Removing vision as a characteristic allows one to put further emphasize the experience, and removes unrelated distractions of the world.

Think about the notion of empowerment. Is your artifact really helping or challenging users?
I envision Haptic-Freq as a project that may build up ones level of empowerment through use of the project. For instance, a user may struggle with self-determination and indecision. Haptic-Freq may assist with this, as it forces users to make decisions quickly with the sole penalty being that the frequency sequence will restart if they take too long to physically recreate the tone. Objective based procedures often help one become more comfortable with themselves, as they gain levels of self-determination and or empowerment through small victories.

Haptic-Freq was not conceived with this specific goal in mind; however, I believe it is important to acknowledge that though an experience of low-cost consequences, comes the potential for one to try and act in that represent intimidating scenarios. As I reconcile the ideology of empowerment of the project, I understand the mentioned biproduct at a larger scale, and start to identify the educational possibilities that may lay within the experience.

On the other end of the scale, some users may find the experience challenging because it requires one to recognize that despite the simple operation, and project objective, it will still outsmart the self-determined individual because the program makes the decisions for the users. The user must listen and act upon its demands, and not the demands of oneself. Therefore, the notion of empowerment will be subjective to the user. I believe this is a fantastic quality to the project, as the initial intention is that each user has an individual experience that connects them to their inner being.

Think about how to successfully communicate your intentions - what Interaction Design Strategies will you employ? What are you trying to tell us?
In order to successfully communicate my project intentions, I will be employing aspects of all five dimensions of interactive design; words, visual representations, physical objects or space, time, and behavior.

I believe the strategy of physical objects or space become a necessity for my project because a user must physically interact with the project. In terms of space, I believe the ideal user experience will be obtained in a quiet individual environment, as the goal is to have the user disregard their surroundings and fully focus on the interactive experience. The introduction of external variables, and sensorial distractions would likely tamper with the projects true experience, and dimmish the users value.

Another important strategy would include the behavior of the project. Once could analyze how users manipulate the object and how they essentially operate it. Perhaps they position the spring back to its maximum compressed location, or they start the process with it fully stretched. The notion of how a user manipulates the project could define their emotional connection to the experience, and thus explain in turn why they physically interacted with the object in the way that they did.

In conclusion, I am attempting to explain that the design strategies are the starting variables to the overall user experience. They are the reason one acts and feels a certain way when directed towards the project.

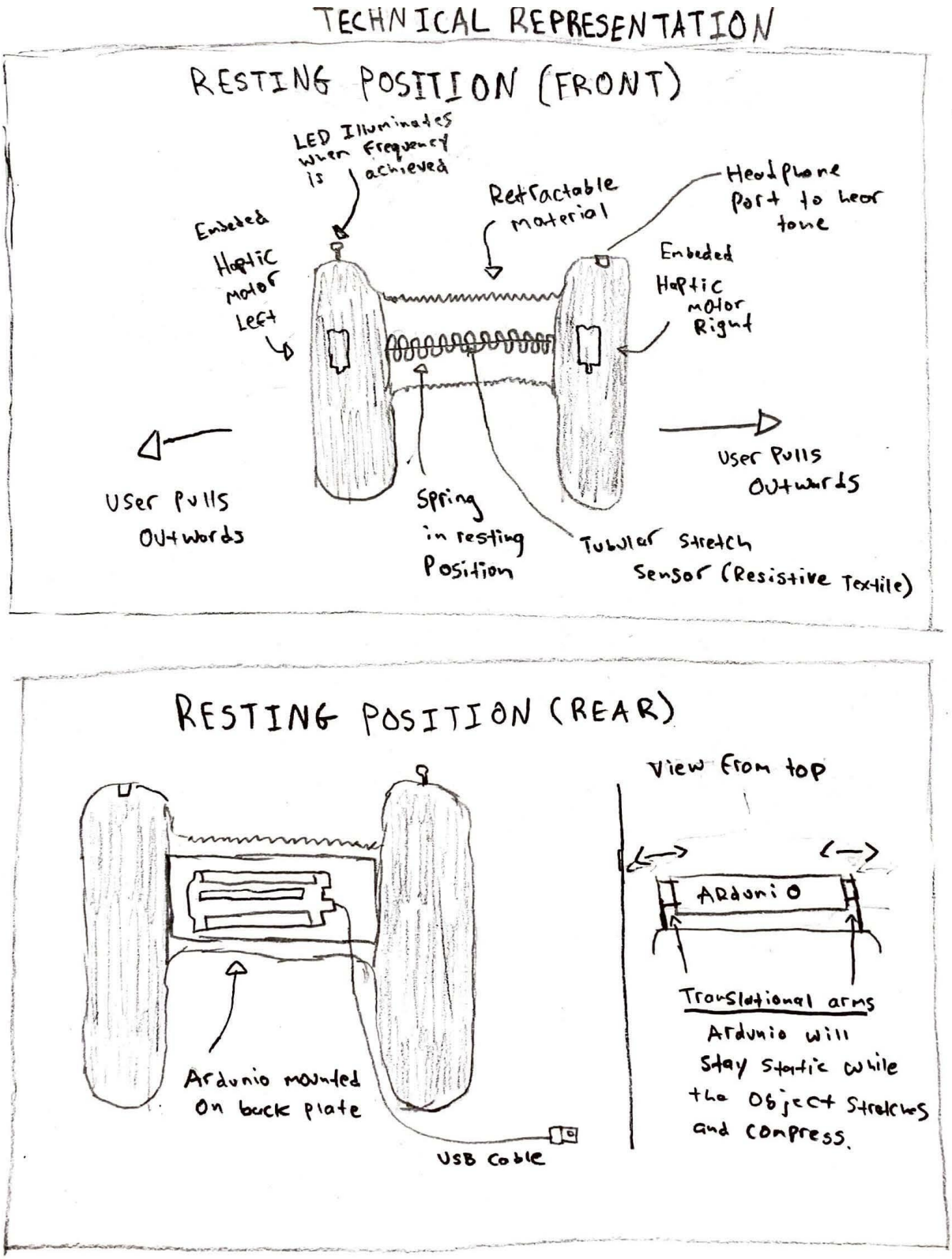
PART THREE: NON-TECHNICAL EVALUATION OF SENSORS

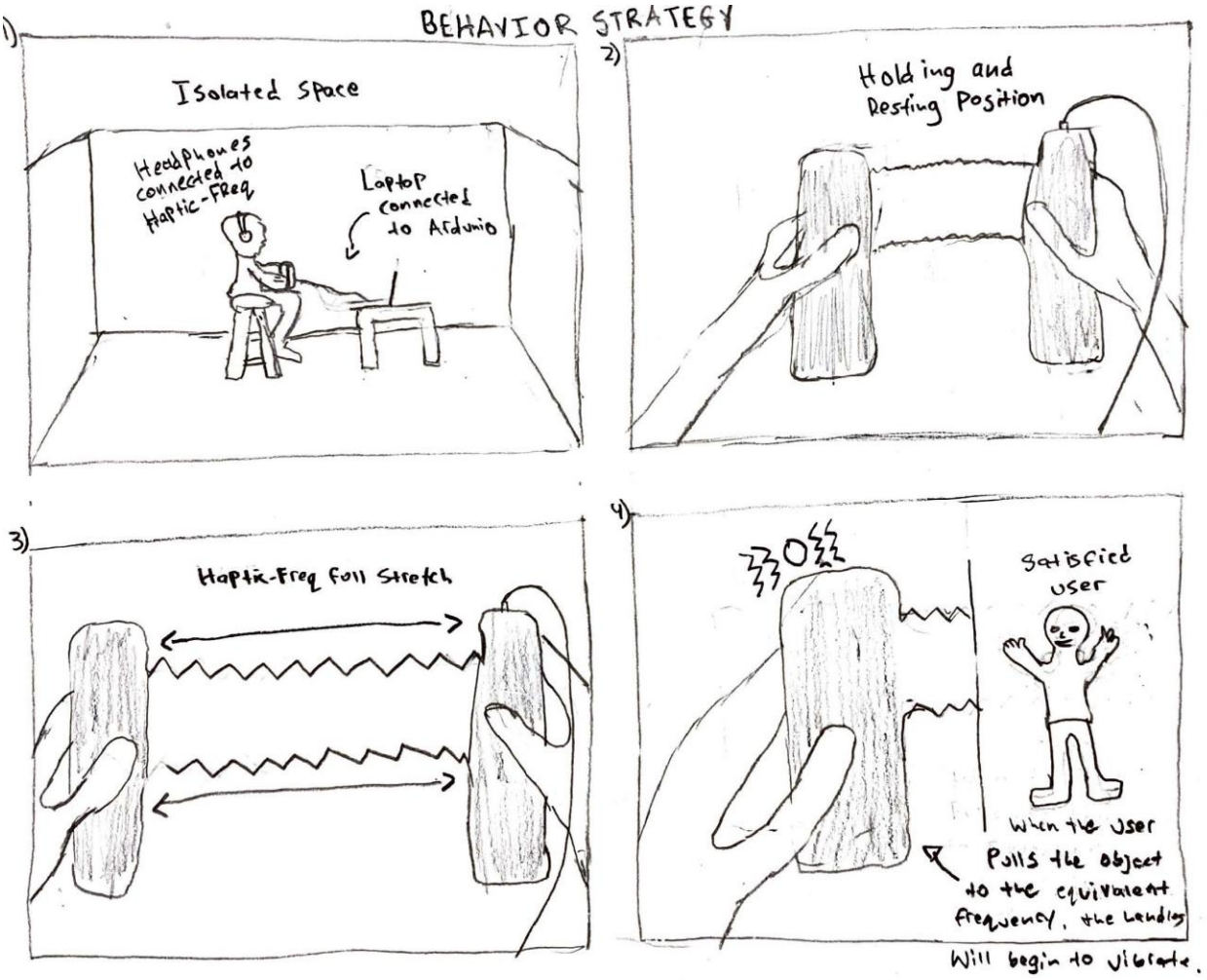
Required Sensors:

1X Tubular stretch sensor: The tubular stretch sensor will be made from an analog textile that changes its resistance when it is pulled and stretched. Essentially, it will create a variable voltage divider that Arduino can read and assign values to. The sensor will be mounted inside the spring, and be stretched upon user interaction. It will remain unstretched within the spring when Haptic-Freq is in its resting position.

2X Grove Haptic motors: The haptic motors / sensors emit a vibration. In essence, one haptic motor will be mounted in the left handle, and another one will be mounted in the right handle of the device. These motors will complement the design strategy of object behavior. The interval of vibrations will decrease, and will become more as a pulsing sensation when the user gets close to replicating the frequency tone. When the user matches the frequency value of the outputted tone to the stretch value, the motors will perform a short flat vibration to indicate that the replication objective has been met.

PART FOUR: VISUAL STORY BOARDS OF THE PROPOSED INTERACTION DESIGN




BEHAVIOR STRATEGY
1)
Isolated Space
Headphones connected to Haptic-Freq
Laptop connected to Arduino
2)
Holding and Resting Position
3)
Haptic-Freq Full Stretch
4)
Satisfied user
When the user Pulls the object to the equivalent frequency, the handle Will begin to vibrate.

PART FIVE: REASEARCH THREE SIMILAR PROJECTS

Similar Project 1 – Haptolin

The first project I researched is called “Haptolin”. A 3D printed Ardunio based, micro tunnel midi instrument. The project implements native midi protocols for easy plug and play use with most synthesizers. The user wears the haptolin on their hand and plays it by pushing their index and middle finger forward against dedicated pedals. Said pedals are connected to rotary potentiometers which adjusts the voltage resistance, and thus produces the sound modulation. The user also experiences tactile feedback from analog motors and elastic bands. The stronger the user engages the pedals, the stronger tactile feedback they receive, which allows one to identify the note that is being playing. The index finger adjusts the dynamics of the frequency, while the middle finger adjusts the pitch. This project incorporates the use of 3D printing, which I find fascinating because it opens the opportunity to create a professional tangible user interface that is specifically designed for the need of the project.

This project is similar in the sense that both Haptolin and Haptic-Freq revolve around manipulation of sound by physical means using the users’ hands. The project is available on Arduino’s project hub and I plan to refer to it while building and programing Haptic-Freq.

Similar Project 2 – Play Polyphonic Tones!

The second project that I researched is called “Play Polyphonic Tones!” It is a simple example of how to play tones through Ardunio, with the ability to pause the tone and select a different play location of the polyphonic tone. This project caught my attention because it addresses how to play 8-bit music, with more than one note while the main sketch is running. My current intention is to only play one note at a time; however, this project’s code may help should I decide to create two (2) note tones for user replication. This project may not have too many direct similarities, however it uses sensors and circuit modules, like the potentiometer that I also plan to use. Therefore, it provides me with an understanding of how I may be able to modify the sensors and modules for my needs.

Similar Project 3 – Make Musical Instrument using Ardunio And Flick Large

The third project that I researched is called “Flick music”. In essence Ardunio is programmed to convert hand-waving gestures above a 3D gesture flick board into musical notes. The project requires the use of a Pi Supply Flick, resistors (4.75k ohm), capacitors (10 nF), RCA interface for sound output, speaker, and Ardunio Uno. The similarity to proposed Haptic-Freq make light in the sense that the user controls this project, and creates audio modulation with hand movement. I find this project additionally interesting because the audio output is simply implemented by connecting the inner and outer cable conductors of an RCA cable straight to the respected output pins on the Ardunio. This allows me to understand how I may even be able to re-create this without the use of a TRRS 3.5mm Audio Jack module.

PART SIX: HOW HAPTIC-FREQ WILL BE DIFFERENT AND IMPACTFUL

How Haptic-Freq differs from "Haptolin"
The main difference is the objective of the haptolin is to modulate sound, while with Haptic-Freq it is to interconnect physically with predetermined modulated sound. Haptolin incorporates midi interaction, however my project will not. My intention is that my audio input / output interaction will communicate with the connected computer, and simply look for the frequency output value to match the frequency input value from the stretching and compressing.

How Haptic-Freq differs from "Play Polyphonic Tones!"
This project differs from my proposed project because it is simply an audio playback device. It also only plays one specific combined tone, whereas mine will play single tones that are randomly selected from an array list. Play polyphonic tones also incorporates a party style RGB led that changes as the tone's playback, my project may incorporate a single power on indicator led and led for when the users archive the desired frequency playback location. Lastly, this project incorporates a potentiometer to control the starting location of the playback tone. I too plan to use a potentiometer; however, I will use it as a volume controller to allow the user to adjust the level at which they hear the tones in their headphones.

How Haptic-Freq differs from "Flick Music"
The most prominent difference from my proposed project to Flick Music, is that my project is guided by physical haptic sensations, as where Flick music does not have any guiding attributes. Flick music allows the user to essentially play the interface as they wish. Haptic-Freq requires that the user follow the played frequency with intention for physical replication. Whereas, Flick Music does not have any notion of physical touch – the users swipe their hand above the Flick pad to create the modulation. Lastly, flick music uses a large speaker for audio output, where as Haptic-Freq will use headphone output to create a more intimate relationship with the device.