EVERYWHERE = NOWHERE = NOW

PROJECT PROPOSAL | CART360

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NON-TECHNICAL PROJECT DESCRIPTION | FOUR 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?

The project is rooted within the intention of expanding the understanding and perspectives of its creators by approaching unfamiliar contexts and situations; to adapt to their languages and efficiently interact with the envisioned users, as well as offering them a meaningful experience. The project introduces its discourse starting from the beneficial involvement of people of all ages in a varied spectrum of leisure activities, healthily stimulating body and mind via uplifting exercises. However, this design particularly tries to observe the structures of the most common and accessible options offered in our current society and context; while one cannot speak of lack of creativity in either shapes or sounds, further inspection is required when discerning the inclusiveness of certain media. A disappointing yet logical framework begins to outline itself: the market is inevitably pushed and fed by profitable choices, which in turn will be dictated by a target whose profile adapts to the weights of the majority. The resulting scenario presents specific groups of mindsets designing products for an audience of the same context; objectively functional on a financial perspective yet lacking when considering the encompassment of and outreach to a broader audience. Following this line of reasoning, our team has specifically focused on the activity of dance and choreography: saturated with shapes and forms, it reifies an approachable recreation setting with innumerable benefits, both mental and physical. Moreover, regardless of its context, it mostly revolves around the senses of sound and touch. Although a considerable amount of structures rely on largely sight-based directions and feedback – one could think, for instance, of the presence of mirrors in dance studios to provide immediate visual assessment, or the format of the *Just Dance* platforms – it is not unthinkable to diminish the significance of these elements and better adapt the activity for our chosen targeted audience: visually impaired people. Analogous to the malleability of dance, the design is not built on a set age-range restriction, rather it concentrates on exploiting a different context to try offering a valuable sensorial experience.

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 project itself consists of a wearable artifact, a glove, exploiting the sense of touch to comfortably guide blind people in performing and/or learning certain dance moves or choreographies. Carefully mapped and equipped with vibration motors, the artifact provides straightforward directions to its user concerning which body part to move, when and, to an extent, how (for instance, 'how high') to move it. Subsequently, the user's reaction will be registered by the artifact - more specifically, by certain 'straps' attached to their body - which will then provide appropriate acoustic feedback accordingly. The design naturally takes into careful consideration the present developments put into place when assisting visually impaired people in the process of learning to dance. Students will initially need to be motored through the movements, directed by the physical guidance of the instructor. Similarly, this project focuses on tangible directives and acoustic feedback, although it hopes to partly override the role and necessity of the instructor as indispensable origin point, while trying to offer more autonomy to the dancer themselves. The artifact as a wearable glove crucially reinforces this intention: if the design is successfully perceived as an extension of the body and coordinating system of the student, it will more likely elicit a cohesive balance and collaboration between artifact and user, thus originating a meaningful, enjoyable experience. Dancing is undeniably beneficial for all learners involved, including blind people; it "can improve students' movement, coordination, independence and can also help the student increase their orientation and mobility skills". If anything, the project aims to facilitate a process that has already been demonstrated to work by trying to offer an intermediate step, a medium, that comfortably blends with the user's body and mindset directly. Furthermore, the project originates from the intention of promoting inclusive designs and installations, to stir up the discourse around accessibility when it comes to commodities and structuring our society. Lastly, it represents both an experiment and an encouragement for designers to closely work with their targeted audience in order to mold an operative path between product and user.

THINK ABOUT THE NOTION OF EMPOWERMENT. IS YOUR ARTIFACT REALLY HELPING OR CHALLENGING USERS OR IS IT JUST ANOTHER PSYCHOLOGICAL PROSTHESIS?

The project articulates itself as a wearable artifact aimed at facilitating coordination between the nervous system and motor skills. Objectively, it consists of tactile yet subtle directions originating on a very concentrated percentage of the student's body – their hand – guiding and engaging larger movements; if carefully constructed and efficiently designed, it would allow for the targeted audience to successfully engage in the dancing and choreography activity. However, our belief and hypothesis are that the artifact would also seek to lessen the necessity of external third parties involved in directing the students, thus hopefully generating a sense of independence that may paint dance in a more approachable light. Under this perspective, the design might as well start as a psychological "crutch" of sorts; subtle enough to smoothly blend within the student's motions, it could encourage visually impaired people to attempt partaking in the exercise. Subsequentially, if effectively engaged, the student would then start benefitting from the more palpable advantages of dance. Exercising would firstly provide the opportunity to increase and maintain a certain level of physical and mental condition and strength. In addition, considering the notion of choreography as commonly recognized as a form of art and expression, it would offer a pleasant and constructive relief valve for students of all ages. Lastly, yet not for importance nor impact, dance activities usually imply the involvement and congregation of space and communities. Although our project sets its ambitions at one single artifact, it certainly engages in an alternative scenario in which multiple devices are plausible and allow for a community of small scale to exchange moments and sensations while sharing the same experiences. Overall, the artifact would introduce itself as an implied psychological reassurance and invite users to engage in exercises that are proven to benefit participants physically and mentally, inclusively.

THINK ABOUT HOW TO SUCCESSFULLY COMMUNICATE YOUR INTENTIONS - WHAT INTERACTION DESIGN STRATEGIES WILL YOU EMPLOY? WHAT ARE YOU TRYING TO TELL US?

"Dance is a visual art. It is difficult for visually impaired individuals to enjoy dance as an art form, not only as therapy. We need accessibility and sight assistance through touch to take classes. I teach workshops throughout the year. I would love to work with university dance departments to start a program to introduce movement for visually impaired dancers. They are our next generation of educators."

Mana Hashimoto is a choreographer and performer who lost her eyesight in her 20s and has been dedicating her time and career researching efficient ways to adapt and convey her passions to visually impaired people curious about choreographic dance. Her work is both inspiring and crucial to outline and sustain the core of our own project. Mere observations and reflections concerning the availability and accessibility of our social structures overlap with a discourse previously mentioned: a concrete, general lack of inclusivity. Our research reinforced and simultaneously brought forward the challenges that visually impaired individuals would potentially face when participating in a specific activity – we objectively analyzed the situation and concerns within it. However, none of the students responsible for the project are directly involved with or share the context of the very same audience targeted by our design. Such preamble lacks reliable logic: how can people who are detached from the situation construct an artifact that proves helpful or advantageous? The answer to such inquiry links this study to the decisive character of the project itself (ironically kept for last): **Participatory Design**. Our artifact is an approach and theory that necessitates being embodied in a context, in situated frameworks, to be tested and perfected, to be proven reliable, or perhaps entirely invalid. Although designing a device astoundingly revolutionary would prove an ambitious – and quite frankly improbable – achievement, our project is founded on the process and mindset of a collaborative feedback channel between designer and user. As discussed in previous lectures, the absence of consideration in regards to the actual needs of the user would make for an installation that may function but cannot possibly be associated with contextual coordinates. The intention, although experimental, is (in case of approval regarding the proposal) to reach out to associations and groups who connect visually impaired individuals in communities specifically dedicated to their context; establishing that crucial communicative channel to engage in a meaningful creating process. Perhaps, the participatory approach and inclusive tendency should be read as the most valuable component within our project.

NON-TECHNICAL EVALUATION OF SENSORS AND AFFORDANCES

Our product will mainly be built with accelerometers, a speaker, and transmitter sensors. The accelerometers are essentially sensors that detect the user's vibration while they are in motion. These devices will provide feedback and information about the user's performance. The collected data will also indicate how well the individual is able to follow the programmed requests and commands. Then by implementing transmitter sensors, the data can be communicated from one Arduino to the other. The next sensor is an audition actuator. This speaker device will encourage the user to mimic the movements by playing a cheerful victory sound. In return, it will play a sad failure sound whenever the user misses a movement or does it incorrectly. By receiving audio feedback, it allows the blind individual to get a response to their action which will motivate them to continue, or to come to a stop if they get discouraged by the repetitive failure sound. Although the user may refuse to reproduce movements that are pre-determined, they are strongly encouraged to follow. The audio feedback will then inform the user about their level of comprehension of the task. We ultimately decided that we would keep the feedback loop simple as our prototype because too much information at once could overwhelm our first-time users. However, if time allows us to refine our prototype, we will add a distance sensor as an option to measure the distance between the user and the walls for instance. This feature would help the individual achieve larger movements in a more spacious area.

SIMILAR PROJECTS

"FINGERSCAN"

This is a tactile music wearable created for a research project called "touchmysound" in 2016. It uses ten vibration motors attached to the fingertips, two Arduino UNOs, capacitors, resistors, diodes, transistors, and a switch regulator. It can serve a variety of purposes. For instance, it can allow deaf people to experience music through touch, allow people to communicate via touch, let people feel the sensation a pianist feels when they perform, and even potential medical uses. It uses two Arduinos, one for each hand, to control the rhythm, duration, and intensity of the vibration from the motors. The patterns of the vibrations can either be pre-programmed onto the Arduinos or controlled in real-time using a computer. The goal of the project is to translate musical elements to a tactile level. The focus of this project is purely on the sense of touch, no sounds are present thus the user does not need to be able to hear. The two Arduinos can either be separate or be synched together to send data to one another. To do so, a wire is needed to connect the TX and the RX pins, as well as updating the software on both of them to include this feature. To be able to supply the power to all ten of the vibration motors at the same time if needed, an external power source is used to give 9V to the Arduinos while a switch regulator is used to reduce the voltage down to 3.3V so it can safely be passed to the motors.

“THIRD EYE FOR THE BLIND”

This is a wearable worn on the body with the purpose of helping visually impaired people. It consists of five Arduino Pro units, five ultrasonic sensors, five perfboards, five vibrating motors, five buzzers, five red LEDs, five slide switches, two female and male header rows, various jumper wires, a power bank, a battery, and some elastics. This device uses ultrasonic waves in order to detect obstacles and then uses vibrations and buzzer sounds to alert the visually impaired user. Because blind people have to navigate without sight, they must use a cane which is not very convenient. With more money, they can get a seeing-eye dog or a smart device. However, a dog is very expensive and smart devices tend to be complicated to use. This device was the result of a project that aimed to develop a way to help the visually impaired to move quicker and more comfortably without being expensive or requiring a lot of time-consuming practice before being able to use. The creator claims that the prototype they made costs less than 25$ to make. This wearable consists of many parts. There are five ultrasonic sensors, each on the two shoulders, the two knees and the left hand. With these sensors, the user can detect objects all around them through vibrations and beeping sounds of different intensities. The closer an object is from a certain direction, the louder the beeps and the stronger the vibrations. This project has won first place for the PPT Innovation award and second place in a state level science fair.

“MUSCLE-MEMORY PROGRAMMER”

This is a device that teaches typing by getting the user to learn and memorize the proper finger to use for typing each letter on the keyboard. By practicing using this device, the user should develop muscle memory and become a fluid typist. It consists of two cycling gloves, a computer program using both Python and Arduino IDE, two vibration motors, two Darlington transistors, resistors, diodes, a prototyping board, Cat 5 cables, and an Arduino Nano. The ten vibration motors are placed at the knuckle area of each finger. The computer application is programmed using Python, specifically Tkinter, to choose a random word from a list of the 100 most common English words. The word is then spoken through the computer speaker and it appears on the screen. The computer sends the signal to the Arduino. The Arduino then decodes it and transfers the finger commands to the correct motors. There is a slider the user can use to vary the rate at which the program sends out commands for the letters to the vibration motors. On the screen, as the correct letter's key is pressed, it appears below the whole word, letting the user receive instant feedback. If the current word is too difficult, the user may click a button to skip to the following word. The inspiration for this project, according to the creator, is a computerized glove from Georgia Tech that taught someone to play a piano song. This project has received media attention, appearing in the September 2014 issue of IEEE Spectrum magazine.

OUR PROJECT

The device that our project aims to create is similar to the three projects mentioned above in a couple of ways, but it also differs from them. Just like the 'Fingerscan', it has the goal of teaching the user to accomplish an artistic objective using a sense not normally demanded of that particular art form. Fingerscan teaches music using touch when music usually challenges one's sense of hearing. Our device uses touch to teach the art of dancing, an art usually requiring sight to be able to follow a choreography. Just like the Fingerscan, our artifact uses vibration motors at the end of fingers. However, we only use five motors because we only use one glove. Another similarity is that both these projects have accessibility in mind. The Fingerscan can let deaf people experience music and our invention helps blind people follow a dance routine. Compared to the Third Eye for the Blind, our project is more specific in use. Our project also utilizes a speaker, vibration motors and sensors, but it is meant solely for dancing, rather than everyday navigation. We use accelerometers to detect motions of the user's body while the Third Eye for the Blind detects the location of objects around the user instead. The Muscle-Memory Programmer teaches typing and uses a computer while our object does not require one, since it should be small and easy to wear so the user can dance without hindrance. Overall, each of these three projects was successful and helpful to different people and we will study their methodologies when constructing our creation.

JOURNEY MAP | FLOWCHART

The intent of this project is to help reduce some of the disadvantages blind people have when it comes to dancing or learning a choreography. For sighted individuals, it requires no effort to see dance moves and imitate at least the overall movements of the body. Even if learning the detailed moves and positions takes time and practice, following the general x and y axis locations of the limbs does not require much thought. However, for a blind individual, it requires someone who gives detailed verbal descriptions regarding the positions of every body part. Blind people, due to necessity, have acquired a keen sense of touch. This project aims to help visually impaired people directing their limbs without needing vocal instructions to assist them learn dance moves; it does so by communicating with them through their acute sense of touch, while providing a meaningful experience through acoustic feedback.

CART360 Project Proposal | Flowchart

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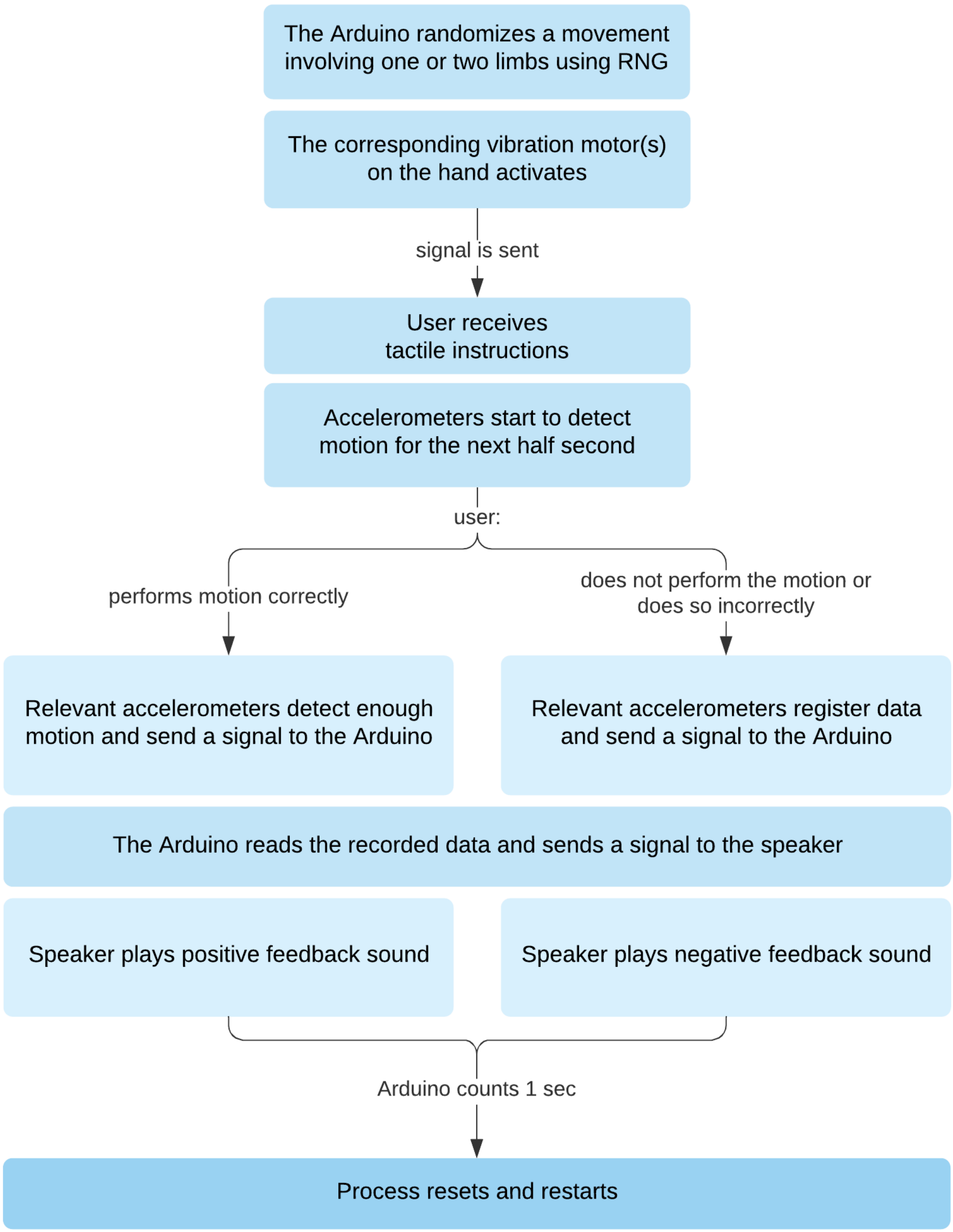

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NOTES:

- https://www.sciencedaily.com/releases/2010/10/101026172021.htm (enhanced sense of touch)
- https://www.sciencedaily.com/releases/2018/08/180801115308.htm (sense of hearing is not improved for the blind)