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PROJECT PROTOTYPE | CART360

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PROTOTYPE PROGRESS REPORT

ADDRESSING THE IMPLICIT CONCERNS OF *WHY DO WE PROTOTYPE?* & FIDELITY LEVELS TO THE DEVELOPMENT PROCESS OF THE PHYSICAL PROTOTYPE

In response to the question of "why we prototype", we initially have to understand the problem we wanted to solve while building our artefact. To bring our idea to life, we had to use the materials and resources we already acquired. We also needed to take into consideration that some interactions are not as intuitive or familiar for visually impaired people. Therefore, the solution would be to implement responsive clues that are using the sense of touch, hearing, smell, or taste. However, we narrowed our options to the sense of touch and hearing knowing that it would be difficult to include, or even access to technology enabling the user to taste or smell. Due to the time limitation and limited access to specific materials that would possibly increase the performance of our product, we had to find a way around to build our prototype and make the main features function properly. We then encountered multiple challenges along the way. We realized that using only a buzzer or sound feedback could overwhelm the hearing sense of visually impaired people. It would essentially be the only type of feedback they would receive. Moreover, we were suggested to add different variations of languages as feedback to improve the user's experience with our artifact. Since all of our sensors are located on one hand, we were recommended to spread the distance between the sensors, for instance on the leg, arm or shoulder, which we are currently working on. The knowledge that we gained throughout the process was necessary to enhance the usability of our artifact.

However, instead of improving parts of our prototype with the goal of selling and designing a marketable product, we want to create a social impact that would benefit the impaired people. To curate an enjoyable and playful experience, we worked with gamification methods which would substantially give positive and negative feedback to the users depending on the execution of the correct or incorrect move.

We started ideating our project using a low-fidelity prototype through flowchart, an empathy map and mockup of intended actions and reactions. Essentially, the vibration motor(s) on the hand activates when the Arduino randomizes a movement involving one or two limbs using RNG. It then sends a signal to the user who receives tactile instructions. The user has the option to perform the motion correctly or incorrectly. If the motion is done correctly, the accelerometers detect the motion, send a signal to the Arduino which receives the data, and the speaker plays a positive feedback sound. If done incorrectly, the accelerometers register data, send a signal to the Arduino which receives the data, and the speaker plays a negative feedback sound. At the end, the whole process will reset and restart. We also used drawings to brainstorm ideas to place our sensors and Arduino on a pair of gloves which is another type of low-fidelity prototype. Considering that the sensors arrived later than we expected, we were unable to attach and include them into our prototype. Therefore, we will present our prototype at the mid-fidelity stage. Unfortunately, we were unable to receive an answer from a community center for visually impaired people as well. Consequently, we did not receive any feedback from people who are living with a disability.

ACCURATE AND TECHNICAL EVALUATION OF SENSORS AND THEIR ASSOCIATED AFFORDANCES IDEALLY SUPPORTING THE PROJECT'S PROPOSED INTERACTION DESIGN STRATEGY.

The While building our artifact, we had to experiment with different sensors and motors in order to achieve the wanted results. One element of our proposal was implemented thus far, such as an accelerometer which outputs the directional values of its location in the X-axis, Y-axis and Z-axis. However, we came to the realization that its purpose was the opposite of our intention. Therefore, we also tested using a six-axis magnetometer which outputs a wider range of values more beneficial in a context of dance movements, as it yields more specific center points. In addition to the three-axis magnetometer, we included vibrators which would

essentially transmit a signal from the Arduino to the user and direct the participant to move a part of their body by buzzing on each finger to indicate a movement on their left arm, right arm, body, left leg or right leg. Another sensor that will be implemented is the speaker which plays a positive sound effect when a movement is done correctly, and in reverse will play a negative sound effect. It allows the participant to be aware of their progress and validates their correct or incorrect movements which could then encourage or discourage them while playing. Moreover, it would be in our favor to add a sensor to measure the distance between the user and any obstacles that could potentially harm them in their surroundings. The moving aspect of our prototype would ideally create a playful game experience for the user in the hopes of compensating for their loss of sight. Our product will fundamentally target users of all ages to interact and gain a pleasant experience manipulating tangible media. The direct touch and sound will also provide reassurance due to the fact that these are the senses visually impaired people rely on the most. Besides, it has been proven that dancing, and overall exercising, has physical and mental health benefits.

ANALYZING THE PROJECT'S INITIAL INTENTION OR SUPPOSED MEANING: HAS IT CHANGED OVER THE COURSE OF RESEARCHING AND IMPLEMENTING THE PHYSICAL PROTOTYPE?

The A substantial portion of our initial proposal wanted to explore the possibilities of Participatory Design as much as achievable. The experiences and perspectives of the targeted audience would have naturally provided the necessary suggestions to design a meaningful artifact. While receiving feedback on our first project proposal, we have been suggested different alternatives to consider when concretely building our design. Suggestions that we would have liked to discuss and experiment with while actively communicating with the user. After receiving a tentative approval for our project, we have immediately reached out to CNIB (Canadian National Institute for the Blind) Quebec to introduce our design and see if there'd be room for any kind of participation/collaboration on their side. We chose this organization, among others, for its structure, network and mission seemed to align with the meaning envisioned for our own artifact. Although similar initiatives and research are available in Montreal, CNIB seems to be especially dedicated to the conversation between visually impaired people and their community (rather than, for instance, home assistance).

Unfortunately, we have thus far been unable to receive any type of answer or acknowledgment from the institute. We are surely not abandoning the objective of exploring participatory design while structuring our artifact; however, as mentioned before, due to time-sensitive restrictions, we have decided to proceed in building our prototype according to the vision presented in our proposal, unfortunately unable, at the moment, to engage in a conversation with our targeted audience. There are different ways to get in contact with CNIB and so far we have not yet run out of options; we remain hopeful in the possibility of a future collaboration and are open to reaching out to other initiatives if necessary.

To sum up everything documented thus far, the purpose and intention envisioned for our artifact have not changed; we aim to build a wearable design that engages blind people into the activity of dance and choreography while working with them to ideally create a meaningful experience. Thus far, we were unable to take part in a conversation with our targeted audience and receive feedback in the first phase of the project; however, we intend to keep trying to seek out the possibility of a collaboration, which would prove especially relevant when experimenting with our first prototype(s) and final design.