Bodystorming a VR Experience for the Visually Impaired Utilizing Haptic and Auditory Feedback

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***Abstract*—An important part of every project is the testing and feedback gathering phase. We gathered feedback via a bodystorming session. With 2 participants, we performed 2 tests with each participant acting as an actor and as an observer. With the acquired information gathered from viewing the game idea played out and the feedback from the participants, we created a new prototype in Hubs by Mozilla. We updated our plan and decided what needs to be kept in mind moving forward into the next iterations of the project.**

***Index Terms*—VR Game, Bodystorming, Iterative design, Visual Impairment, Accessibility, haptic feedback, auditory feedback.**

I. Introduction

The purpose of this project is to create an entertaining VR game for, primarily, the visually impaired. The players will be put into a dark environment, and will need to listen to sound indications around the room and to find two objects imitating the same sound and match both objects to gain a point. Before the production of a high fidelity prototype for this game begins, we needed to create a paper prototype of the game to gather feedback. The bodystorming testing method was used to gather the needed information. One actor pretends to be in the game, while the other person observes and writes down what he/she is seeing during the test. When the test concludes, we will take the results of this test and apply this feedback to the next iteration of the project.

II. Methods

In order to conduct this bodystorming session, we needed a representation of our target audience. To accomplish this, we created a use case diagram (Figure 1) and a persona (Figure 2). Next, we made a paper-prototype by creating objects for our game using sticky notes with symbols drawn on them. It was important that all of the objects were the same physical shape, despite the differing symbols, as in the final VR game, the only indicator that an object exists will be controller vibration, not a traditional sense of touch. After the creation of the symbols, we acquired objects in order to simulate sounds: a pen, a metal spoon and a golf ball. A blind fold was also acquired to simulate user blindness, as there were no actual blind people available (Figure 3). Next, 2 people were asked to participate in the bodystorm. They were given an explanation of the game and how to play, and were asked to write down what they had learned from this explanation, possible scenarios for the player to be in and some issues that could arise during gameplay (Figure 4). The first actor was blindfolded and the sticky notes were arranged on the table (Figure 5). The 3 sound maker objects were then tapped on each sticky note in order to make a distinct noise associated with each symbol: golf ball for circle, spoon for square, and pen for triangle. When the actor was done listening, they reached out to locate the sticky notes they thought matched and grouped them up. While the game was being acted out, the other participant acted as an observer, taking notes on the actions being performed by the actor (Figure 6). Afterwards, the actor and observer switched roles and repeated the bodystorm once more. Once the session was completed, we took the gathered data and created a mozilla hubs prototype based on the feedback we had received (Figure 7).

III. Results

The results of the bodystorm were very useful in the further development of the project. The actors understood the instructions clearly and performed well in the matching game as well. One area they did seem to struggle with was the exact locations of the objects, as they were flat sticky notes which are easy to slide your hand over. However, this issue can easily be remedied by adapting the game into a digital format. We have decided that the controller should vibrate when a user's hand is close to a grabbable object in order to let the user know when they can grab something. Looking at the mozilla hubs prototype, we have noted how over-bearing these sounds can be when played too frequently and we will be sure to avoid these issues from popping up in our final product by adjusting sound frequency. Moving forward, we plan on adapting our plan with all feedback in mind into a unity prototype where we can test it on a computer and onto an Oculus Quest 2 Headset. Afterwards, we will continue to test, iterate and perfect the game before the final deadline arrives.

APPENDIX

A. *Figures*

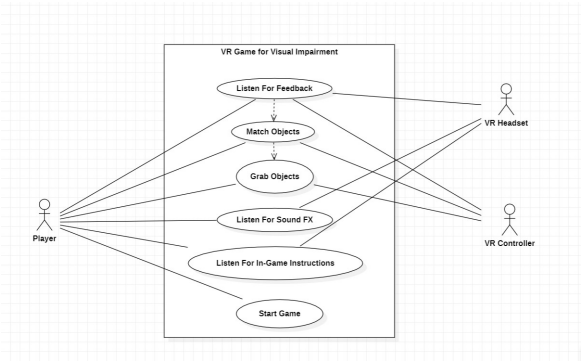

Fig. 1 - Use Case Diagram

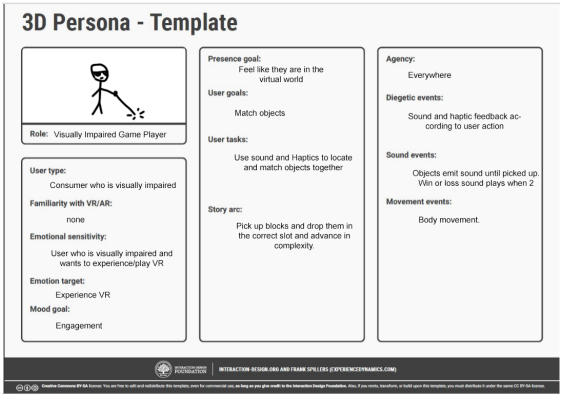

Fig. 2 - Persona

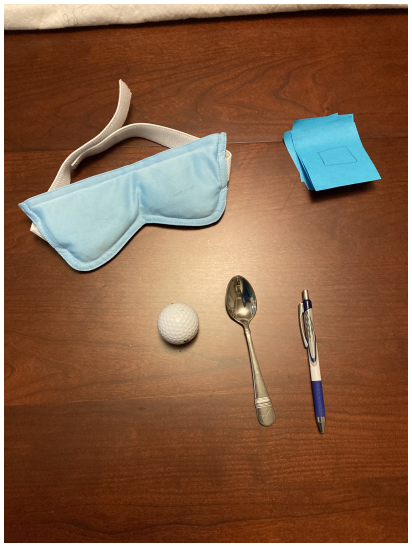

Fig. 3 - All Objects Used in the Bodystorm

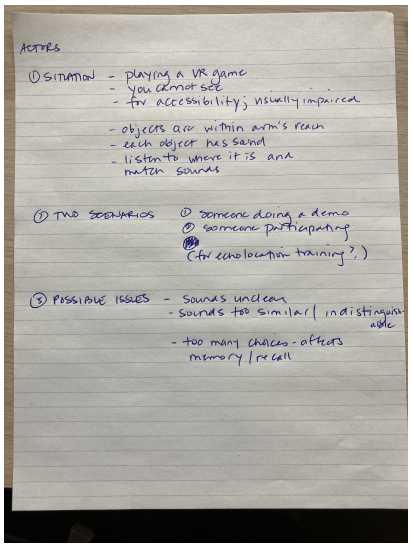

Fig. 4 - Actor Notes

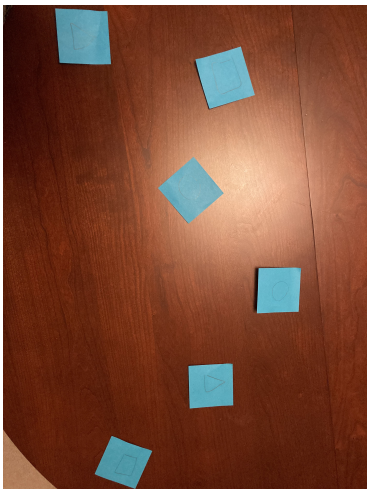

Fig. 5 - Game Layout

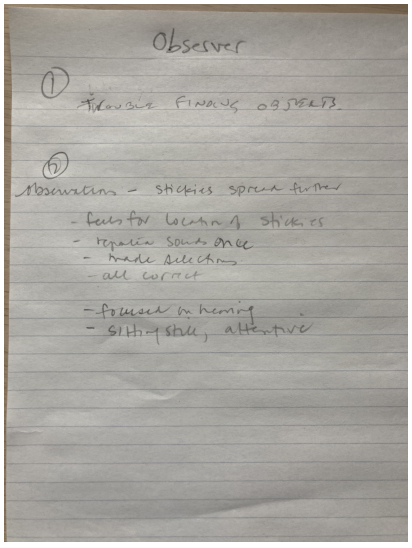

Fig. 6 - Observer Notes

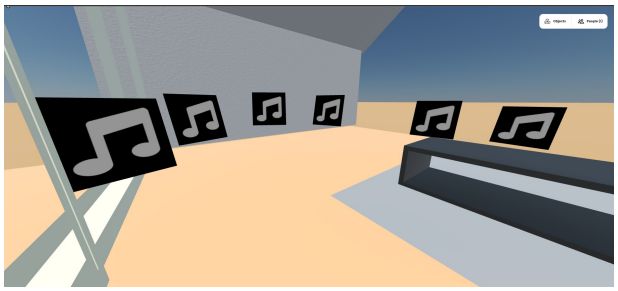

Fig. 7 - Mozilla Hub Prototype

B. Team Contributions

Matthew McPherson: Bodystrom Conductor, Report Writing, Presentation, Persona.

Jonathan Leung: Report Writing, Presentation, Persona.

Jelani Garmes: Mozilla Hub Prototype, Report Writing, Presentation, Persona, Use Case Diagram.