

VR Voice Commands for Individuals with Motor Disabilities (Bodystorming)

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Abstract—The purpose of this assignment is to identify physical or virtual flaws in our project idea and finding additional use cases. Utilizing bodystorming as well as Wizard of OZ prototyping we're able to identify multiple flaws in our ideas. Movement can be important in certain platforms such as Mozilla Hubs so having movement voice commands is something we decided to work on as well. Some glaring flaws can be identified through bodystorming, such as saying "mute" before muting would mean everyone can hear it. Overall, we found solutions to supplement each of the flaws in this assignment.

Keywords — *Voice command, Motor Disabilities, Online Learning*

I. INTRODUCTION

Our application idea is to have voice commands that people with motor disabilities can use since controllers are not an option for them in VR. The purpose of this assignment is to bodystorm for our project and to identify potential flaws in the use cases that we think that users will encounter with our project and also to find solutions for the flaws that we identify. For this assignment we utilized different methods to potentially find flaws or maybe even additional use cases for our project. One of the methods is bodystorming where we physically act out scenarios to find physical flaws in our ideas. While Wizard of OZ prototyping in unity finds flaws virtually. The results that we found from doing both of the testing allowed us to find additional use cases and also find solutions to some of our glaring flaws. Through finding those solutions and to some flaws that we have not been able to find yet, we're able to identify what our next step is in this project.

II. METHODS

The methods we used for our bodystorming is having different scenarios to find flaws in our ideas by putting ourselves in the lens of our target customer persona (see **Fig. 1**). The first scenario is having the user configure language settings. The next one being in a classroom setting, using each of the commands that we thought users would use the most such as: muting/unmuting and raising hand/putting hand down. While the final scenario is in a Mozilla Hubs space where movement is required for the user to be able to look around the space. We created a use case diagram to better

articulate the user's use case (see **Fig. 2**). After bodystorming we replicated each scenario in Unity to see if we could find additional flaws. Without Wizard of OZ here it'd be difficult to gauge the inefficiencies of movement in a VR space using voice commands.

III. RESULTS

Through bodystorming we're able to identify several flaws. We plan on implementing a language setting so that there is no way to trigger a command in a different language by accident. The flaw with this system is that perhaps there are people who are bilingual and may need both languages to convey their meaning. In that case we can have modular commands for the user, allowing the user to configure their own commands so that there are no conflicts. Another issue we discovered is the muting function where the user would be clearly heard by everyone else saying "mute" before the mute command would activate. To combat this flaw, the solution will be to have the application automatically mute the user after a certain period of inactivity that can be configured by the user. One additional use case that we found is that for certain applications such as Mozilla Hubs, movement is of importance. Adding voice commands to be able to manipulate movement would be a good idea. Our original thought process was to have simple commands like "forward" and the user would teleport one unit forward but that would be incredibly inaccurate movement perhaps leading to frustrations. Our other idea for movement is to have continuous movement. "Forward" will continuously move the user forward until the user gives the stop command. Although it may take longer for the user to reach their destination perhaps this would allow for more precise movement. We discovered that depending on the person, perhaps people with lower limbs could use alternative inputs to voice commands for better inputs but for our purposes, we will focus mainly on voice commands. Moving forward we will continue to add upon our solutions and/or find better solutions for our flaws. Our next goal is to begin to try to create a functional prototype that can recognize voice commands, then all the functionality will follow after that base is established.

IV. APPENDICES (ALL IMAGES IN GITHUB)

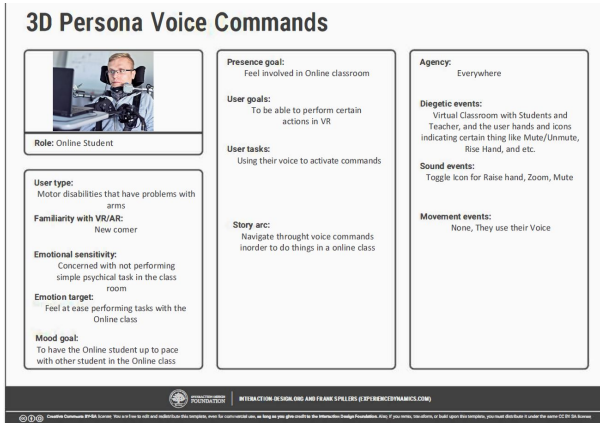


Figure 1. Customer Persona

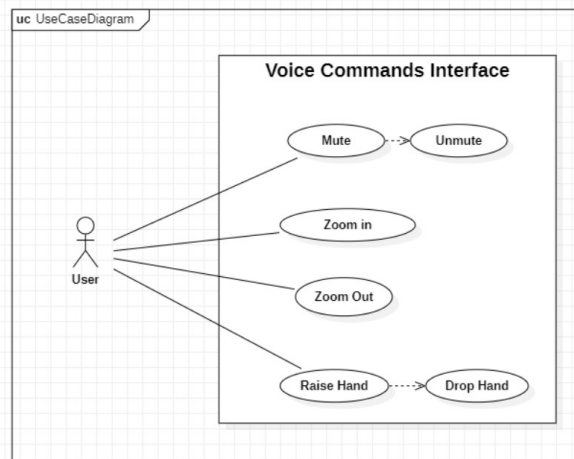


Figure 2. Use Case Diagram Original

A. Observer Notes

- Perhaps people with functional lower limbs could use alternative inputs to voice commands that are much more efficient.
- movement with voice commands is incredibly inefficient
- the speed of the movement should probably be configurable

B. Actor Notes

- Potential user error with voice commands.
- using the mute command would allow everyone to hear you say mute before the command activates.
- moving in increments is annoying but so is slowly inching forward, perhaps a combination of both or have the option to choose?
- modular commands that gives the user more flexibility could be useful.



Figure 3. Bodystorming

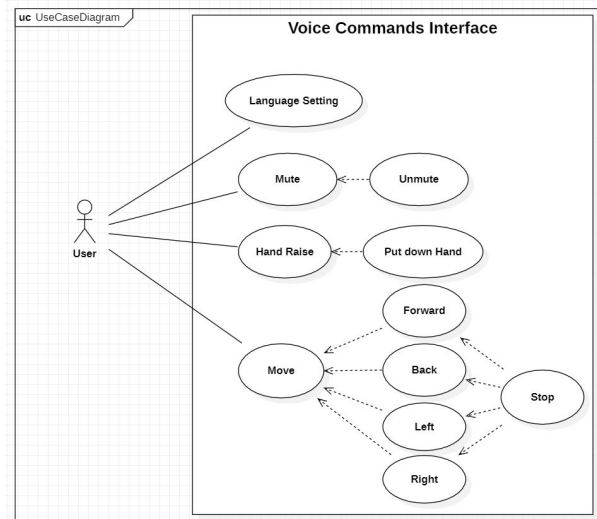


Figure 4. Use Case Diagram Revision

- thought needs to be put into the settings and how the user will navigate it under the assumption they cannot use controllers.

C. Use Case and Takeaways

Overall, the use case of our application had a major shift in focus. We decided to remove the specific commands like zooming in and out because those commands we can do without in VR. Replacing those commands in the newer diagram we have movement. Depending on how the users would prefer maybe we can make it so users can choose between teleport movement and continuous movement. Both methods have their own flaws but at the same time there are benefits using either one. Teleporting would allow the players to get somewhere faster with less accuracy while continuous movement could be much slower but more accurate. Some more general takeaways we got including previous assignments, is that we will be focusing down on VR rather than online classrooms in general and also focusing down on targeting people with motor disabilities. Through utilizing bodystorming we're able to find

flaws in our ideas or maybe even additional use cases which helps us to improve our application to better fit the needs of the people whom we're trying to create this application for.

D. Wizard of OZ Prototype Video

- [Link](#)

E. Bodystorming Breakdown Video

- [Link](#)