Bodystorming for VR Subtitles(WIP)

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I. Abstract

This paper is going to highlight our bodystorming process and cover how we tested wiht this method to figure out how subtitles could be used in the virtual classroom. Using bodystorming we were able to not only find the best way to implement subtitles but also the settings needed to give any user a personalized experience with them. Also using this information to create our Wizard of OZ prototype which is a good first step in creating our finished solution. Our plan has the possibility to add easy to use subtitles that not only the hard of hearing can use but anyone could to improve the capabilities of any students learning.

II. Keywords

Virtual Classroom, Hard of hearing, Subtitles

III. Introduction

Our project is a subtitle interface that hard of hearing people could use in the virtual classroom. With our body storming we learned what the best way to implement these subtitles are as well as some settings needed to improve the experience for our users. Our original concept for our interface was to improve the virtual classroom experience for hard of hearing users since they lack the audio from this type of learning. But during our research we found that subtitles improve the learning from a source whether a person can hear or not. With this information we sought to use bodystorming to further our understanding of the interface and figure out the best way to implement it for the best user experience. After gathering all this data we compiled it into out Wizard of OZ prototype with basic subtitle functionality, with plans to add the user settings in the future.

IV. Methods

For our bodystorming we had the actor wear noise cancelling headphones to simulate hearing loss, this allows us to get a sense of what our target user might be like. We had the actor have noise-canceling headphones on while sitting at a distance away from a video with subtitles on (see **Fig. ??**). The observer would watch the actor and had control of telling the actor to stay in place, so the observer could write notes. The observer was also able to create scenarios based on their point of view. For example, what if the speech-to-text is unable to understand someone with an accent and outputs the wrong words. After the first bodystorming was completed the actor would then take on the role of observer and the observer would take on the role of the actor. This would give us two different points of view on our prototype. After both bodystorming were completed we created a prototype in VR using Unity and an Oculus Quest headset. Doing this gave us an even better understanding of what worked well, what didn't work well, and what needs to be changed.

V. Results and Discussion

From our bodystorming we found very insightful information about our product. We found that subtitles in a virtual space should be close to the user instead of far away from the user. We also found that adding settings for our subtitles, such as different colours, font size, different fonts, and position can give our users a personalized experience that is tailored to their needs. Toggling the subtitles is the best way to incorporate it into the virtual classroom as everyone may not need them so there is an option to have them off if needed. A major flaw we found during our research would be how the speech to text would translate if people in the class were talking over the teacher. But we found that a simple solution would be everyone in the virtual classroom would be muted much like how synchronous lectures through the computer were done during the pandemic. Our next steps are to add to the virtual reality space we created in unity. We will need to add the user experience settings for the subtitles like colours and fonts. We also need to get a working version of the subtitles since right now in the unity scene the subtitles just say "subtitles" which will need to be changed to a speech to text add on translating the audio.

VI. Appendices

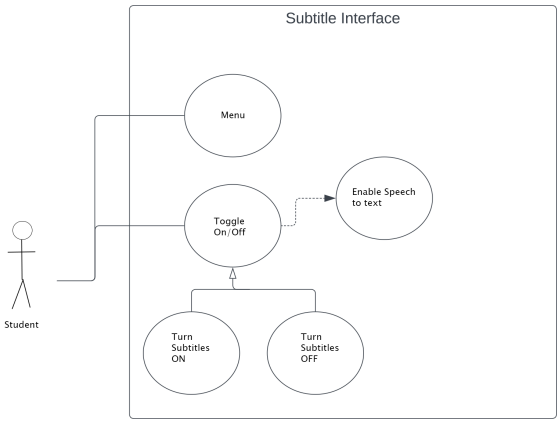

Fig. 1. Use case diagram

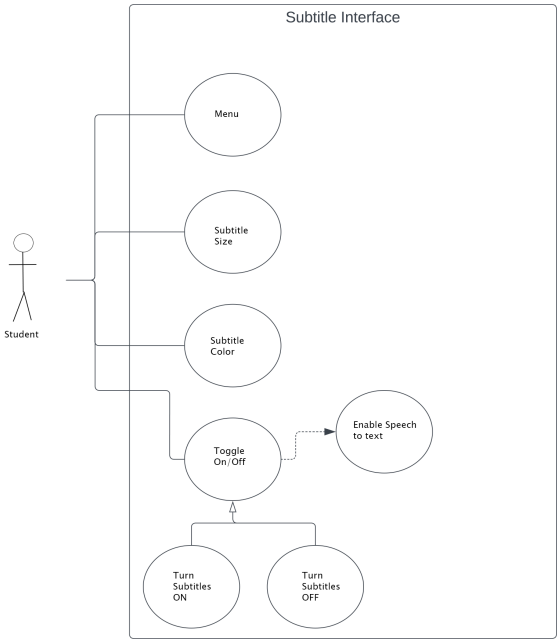

Fig. 2. Updated use case diagram

These are the two UML charts we have made for our product. As you can see in the first UML chart we had a simple design that just had subtitles for the user to turn on an off. But as we did research and testing with our body storming we figured out the extra settings that needed to be added onto our interface. So according with that info we also updated the UML with the extra functionality we desire.

Link to VR wizard of Oz prototype video
https://youtu.be/xFVj9smPyZE
Link to video report
https://youtu.be/2Tbw$_x luOeM$

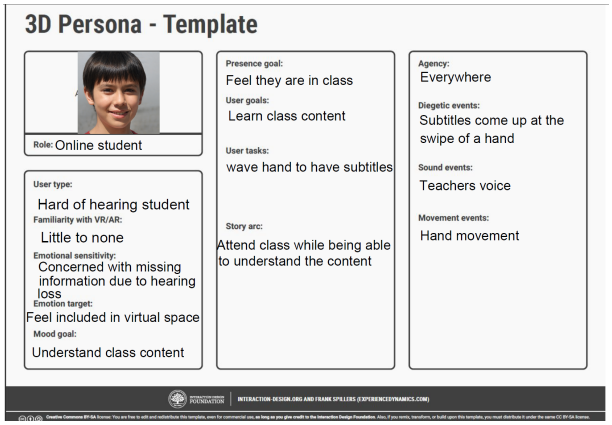

Fig. 3. Persona

Actor 1 situation: A hearing impaired user needs to understand an online lecture in VR.

Actor 1 scenarios: The actor is presented with a live lecture. Another scenario is presented with a recorded lecture.

Actor 1 issues: can't hear teacher, hard to understand teacher.
Actor 1 solutions: Create subtitles, increase volume

Observer 1 notes: User seems to have trouble reading subtitles and looking at the lecture at the same time. Maybe move subtitles closer so it is easier to read and look at the lecture. What if the teacher is hard to understand for the speech to text?

Actor 2 situation: A hearing impaired user needs to understand what is happening in a VR classroom.

Actor 2 scenarios: The actor is presented with another student trying to talk to them. Another scenario is another student giving a presentation.

Actor 2 issues: can't hear other students, hard to understand students.
Actor 2 solutions: Create subtitles, increase volume, change size and colour of the subtitles.

Observer 2 notes: User seems to have trouble reading subtitles and looking at the presentation at the same time. Maybe move subtitles closer so it is easier to read and pay attention to content being presented. What if there is background noise that interferes with the speech to text?

Fig. 4. Notes from actor and observer

The toggle of the subtitles worked well. Adding settings for subtitles could be beneficial for example different colours, size change, different fonts, and position. This will also give a personalized experience to each individual user.

Fig. 5. Takeaways