Presence Detection for Video Conferencing Applications

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***Abstract*—With the Covid-19 pandemic the shift towards the usage of video conferencing software as a means of communication for different sectors has become more prominent in the last few years. However, this video conference software can sometimes be lacking in its support for those with disabilities who would be using them. Our project is centered around the creation of a device for users who might have vision related disabilities to allow for a much smoother and accessible experience. This is important because often times these programs can have limitations that make it difficult for these people to use them. We plan on the creation of a controller that will provide those with seeing problems tactile feedback for controlling video conferencing software, we also wish to create an automated system that will automatically mute the user if they leave their chair. We came up with the solution by conducting design thinking to come up with solutions, as well as conducting a literature review to deem whether or not the idea was worthwhile.**

***Index Terms*—remote communication, telecommunications, control interaction, human computer interaction, user interface**

I. Introduction

Currently video conferencing has taken a large role in communication for different disciplines and fields in response to the Covid-19 pandemic. However, often times video conference software while providing a valuable tool, can often time lack adequate support for people with disabilities. Even still there are still many different steps that can be taken in to consideration when improving the experience for those who may lack certain senses. For our project we propose the creation of a device that will allow users with disabilities particularly the loss of sight a more accessible method of controlling their microphone as well as other elements of video conferencing software. Increasing the accessibility of video conferencing software is important as more and more industries adopt a work from home style where users are required to attend meetings online. Because of this the ability of conference software to meet the needs of those with disabilities is important so that they are able to adequately interact with the software. If the needs of these users are not met then it can cause them to have an overall negative interaction and may even cause issues not just to the person with the disability but also those participating in the meeting.

II. Methods

We began our research by using Google Scholar and the Ontario Tech online library to find papers on the topic of accessibility in video conferencing applications. From these papers we checked their sources and gathered more papers on the topic. Whilst searching for our papers we focused primarily on documents that studied the accessibility of different conferencing software [1] [2] [3]. Then we looked for journals that broke down the accessibility problems common amongst conferencing software and that also provided solutions as well as guidelines to consider when it came to designing software with those with disabilities in mind [4] [5]. Using this information, we were able to identify features which were lacking throughout all of the many different leading video conferencing applications. With this knowledge, we researched the capabilities of Arduino devices to determine if any of them would be suitable in interfacing with video conferencing applications to solve our problems. We also researched various different types of sensors in the Arduino documentation to determine what would be optimal for usage in our device. From this point we began doing rough approximations of how our final project could function, and what features are either necessary or nice to have. This brought us to determining our rough form factor of the device and how it would interface with both the user and the computer. We separated the whole process of creating the device into four main tasks, which we coordinated on a Gantt chart along with the assignments for our Emerging Technologies class related to this project.

See Appendix A

III. Results

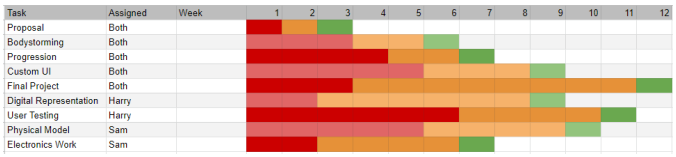
During our literature review we conducted research across the topic of potential accessibility problems that could occur when those with disabilities used video conferencing software. Multiple studies noted the importance of creating systems that could better support those with disabilities due to many of the conferencing software featuring minimal considerations when it comes to those who are blind. This indicated that the creation of a device that would accommodate for these types of users would prove to be valuable. Furthermore, we noticed in our literature review that some conferencing software featured a lack of keyboard accessibility [2] which could cause issues for those who are blind or visually impaired who may not be able to see the controls on screen. This indicated that a device that users could interact with to control themselves in a call would prove beneficial to our end users. Lastly, we

conducted research to determine whether or not automatic muting would also be beneficial to users, in [1] Anderson notes that for blind users listening to participants talking simultaneously is not a viable option for blind people who may not be able to distinguish between voices. This point, while not directly connecting to our idea, indicated the importance of a device that would limit the sound that users hear by ensuring that they are muted if they aren't present in the call. After conducting our initial literature review, we began on the design thinking process in order to try and come up with a preliminary approach to resolving the issues we discovered. We first determined that the issues we wished to resolve was the lack of controls for those who are visually impaired when it came to using conferencing software. Particularly, we wanted to create a device that provided users who are visually impaired a control system that would allow them to interact with video conferencing software in a user friendly way. Our initial prototype design would feature a central control box with switches that could be flicked in order to enable and disable certain elements in call. These switches would feature tactile markings to indicate what they control and whether or not they were on or off [4]; this would control elements such as muting,raising hand, enabling camera, etc. Lastly, we wanted the device to feature a system that would automatically mute users when they stood up to reduce noise pollution for other members of the conference and prevent background audio from disrupting the conference itself. These elements we feel would combine to create a much more accessible system for those who are visually impaired when it comes to using conference software.

IV. Conclusion

Based on what we found, we believe that our solution can adequately solve the problems of people facing accessibility issues in video conferencing applications. For the most part our literature review focused on changes that could be made to the software, since there are not many hardware control devices in the video conferencing space. There are a few products that operate similarly, but do not serve certain disabilities. The MuteMe device is one of these devices, which has spawned many clone products. However, this device only has a mute button and light, which does not provide enough feedback for all users. There are not any hardware video conferencing devices that incorporate automatic mute and auto disable video functionality. A potential alternative solution to this problem would be for the conferencing applications to incorporate AI facial recognition to only un-mute and enable video when users are actually speaking, but this would still not cover the tactile manual controls of our proposed device. As for the device, we have prototyped many methods of actually determining whether the user is present and ready to speak, including ultrasonic sensors, force sensors, and accelerometers. Our next step for this project is to make a physical prototype with a force sensor and toggles, and test whether or not it will work well enough for our desired purpose. After, we want to test it in various use cases and determine how important our many features actually are to our end user.

Appendix A
Gantt Chart



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