

Designing Personalized Assistive Technology for Student with Cerebral Palsy

Gilgal Ansah, Biomedical Engineering

Mentor: Dr. Jennifer Blain Christen, Associate Professor, School of Electrical, Computer and Energy Engineering

Abstract

One of the symptoms of Cerebral Palsy (CP) is the lack of spatial awareness due to the inability to respond well to visual cues. This project seeks to augment visual perception with an auditory feedback system to enhance spatial navigation of a student with CP. When using a wheelchair, the student tends to bump into obstacles and as such, requires assistance to get by. The project applies principles from medical instrumentation and leverages on the student's ability to respond to sound to design an Arduino-ultrasonic-based auditory feedback device that alerts the student when approaching obstacles.

Methods

The design of the personalized assistive device involved constant communication with the end user and their family.

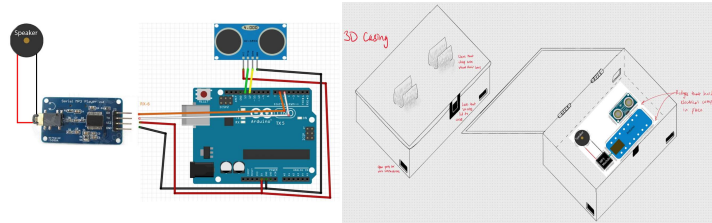
Discussions focused on understanding the needs of the student and most importantly the idiosyncrasies of the student.

Questionnaires were prepared for the family of the student to provide details on the likes and dislikes of the students as well as their quotidian activities.

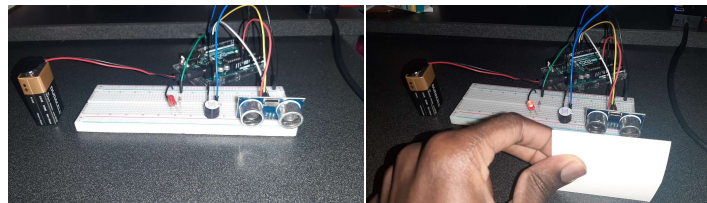
Responses from these informed the final concept selection to propose a solution to the problem.

Current Progress

Schematic of design concept



Battery Testing



- 9V Battery
- Ultrasonic distance sensor
- Buzzer and LED(in place of mp3 module and speaker)
- 10 cm alert distance

Battery Life



Challenges and Future Work

The greatest challenge this project faced was completing an alpha ready prototype for the student to test for feedback.

As such, future work of this project will focus on completion and physical testing of a fully functional prototype.

Acknowledgements

I would like to thank the members of my ACCEL team (Nekiyah, Ana and Sepehr) for their immense contribution to this project.

I would also like to thank Dr. Blain Christen and Matt Levac for their mentorship throughout the project.

References

1. Cerebral Palsy. Centers for Disease Control and Prevention. <https://www.cdc.gov/ncbddd/cp/index.html>.
2. CP DAILY LIVING. What is Cerebral Palsy? <http://cpdailyliving.com/whatiscp/>. Published 2011.
3. Cerebral Palsy. Centers for Disease Control and Prevention. <https://www.cdc.gov/ncbddd/cp/facts.html>.
4. Assistive Devices for Children with CP. Cerebral Palsy Group. <https://cerebralpalsygroup.com/treatment/assistive-devices/>.
5. <https://www.youtube.com/watch?v=HynLoCtUVtU>