A.U.R.I.S.:

Glasses to improve directional awareness

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Problem Statement

People who are **deaf or hard of hearing** often find themselves **unaware** of their surroundings, especially during conversations involving multiple people. People may acknowledge a deaf person behind them, for example, but they would have no way of knowing **what sound is out of their line of sight.**

Engineering Goal

To engineer a device that can display **directional audio cues** and enhance the user's awareness.

Methodology

Initial Sketches

We generated ideas and then sketched them out using pencil and paper to identify basic strengths and weaknesses.

CAD Design

We used OnShape CAD to model potential designs and reason through implementation.

Iteration

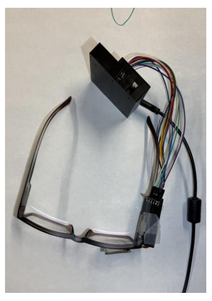
We made a proof of concept and a prototype, as well as communicated with clients to determine effectiveness of the solution.

Testing

We followed a thorough testing procedure for the microphone range and the display to ensure that the device worked as intended.

Current Design

Glasses + Headband



Benefits:
- Able to detect audio
- Less clunky when compared to previous designs
- Effective display

Fig. 1 -- Current prototype of device, combination of Design #1 and Design #3

Design #1

Glasses

Pros:
- Compartments store crucial components such as Pi
- Not as clunky, easier for user

Cons:
- Clunky, uncomfortable

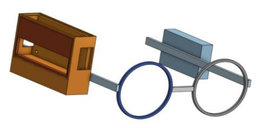


Fig. 2 -- CAD Design of Glasses Design

Design #2

Walking Stick

Pros:
- Does not reveal the user's disability

Cons:
- Clunky
- Not practical for those who don't need a walking stick

Fig. 3 -- CAD Design of Walking Stick

Design #3

Headband

Pros:
- Comfortable
- Small / Portable

Cons:
- Non expandable
- Vibrations ineffective at conveying directional cues

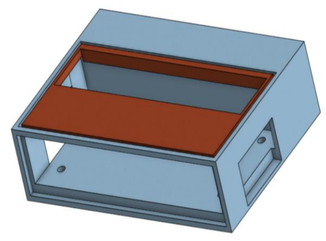


Fig. 4 -- CAD of storage compartment (Attached to headband)

Design Study

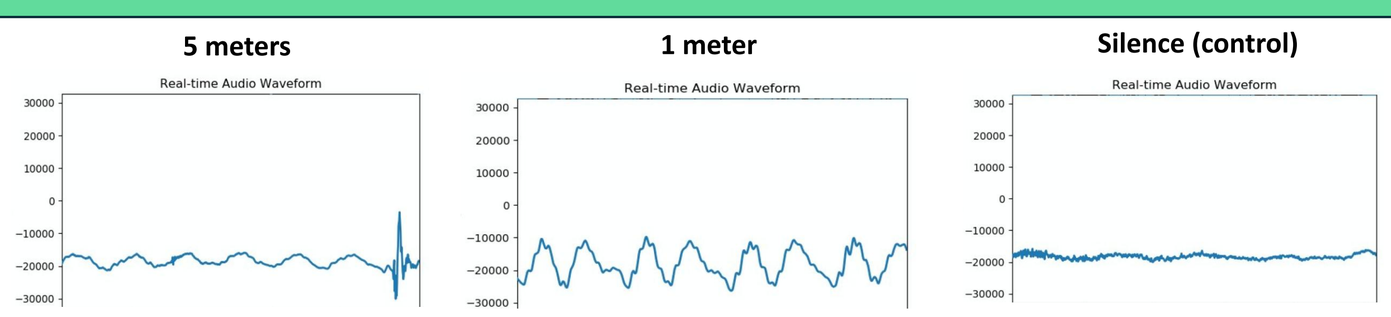


Fig. 5 -- Microphone range testing results
From left to right, waveform picked up by microphone from a conversation from 5 meters away, 1 meter away, and silence for control.

Requirements

#	Level	Requirement Type	Requirement Statement
1	1	Functional	The device shall display directional audio cues accurately
2	1	Functional	Must be able to detect conversation more than 90% of the time
3	1	Functional	Battery must last 6 hours or longer
4	1	Cost	The device shall not exceed the price of $150
5	2	Physical	The device shall not extend more than 2 inches away from the head (if it is attached to the head)
6	2	Physical	The device should be easy to clean
7	2	Functional	The device shall display captions
8	3	Appearance	The device shall be aesthetically pleasing
9	3	Appearance	The device shall not reveal the user's disability
10	3	Functional	The device shall not exceed 3lbs In weight.

Conclusions and Future Work

Conclusion

- Key features of MVP work
- Design is comfortable for user
- Design effectively addresses the problem

Future Work

- Classify different categories of noise to inform the user
- Improve comfort of the device
- Provide a way to separate out conversations