AuSense

Sensory Overload Detector

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Problem Statement

Sensory overload is when the brain is overwhelmed by too much sensory information. Individuals with autism are more likely to experience sensory overload and there are currently no ways to detect sensory overload as different people have different sensory thresholds.

Engineering Goal

Our goal is to develop a device to detect and alert individuals with autism when they are in environments where they may experience sensory overload. We want to ensure the device is customizable based on varying user thresholds for sensory overload.

Methodology

Initial Sketches:
- Created sketches for three potential designs to help with planning and prototyping

Prototyping:
- Implemented design using Arduino and EmotiBit technology

Testing:
- Analyzed and tested sensor precision and accuracy

Finalization:
- Adjusted according to test results and feedback from client

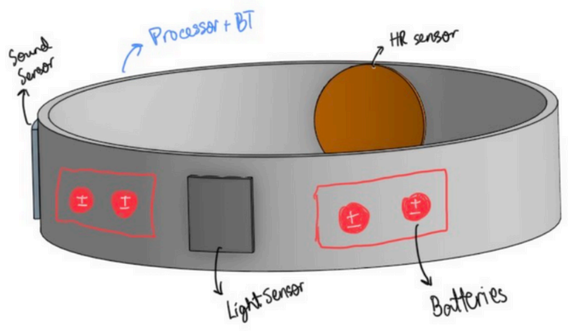
Current Design

Final prototype and application

Requirements

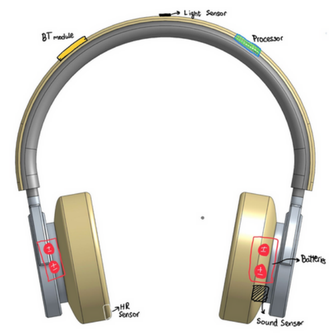
- Detect surrounding light, noise levels and heart rate of the user
- Must allow the user to input their sensory threshold
- Must analyze and alert the user when the conditions exceed the threshold level
- Must be below $200 and affordable in the market
- Must be wearable with one hand and comfortable

Design 1: Bracelet



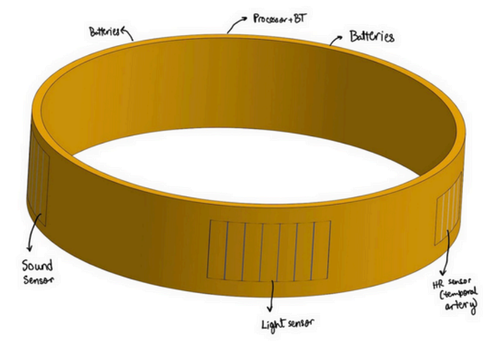
- Not very noticeable
- Small and easy to transport

Design 2: Headphones



- Allows for noise cancelling
- Spacious for sensor installation

Design 3: Headband

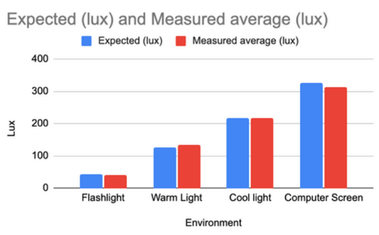


- Best readings for light and sound
- Very noticeable, might bring unwanted attntion

Design Studies

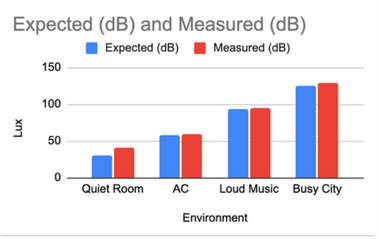
Light Sensor Testing

Light sensor testing involved analyzing light intensity (lux) sensor readings for ten trials of four different sources of light: cool light, warm light, flashlight, and computer screen light. The standard deviation among the ten trials was 23.22.



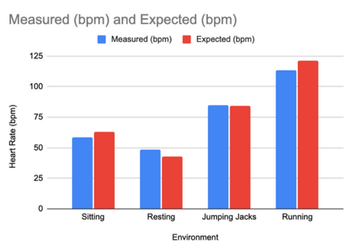
Sound Sensor Testing

For testing the sound detection quality of the prototype, decibel trials were conducted in four different environments with predetermined sound levels. Across the four environments, [c] an average standard deviation of 3.11 was found.



Heart Rate Sensor Testing

To test the heart rate sensor the heart rate in beats per minute of the user was measured in four different scenarios. The scenarios were when the user is sitting, resting, running, and doing jumping jacks. The average standard deviation for the heart rate test was 2.54.



Conclusion

- Offers early detection of sensory overload using personalized light, sound, and heart rate thresholds
- Enables faster intervention and outcomes by notifying caretakers in real-time
- More accessible than current market alternatives

Future Steps

- Implement a smaller design; make the device less visible
- Add time sensing to track persistence of stimuli; factor into the overload detection algorithm
- Reminders for sensory overload detection