Problem Statement and Goals
SE 4G06, TRON 4TB6

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Table 1: Revision History

Date	Developer(s)	Change
Date1	Name(s)	Description of changes
Date2	Name(s)	Description of changes
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1 Problem Statement

1.1 Problem

In this day and age, communication is a very significant part of our day to day lives. So, people who have difficulty in recognizing sounds within their surroundings are not able to live their lives to their fullest. For instance, hard of hearing (HoH) individuals are not able to always respond promptly whenever their loved ones are calling their name or when a doorbell rings out for a package delivery. As a result, this can be rather unfortunate for the HoH individual as inconveniencing loved ones for another appeal or missing a delivery are both not ideal scenarios to be in. This can especially be the case for life-and-death situations where the importance of sound awareness is highlighted. With all this in mind, a device which will monitor your surroundings for you would encourage confidence within the users to complete daily tasks as well as notably improve their quality of life.

1.2 Inputs and Outputs

1.2.1 Inputs

- Environment Sounds
- App Settings/Configurations

1.2.2 Outputs

- Noise Detection Feedback

1.3 Stakeholders

- Individuals who are hard of hearing or that are in an environment where hearing can be obstructed
- Long term care homes

1.4 Environment

1.4.1 Software

- Visual Studio Code
- C
- Python
- Speech Recognition Library

1.4.2 Hardware

- Vibration Motor
- Bluetooth module
- Microphone
- Microcontroller
- Battery
- 3D Printer

2 Goals

2.1 Finished device can withstand above moderate environmental conditions such as moisture and heat

- The device will be a wearable technology which makes it a necessity that the user does not need to worry about damage in average daily conditions.

2.2 Device can collect and process data in real time while filtering out noise

- A core functional aspect of the device is to process a continuous stream of data and react once a key data point is found.
- This permits our device to provide the necessary sensory outputs to the user.

2.3 Finished product can communicate with an external device

- Having the ability to directly communicate with external devices will allow the device to be uniquely programmable by different users.

2.4 Data collected will be processed and then deleted in real time

- This allows the product to be used in multiple environments without the risk of privacy concerns for the user.

2.5 Finished product will retain all functionalities in a form factor that is wearable

- Device will need to be appropriately small such that it can be worn comfortably and non-intrusively by the user.

2.6 Finished product will be rechargeable and reusable

- This will expand the usability of the device and help market growth.
- This will also contribute to reducing e-waste since the finished product will have a longer lifespan.

2.7 The finished product will have sufficient distinct sensory outputs such that the user can distinguish between them

- This allows the device to have multiple programmable key data points that the user can choose to be notified by.
- This will also act to expand the usability of the product and programmability of the device by the user.

3 Stretch Goals

3.1 Finished product will have a water resistance rating of IPX5

- This will increase usability of the product.
- This will also avoid the possibility that the device will become malfunctional under certain wet weather conditions.

3.2 Finished product can actively filter out noise in particularly loud environments

- This will expand the environments where the product can function as intended. This will also lead to more reliable outputs from the device in situations where hearing is more obstructed by noises in the surroundings.

3.3 Finished product will support over the air firmware updates

- As the product develops and is used in real world applications we predict that the noise detection algorithm we use will keep improving. Having the option to upgrade prior devices with better signal processing through software will aid in extending the usability of older products.