Experimental Design

Location:

There are many locations this experiment will take place, as this will be one of the independent variables that will be used. Some examples of places we could use would be a school, on the road, at home, or in a park.

Safety:

For safety, the only way to be harmed in this project would be if one were exposed to sounds that are bad for the human hearing for more than a certain amount of time. During these parts of testing, it would be necessary to wear noise cancelling earmuffs. The case will make sure that the parts of the actual project will not be damaged with transporting on the back of the phone.

Independent Variable:

The first independent variable is the location at which the sound will be playing. This means that the data for the location will be processed to see if the location is reasonable or not for the sound. This will be changed by moving the whole module to different areas of the town to see whether or not the person will be alarmed. Another independent variable is the decibel level of the sound being played. This means an alarming system will be dependent on the decibel level. This will be changed by changing the decibel level that is heard in each test by the module. The decibel level measured using a professional Sound Level Meter to ensure that the test sound level is what it is supposed to be. Another independent variable that will be changed is the time of which the sound and test is taking place. Specific testing times were selected according to ideal times when people might go to the locations.

Dependent Variable:

When a large decibel level is heard at an “odd” location, the vibrator and light will both be activated to alert the person to a danger. The decibel level and the exact location and whether or not the alert was sent will be stored as data. The dependent variable will essentially be the outcome of the responses under different conditions. This device will be alerting the person to a noise that may be unexpected at the location which the person will be at. The device will be programmed to alert the user by taking a reading of the decibel level of the user’s environment at a certain point of day. Then the location will be taken and using an AI it will evaluate if there is a danger or not. The sounds that it will be trained to ignore will be based off of the location of the device.

Control:

The control setup will be the module at 18 Thistle Hill Drive, at 6:00 pm, with a decibel level of 20 dBs where NO alert will be sent. We will compare this to the several different independent variables changed during experimentation.

Procedures:

Building:

1. Attach Expansion Module to the Arduino
2. Solder 4 jumper wires to the Bluetooth Module
3. Attach 3 jumper wires into the analog sound sensor
4. Solder the wires from Step 3 into the Expansion module
5. Solder wires from step 2 into the expansion module
6. Solder 2 wires into the button
7. Solder wires from step 6 into the expansion module

Testing and Data Collecting (Accuracy):

1. Turn on the device which will make a sound for 10 seconds
2. Simultaneously for 10 seconds record the actual decibel level as well as the device's decibel level
3. Repeat steps 1-2 4 more times
4. Repeat steps 1-3 4 more times for 4 different items that make noise at different decibel levels

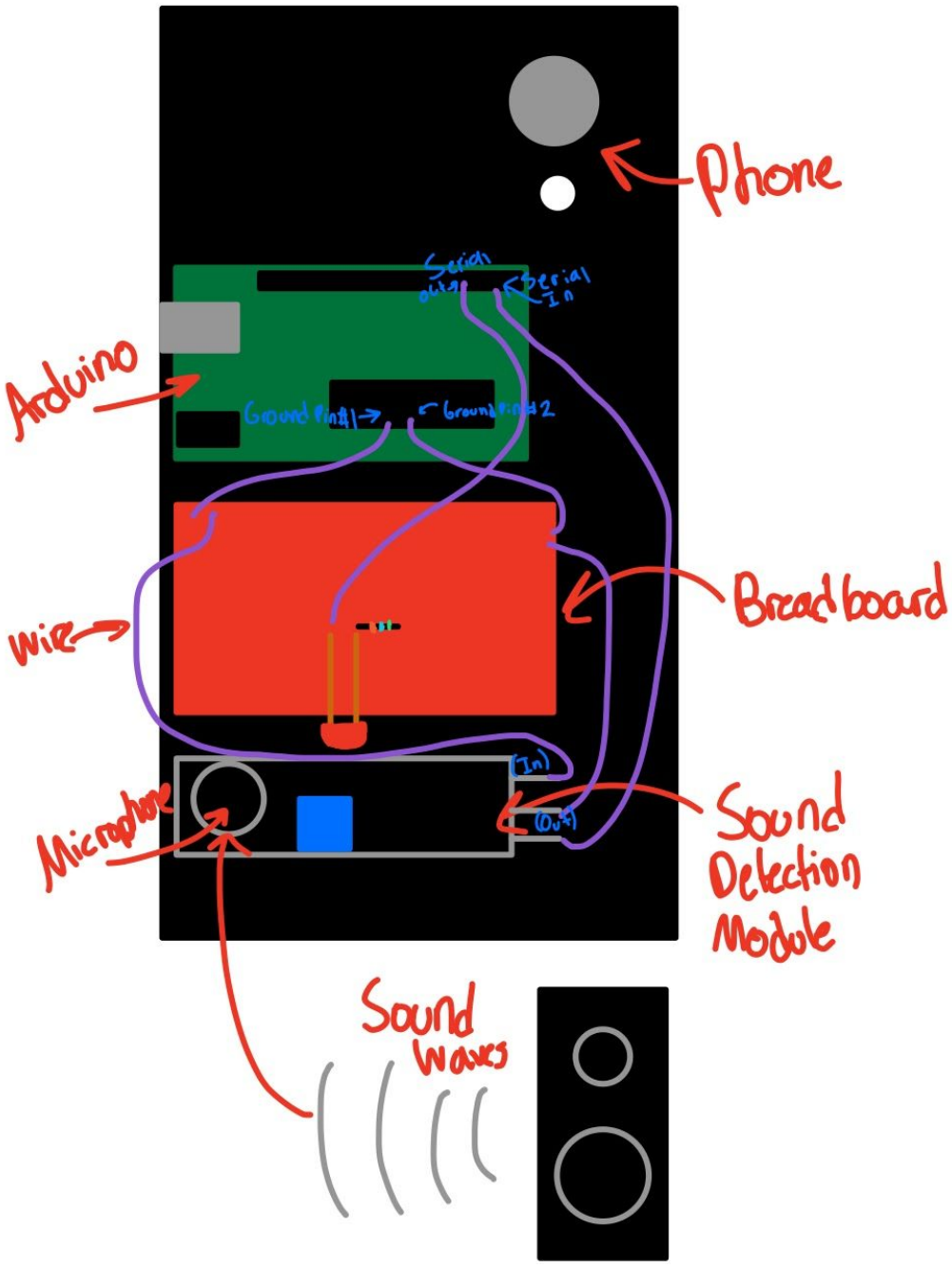
Testing and Data Collecting (Distance):

1. Turn on the device which will make a sound for 10 seconds at 30ft
2. Repeat step 1 for 20ft, 15ft, 10ft, 8ft, 6ft, 4ft, and 2ft
3. Repeat steps 1-2 4 more times for 4 of the same items as were use in the Accuracy data collection
4. Repeat steps 1-3 starting at 20ft outdoors

Materials:

- Android Phone
- 1 piece of 1cm by 1cm velcro
- Arduino
- Sound Detection Module
- 9 jumper wires
- Vibrator
- Arduino Expansion Module
- 25.6 inches squared of Lexan Polycarbonate
- Bluetooth Module
- Button
- Soldering Gun
- Lead(For soldering)

Experimental Set-up:



The sound waves in the picture should come from a real noise that happens in the environment, but since it is not possible to recreate all decibel levels instantaneously, noises from different

devices will be replicating the intended decibel level. Devices such as a car horn, fire truck siren, table saw machine, and leaf blower will be used to measure different decibel levels.

Data Collection:

Location #1 (Longitude, Latitude) Time #1
Was it Alarmed?
(Expected Results)
8:00 am at 18 Thistle Hill Drive(House)

	20 dB	40 dB	60 dB	80 dB	100 dB	120 dB	140 dB
Trial 1	None	None	None	Alarm	Alarm	Alarm	Alarm
Trial 2	None	None	None	None	None	Alarm	Alarm
Trial 3	None	None	None	None	Alarm	Alarm	Alarm
Trial 4	None	None	None	Alarm	None	Alarm	Alarm
Trial 5	None	None	None	None	None	Alarm	Alarm

At each location, three different times will be tested, 8:00 am, 1:00 pm, and 8:00 pm, to incorporate the changes in the independent variable. Each spot will be filled with either a yes or a no for whether or not it alarmed the person.