

## **Group #59**

*Aarushi Biswas, Anitya Kapoor, Yash Gupta*

# **Bracelet Aid for d/Deaf People**

## Our Team

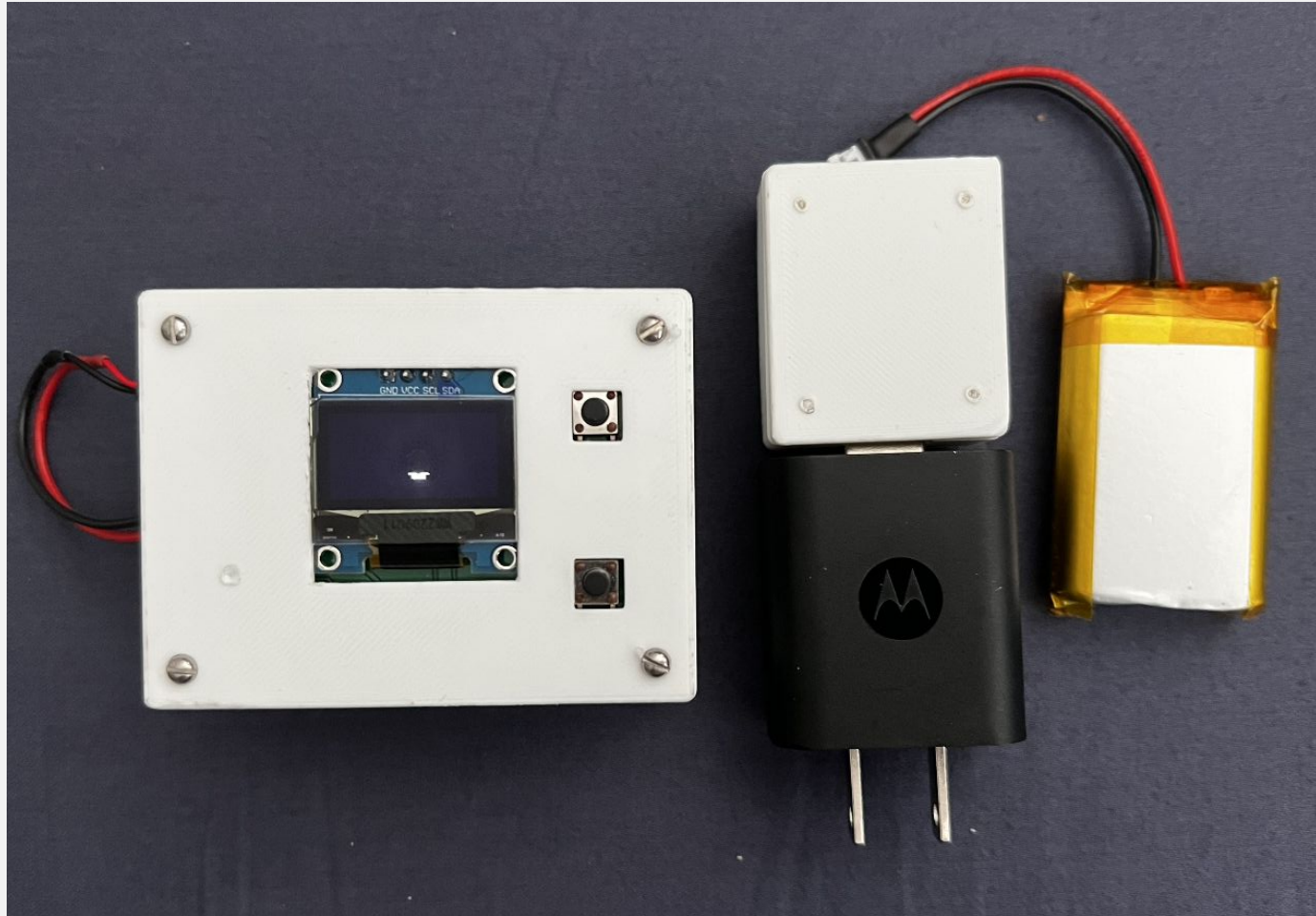
Aarushi Biswas  
*Computer Engineering, Senior*

Anitya Kapoor  
*Computer Engineering, Senior*

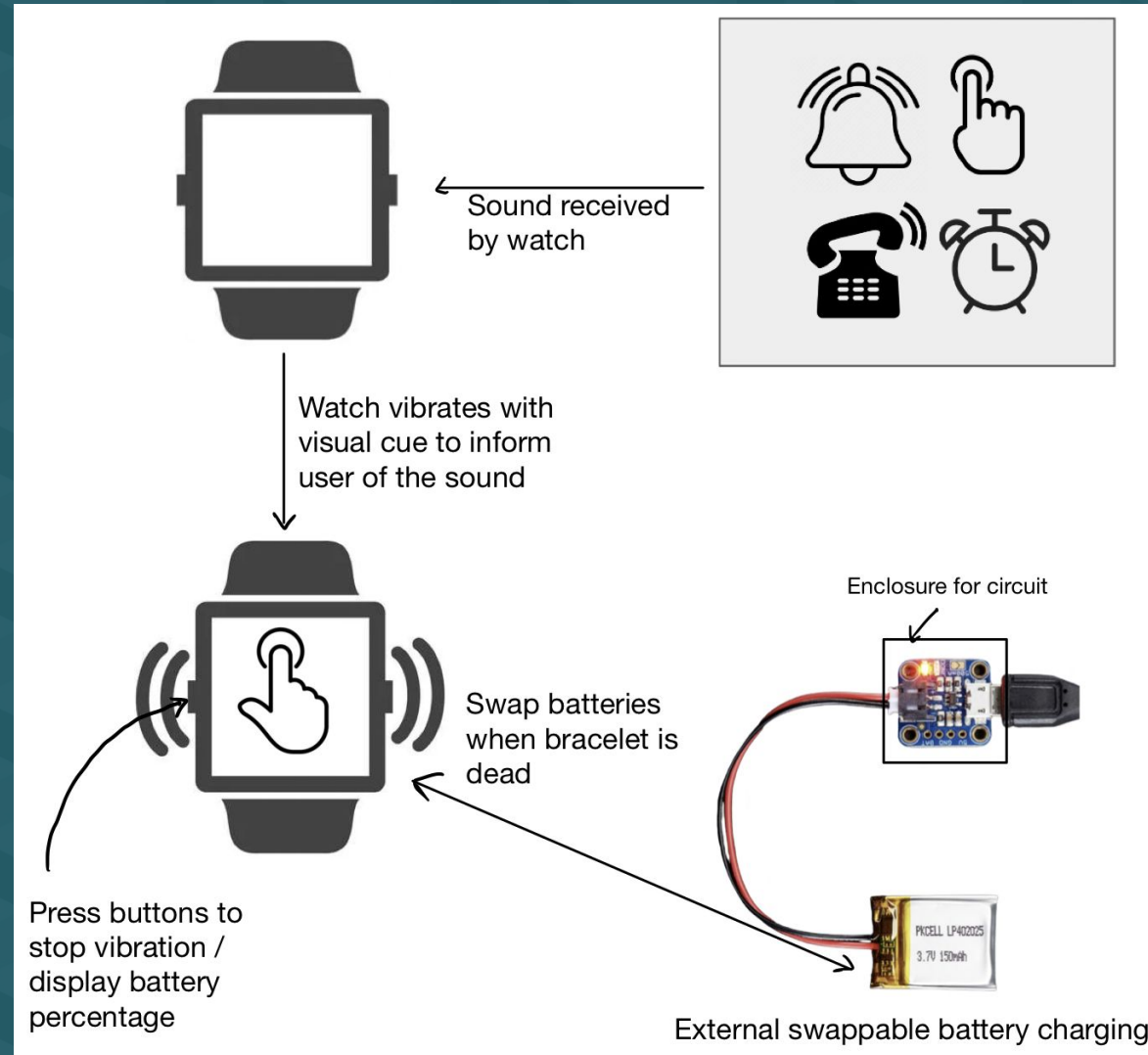
Yash Gupta  
*Computer Engineering, Senior*

# HOW IMPORTANT ARE SOUNDS?

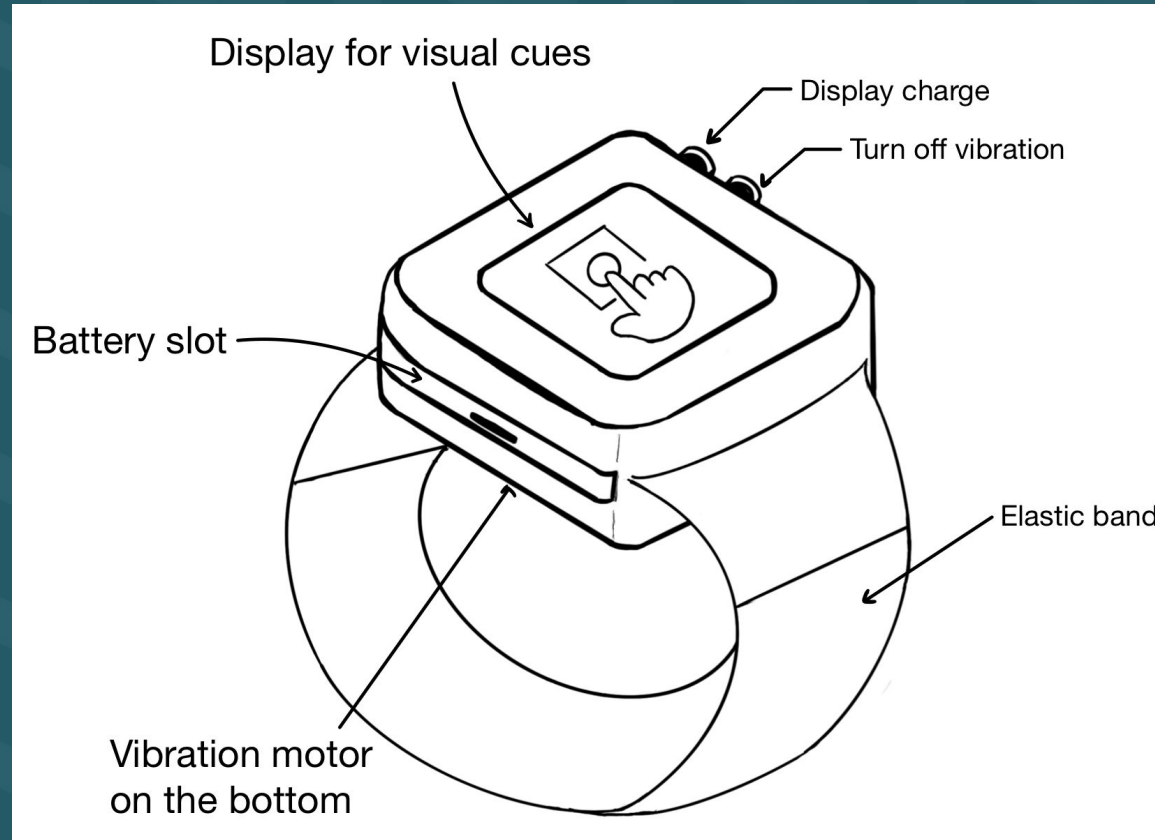
## Our Solution



# How does the device work?

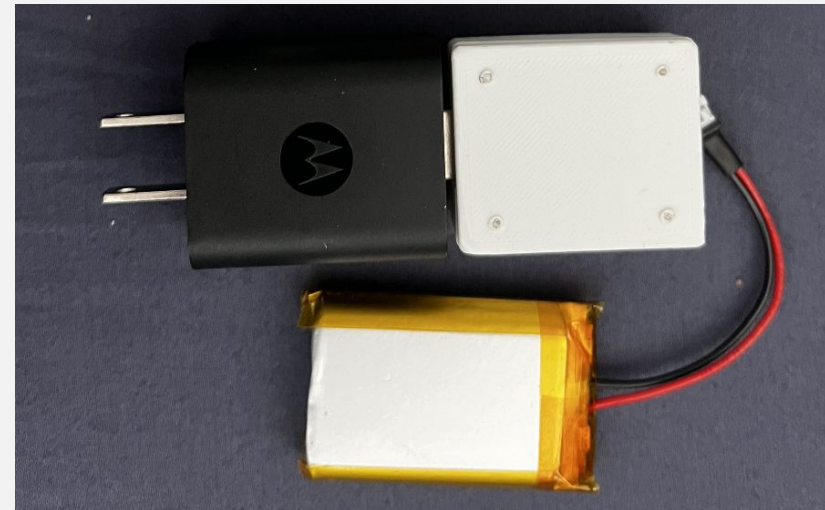
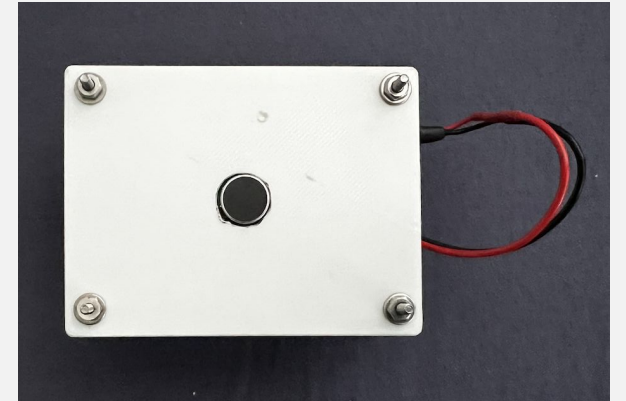
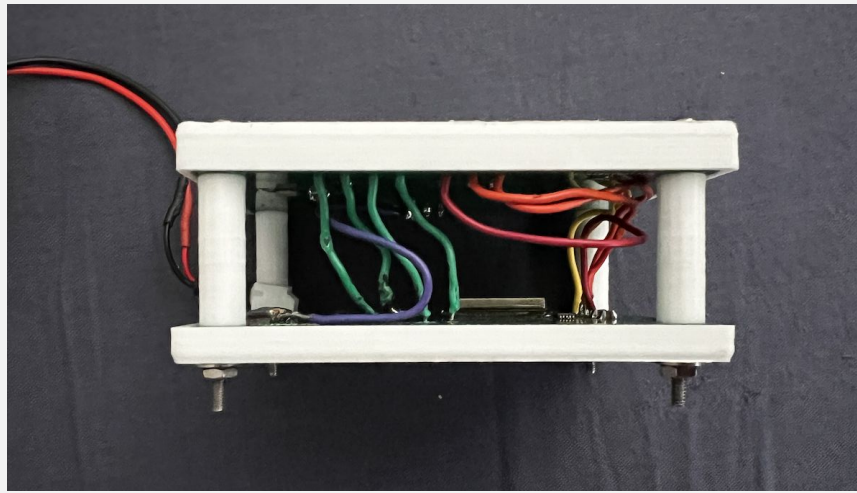
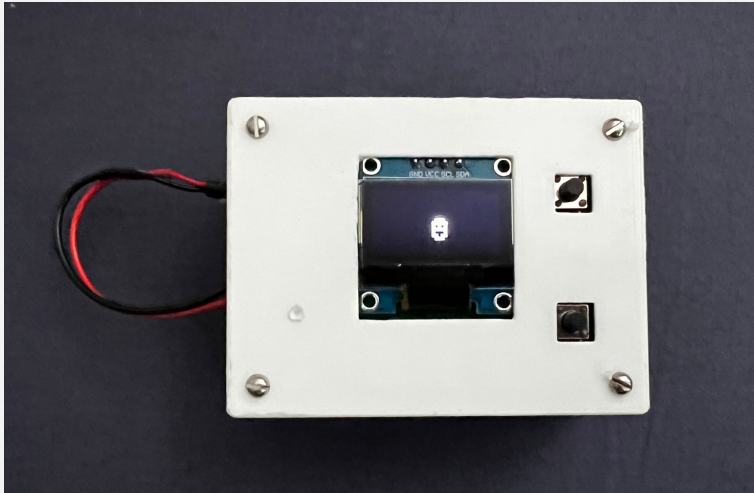


# Physical Design : Initial Prototype





# Physical Design: Our Final Product

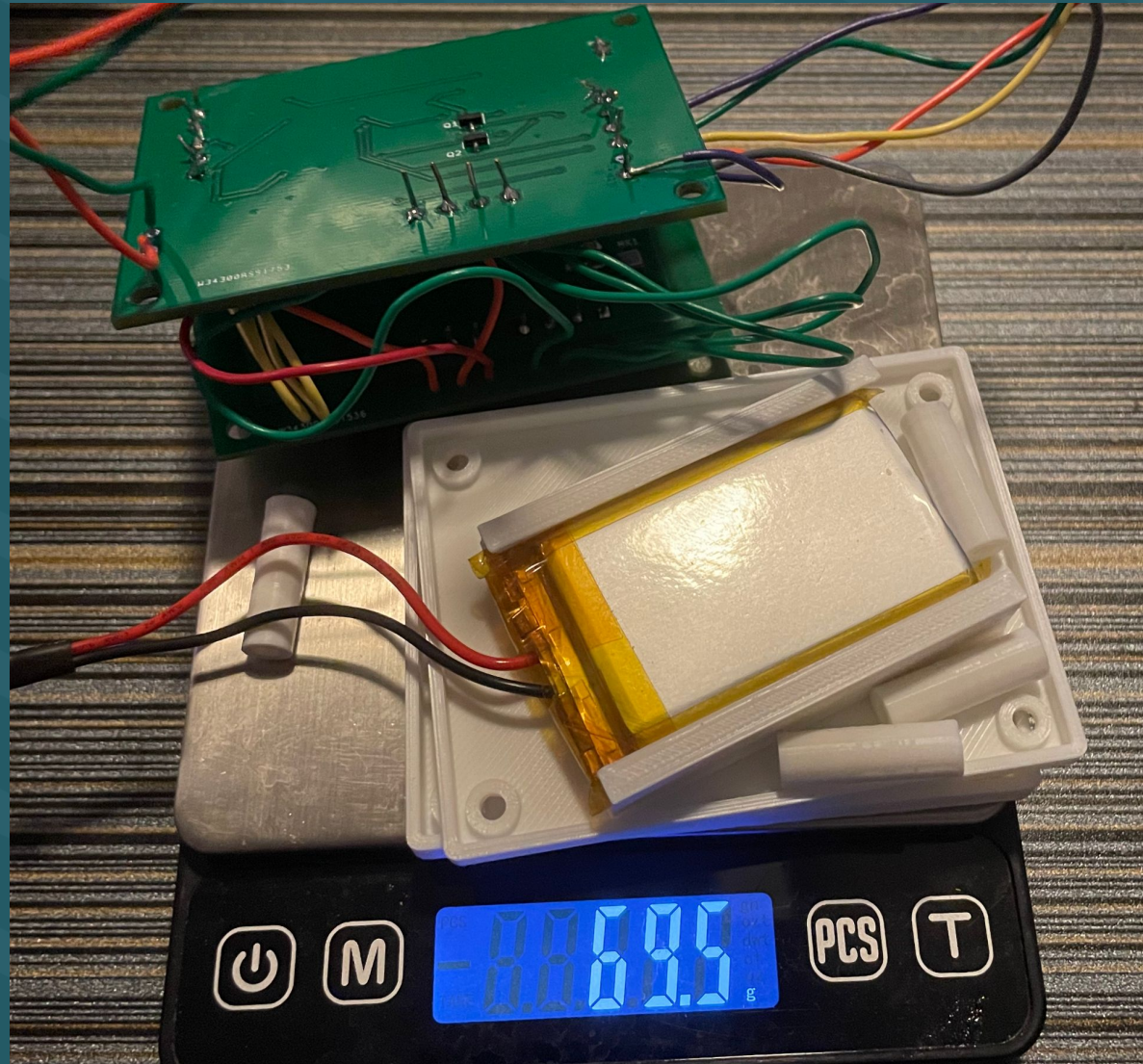


## High Level Requirements

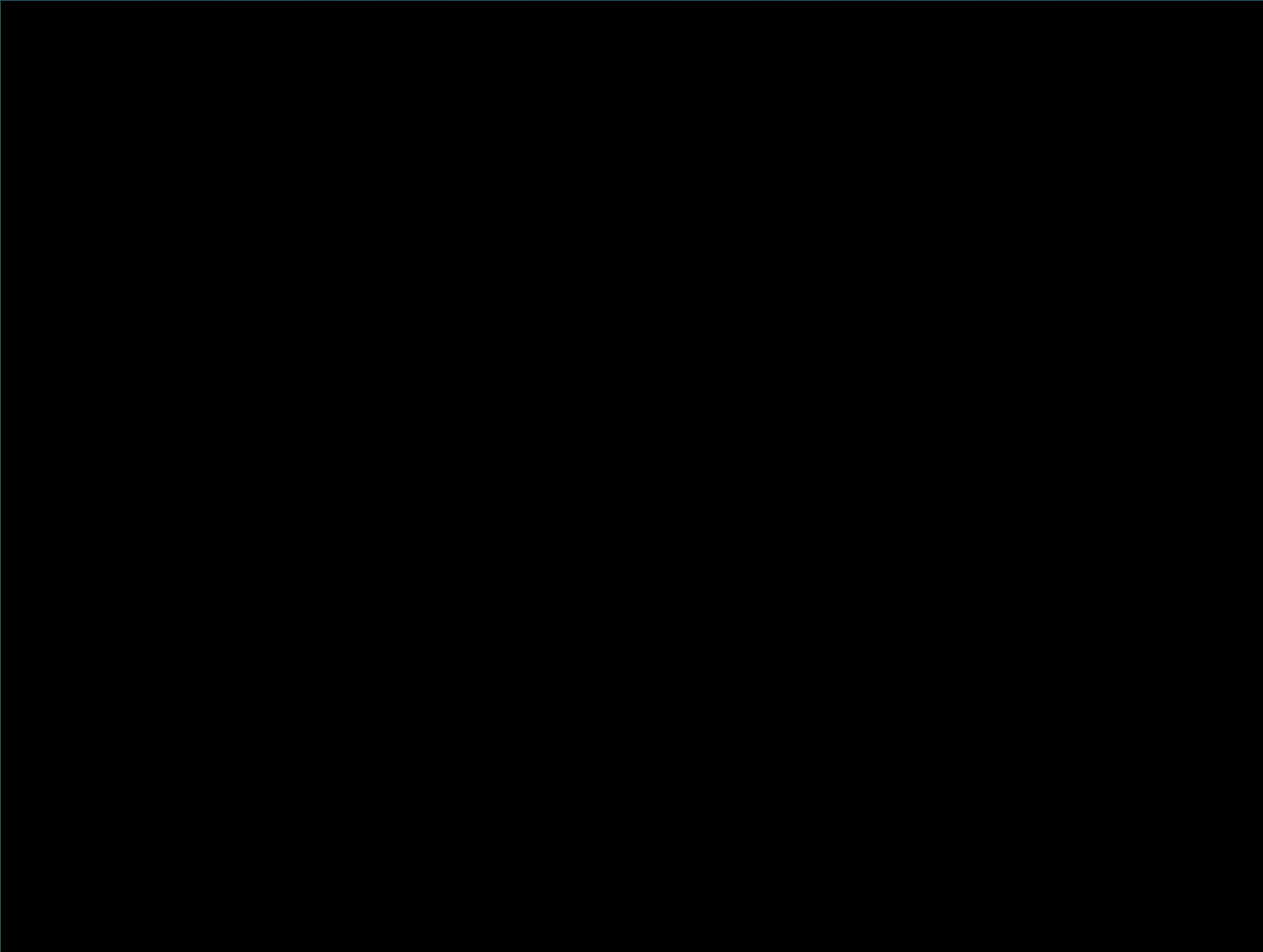
- 
- Lightweight and comfortable with a total weight of less than 70 grams
- Can detect upto 10 different sounds and produce 10 distinct vibrations
- The feedback time between detection and notification is less than 10 seconds



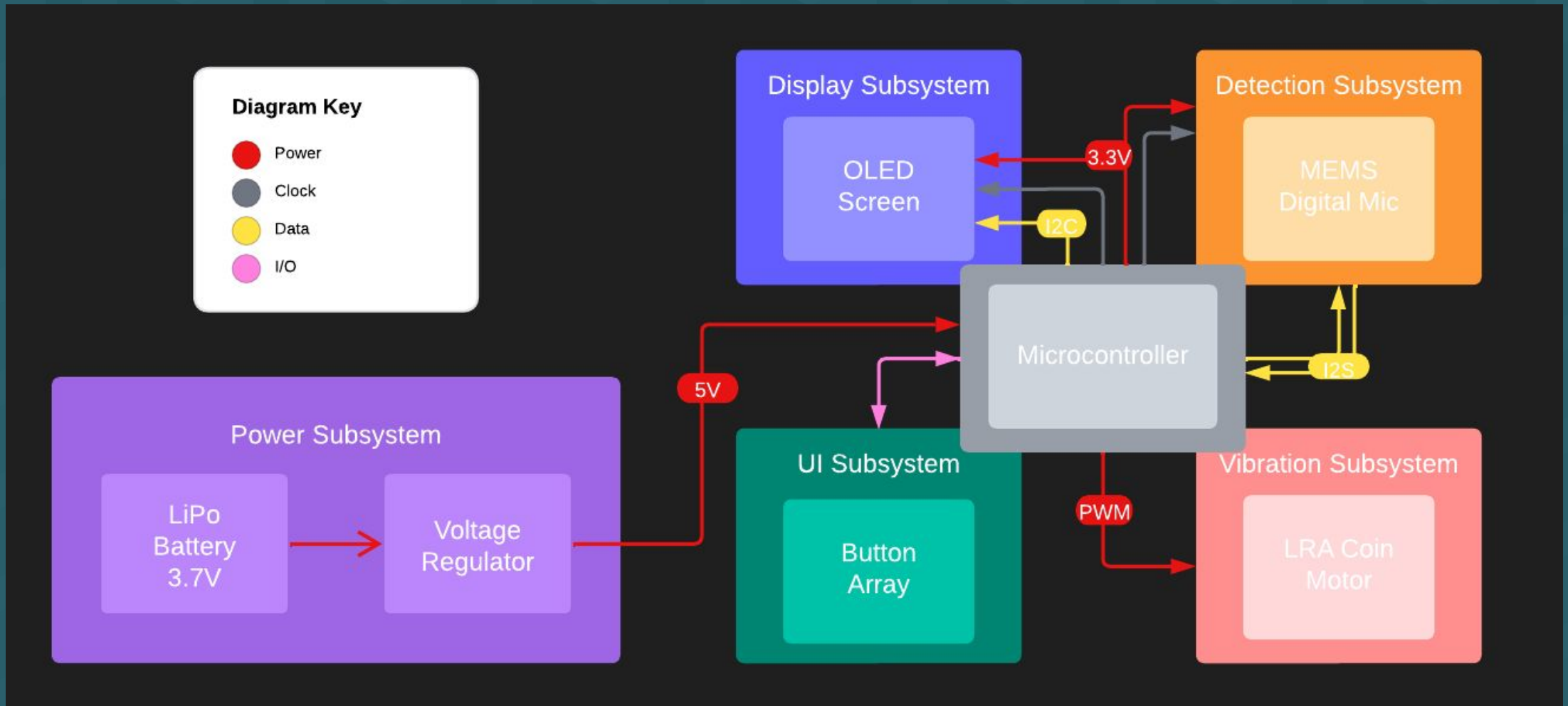
Our device weighs just under 70 grams, making it extremely lightweight and wearable



# Our Demo



# Our Block Diagram



# Power Subsystem

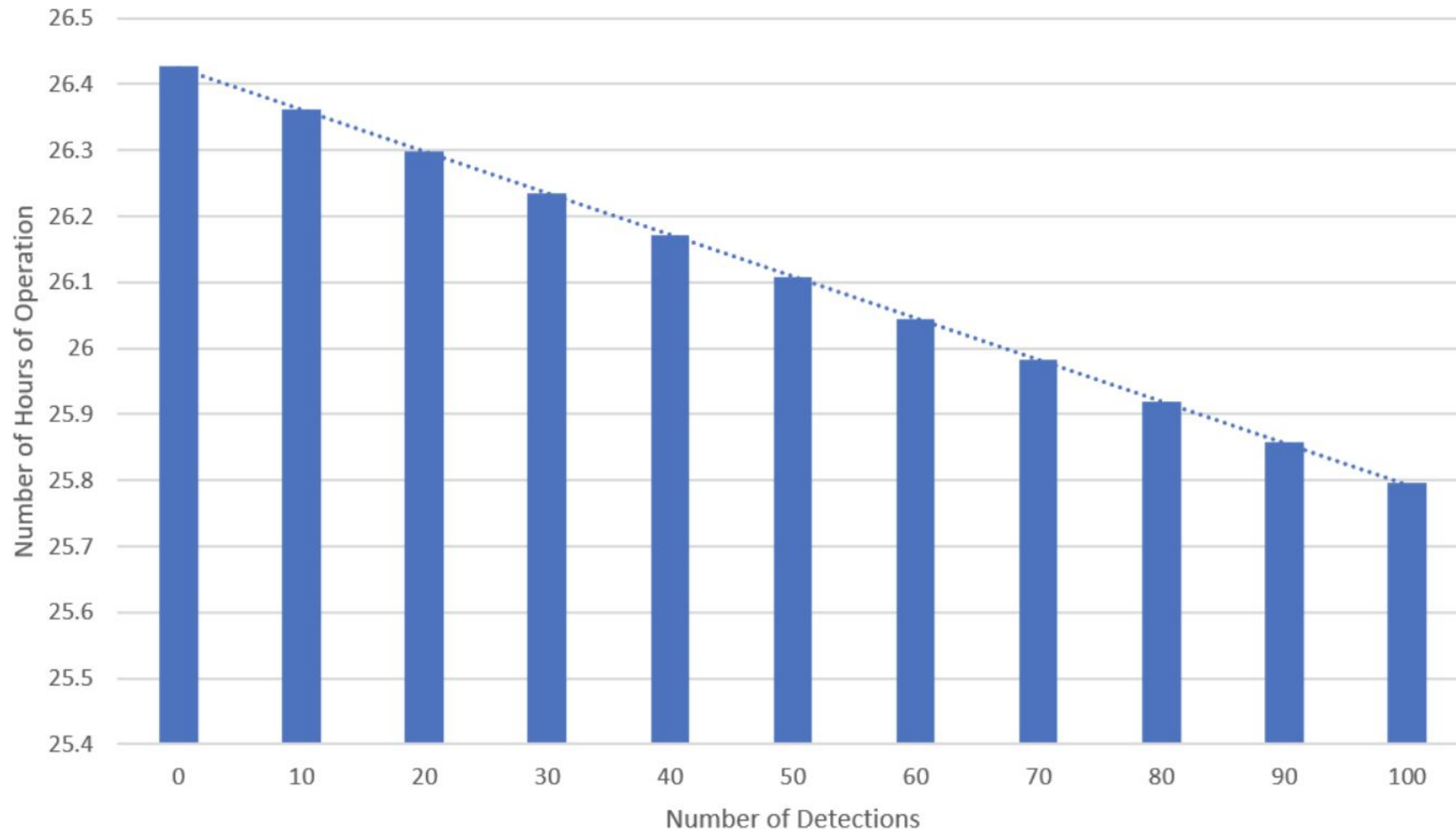
## Power Subsystem

- Most critical requirement → Battery life of >24 hours
- Swappable Batteries provided
- Additional Charger circuit included

Ensures that user has 0 downtime



Projected Battery Life vs Detection Count



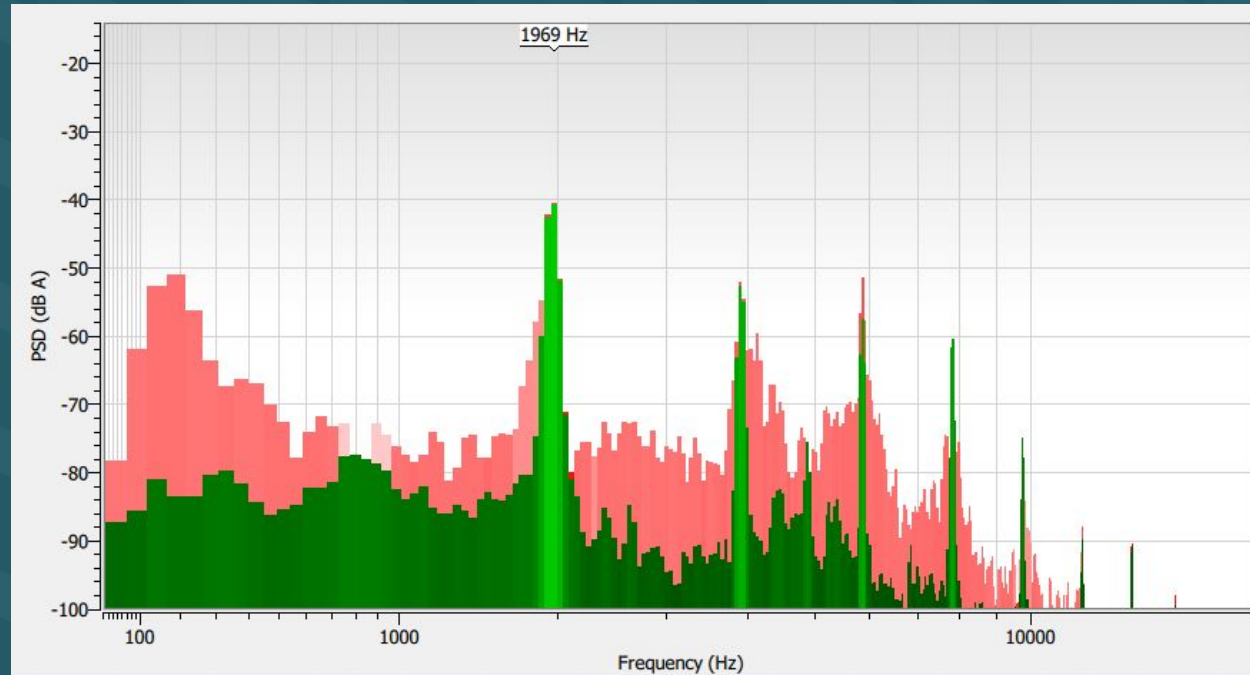
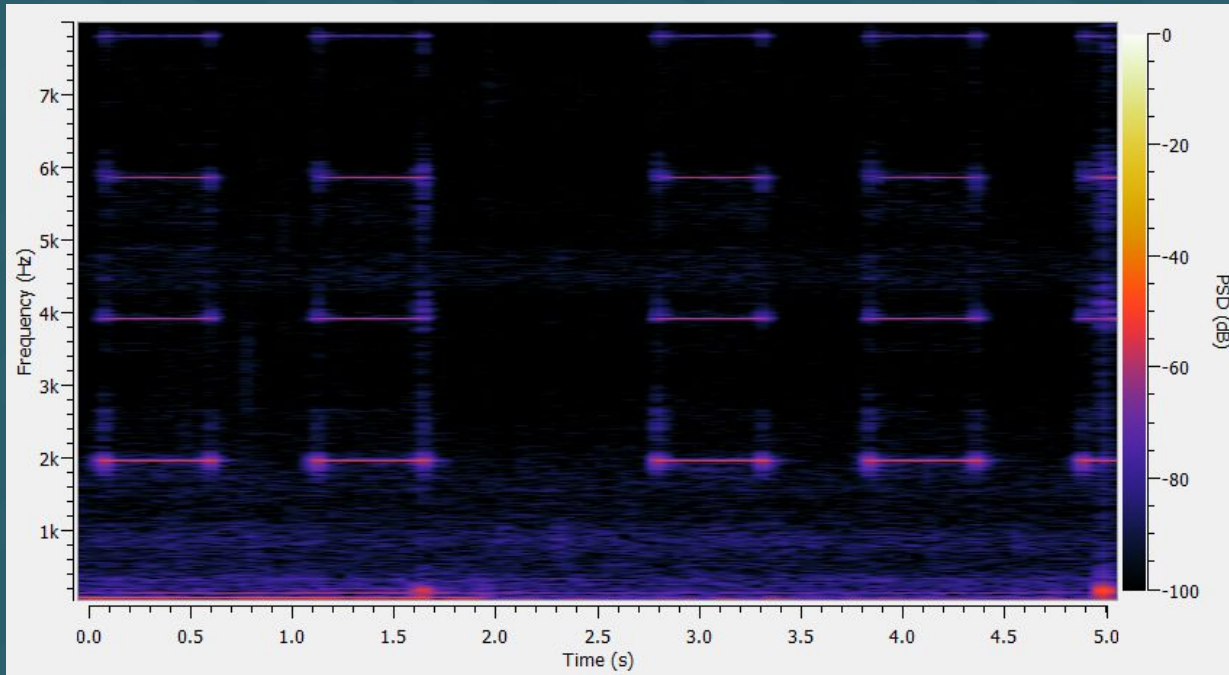


# Sound Detection Subsystem

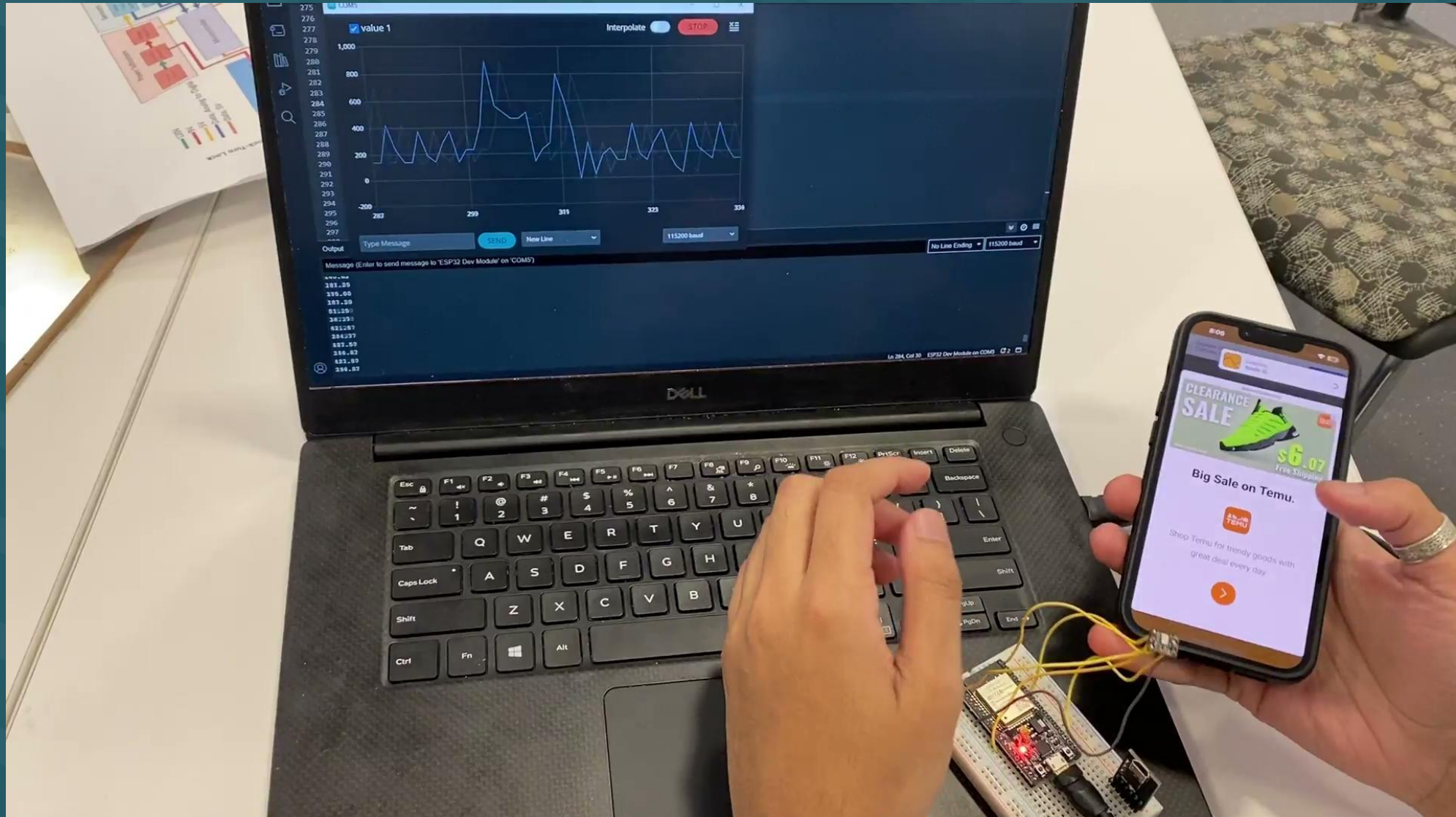
# Sound Detection Subsystem

- Major Requirements:
  - Subsystem should detect sounds with a frequency range of 200 Hz - 15 KHz
  - Detection time of <10 seconds
- How are we doing the Sound Detection? Using Fast Fourier Transforms

# FFTs



Our Subsystem can detect sounds with frequencies from 200 Hz to 15 KHz



# Vibration Subsystem

## Vibration Subsystem

- It should be able to produce at least 10 unique vibration patterns
- The subsystem should successfully produce a vibration within 10 seconds of when a sound is produced



## We asked 15 people whether they can distinguish the 10 vibrations

We asked a group of 15 people to verify whether they can differentiate between our 10 vibrations and 10 symbols. The results were as followed

Name	Vibrations	Display	
Anuraag Agarwal	No	Yes	Microwave and Fire alarm vibrations felt similar, changes made according to user input
Trusha Vernekar	Yes	Yes	
Achyut Agarwal	No	Yes	Phone ringing and Fire alarm vibrations felt similar, changes made according to user input
Kartik Mehra	No	Yes	Smoke Detector and Burglar alarm vibrations felt similar, changes made according to user input
Elina Mehra	Yes	Yes	
Malhar Vora	Yes	Yes	
Rohan Batra	Yes	Yes	
Eshrit Tiwary	Yes	Yes	
Panav Munshi	Yes	Yes	
Aliva Panigrahi	Yes	Yes	
Aumkar Renavikar	Yes	Yes	
Daniel Abdoue	Yes	Yes	
Sruti Kamarajugadda	Yes	Yes	
Adit Arora	Yes	Yes	

# Display Subsystem

# Display Subsystem

- It should be able to clearly display symbols associated with detected sounds



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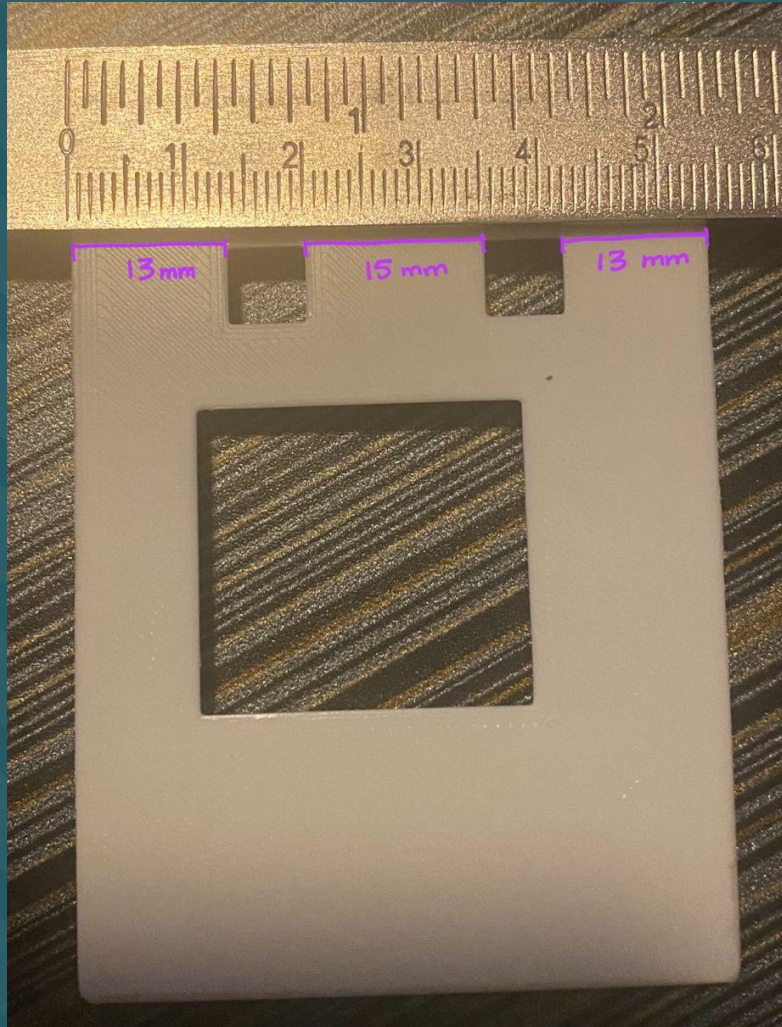
# User Interaction Subsystem

# User Interaction Subsystem

- 2 buttons
  - Display Power on the Display
  - Turn off vibrations once user has been notified
- Easily accessible and spaced far enough apart to ensure buttons aren't accidentally pressed



## Our Top Enclosure



## Button view



# Conclusion

- High Level Requirements met
- Subsystem requirements met
- Project working on a PCB

## Major Problems Faced

- Changed Microcontroller → Changed PCB design
- Too much computing load on Microcontroller → Changed FFT libraries
- End moment soldering issue

## Future Plans

- Switch to Neural Nets for Sound Detection for more reliable results
- Better packaging in order to prevent absorption of vibrations
- Connection with a phone app
- Allow user to record their own sounds

**Thank You!**

**Any Questions?**