



Vibrational GPS

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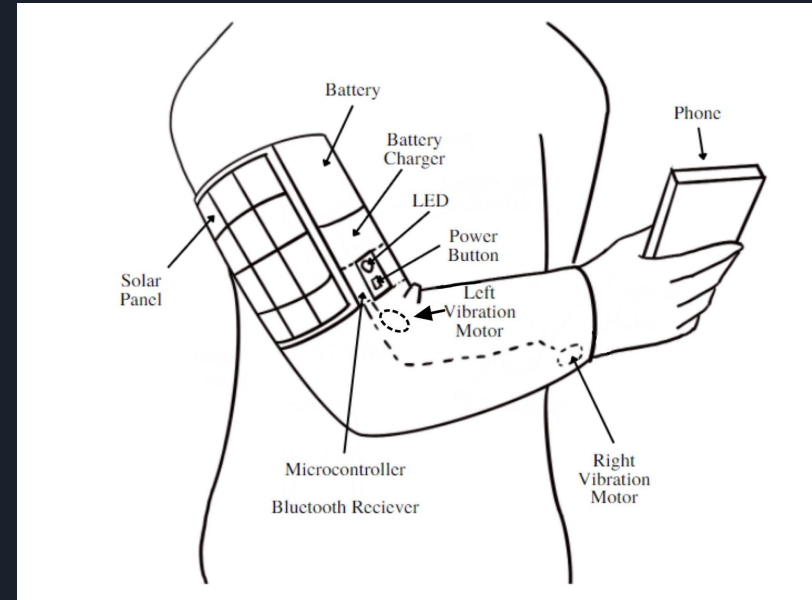
SECTION 1



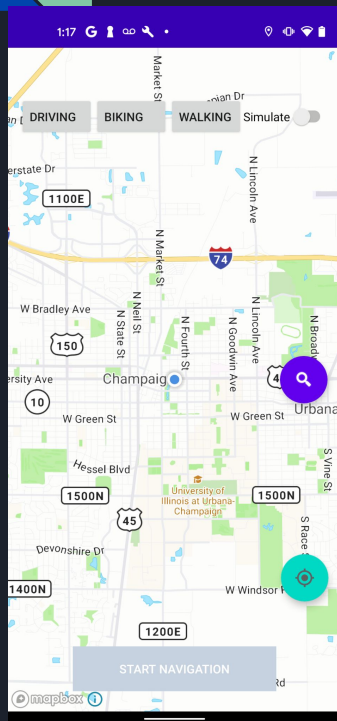
Objective and App Overview

Introduction / Objective

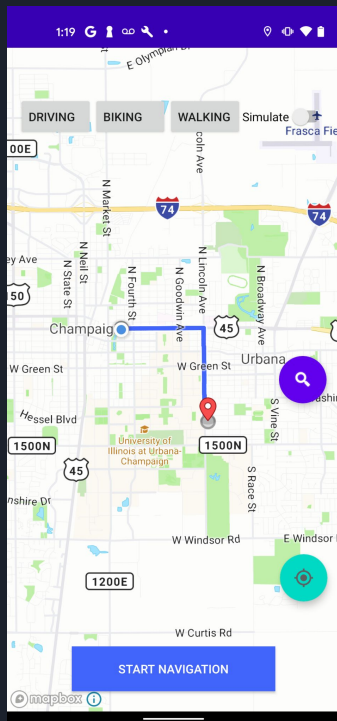
- Dangerous to navigate while cycling due to distractions
 - Phone notifications, audio, pop-ups
- Allows for distraction-free navigation
 - Keeps eyes and ears focused on road
- Utilizes two vibration motors for directions
 - One for left, one for right



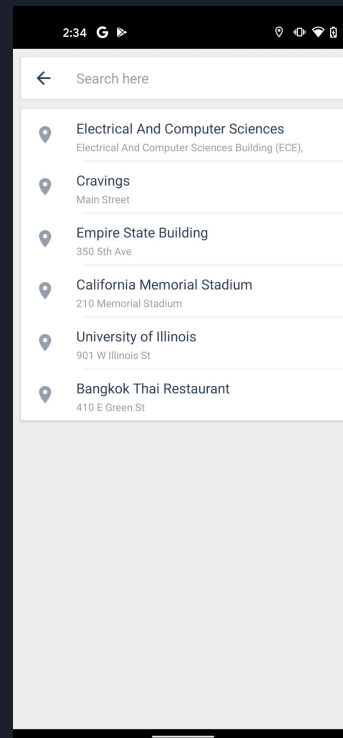
App Design



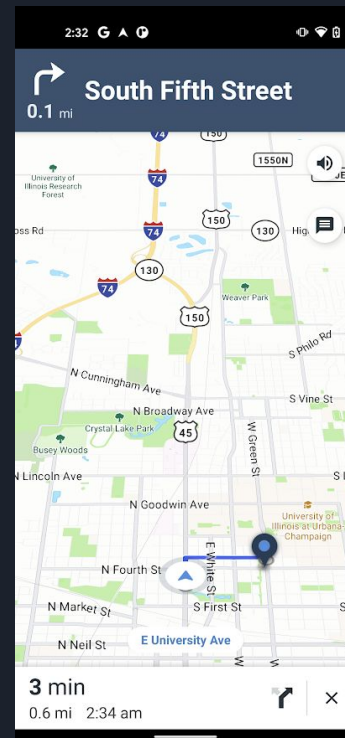
Main Menu



Route Generation



Search



Navigation



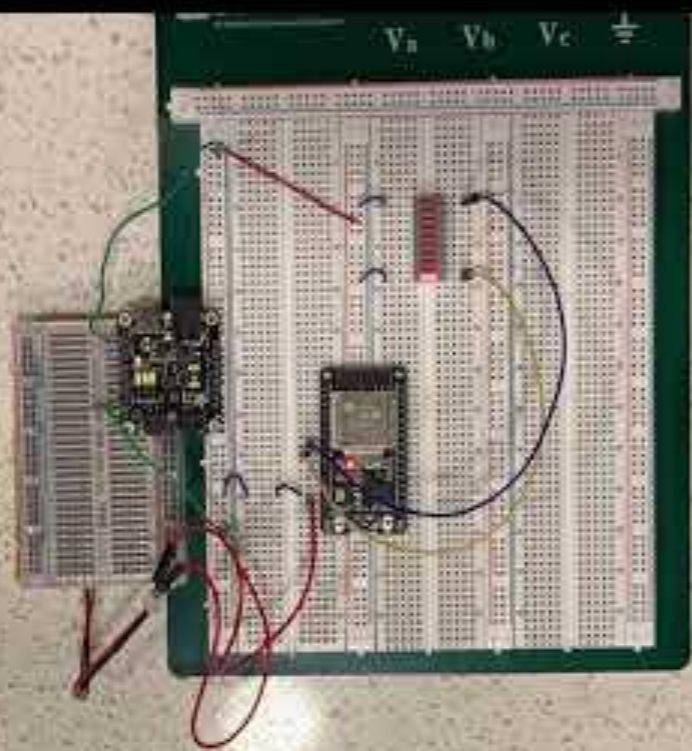
Solar Panel

Hardware

Right Vibration
Motor

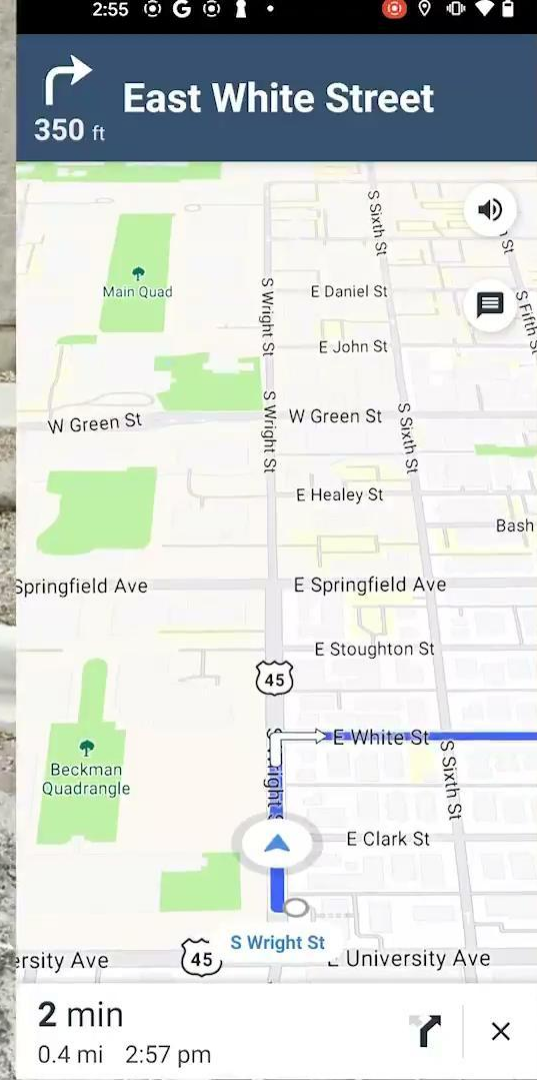
Left Vibration
Motor







Soo Min makes a wrong turn here



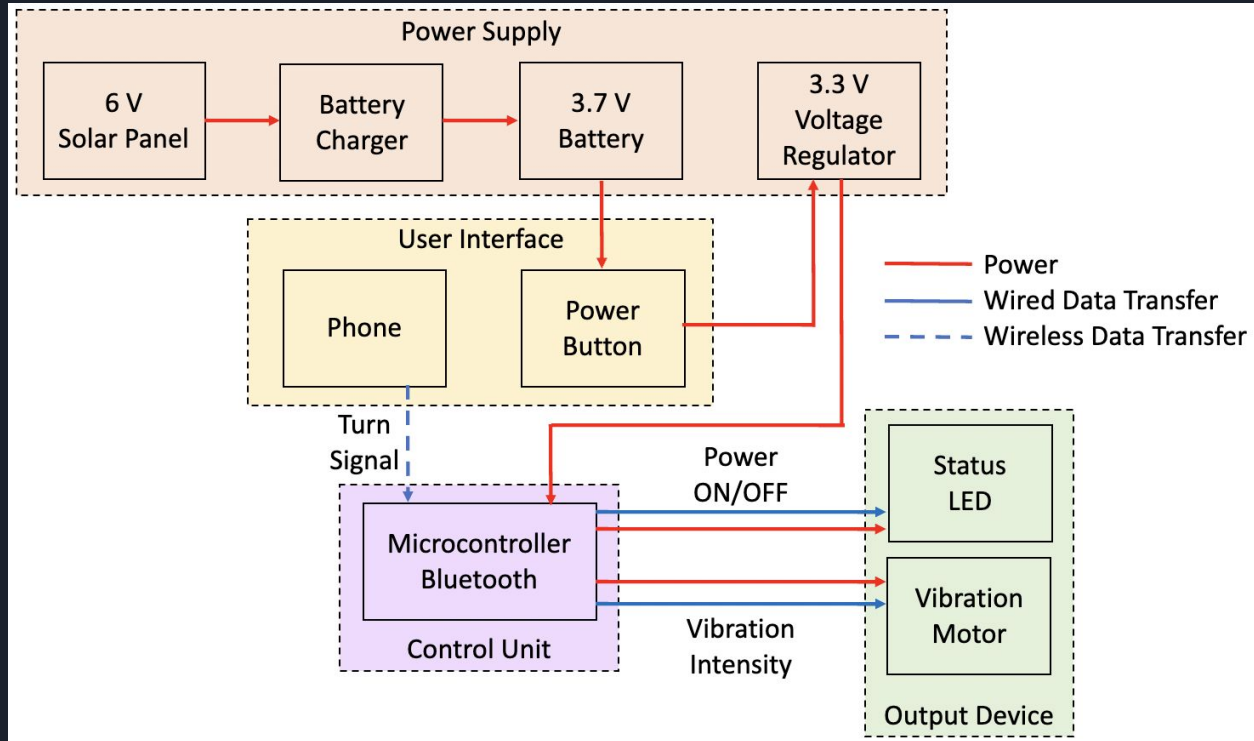


SECTION 2

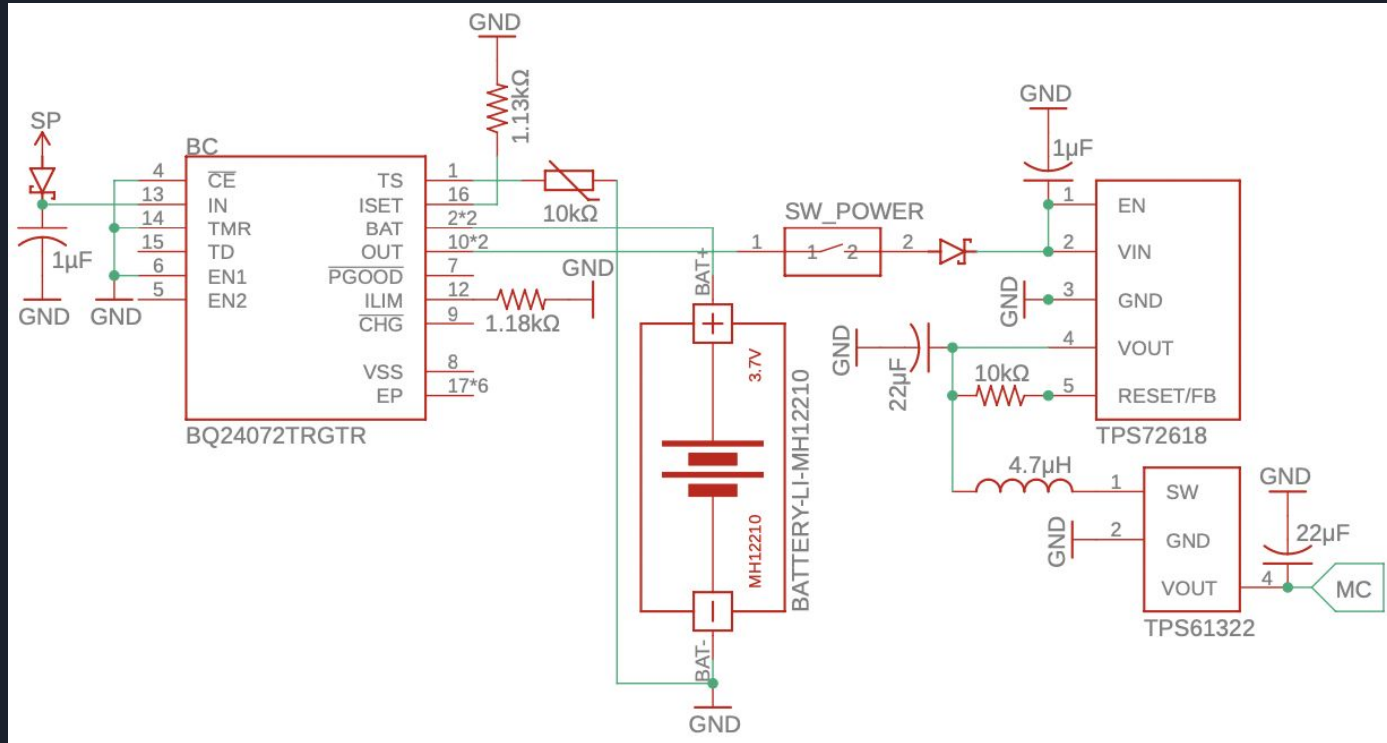


Original Design and Verifications

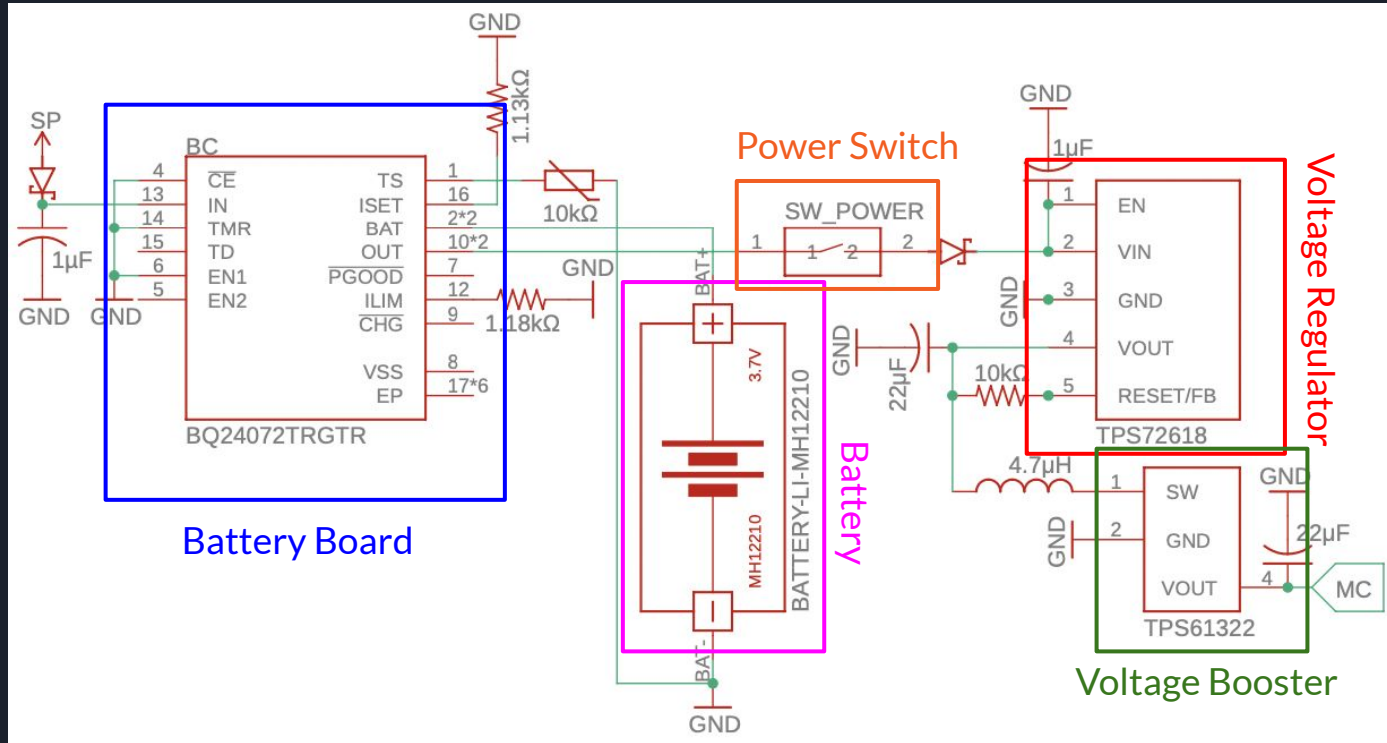
Block Diagram



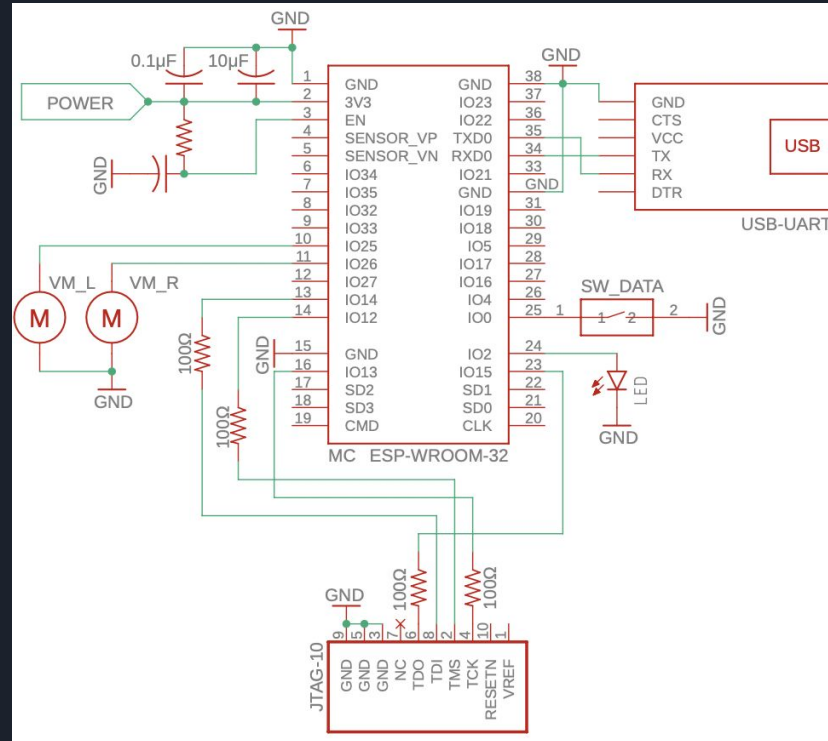
Schematic - Power Supply



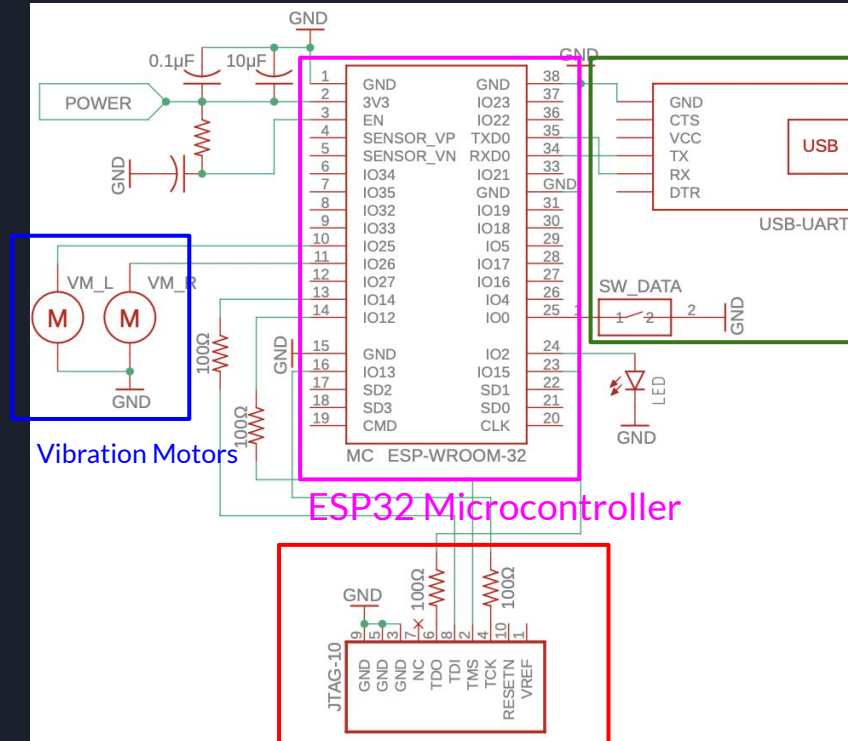
Schematic - Power Supply



Schematic - Microcontroller



Schematic - Microcontroller



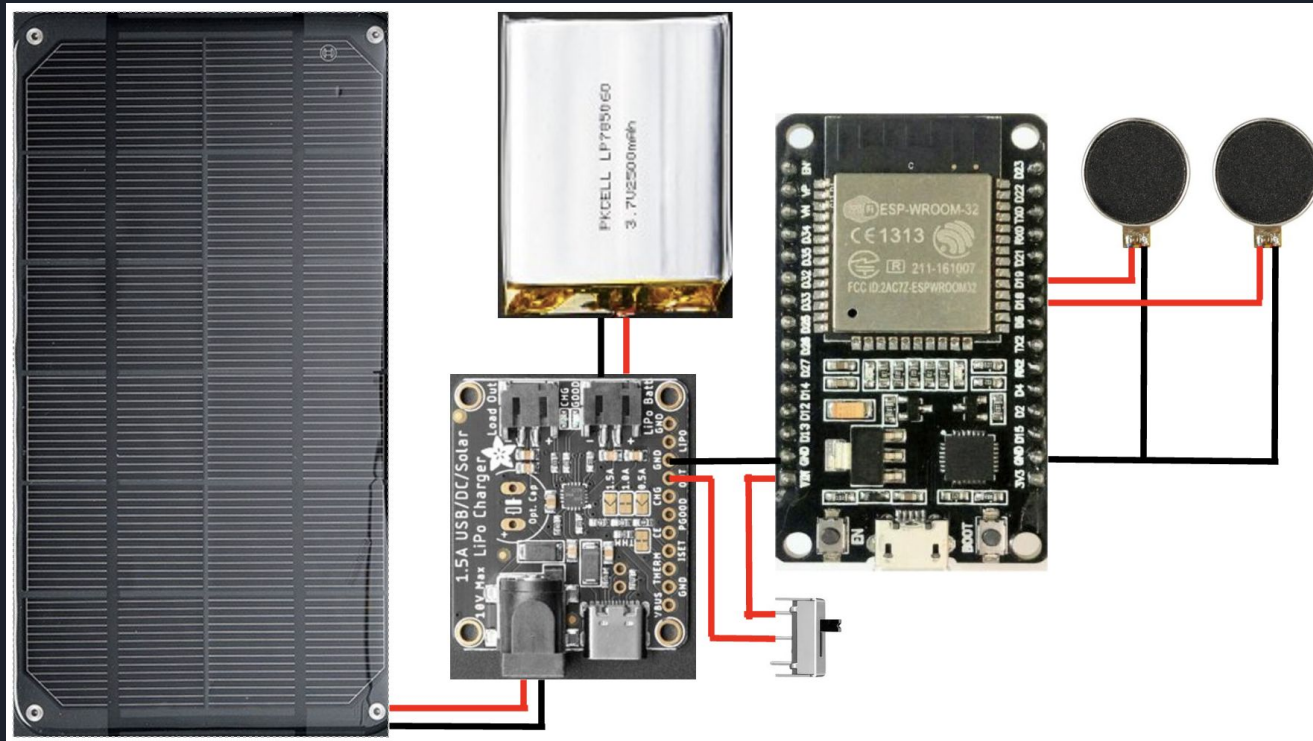
UART - Program Chip

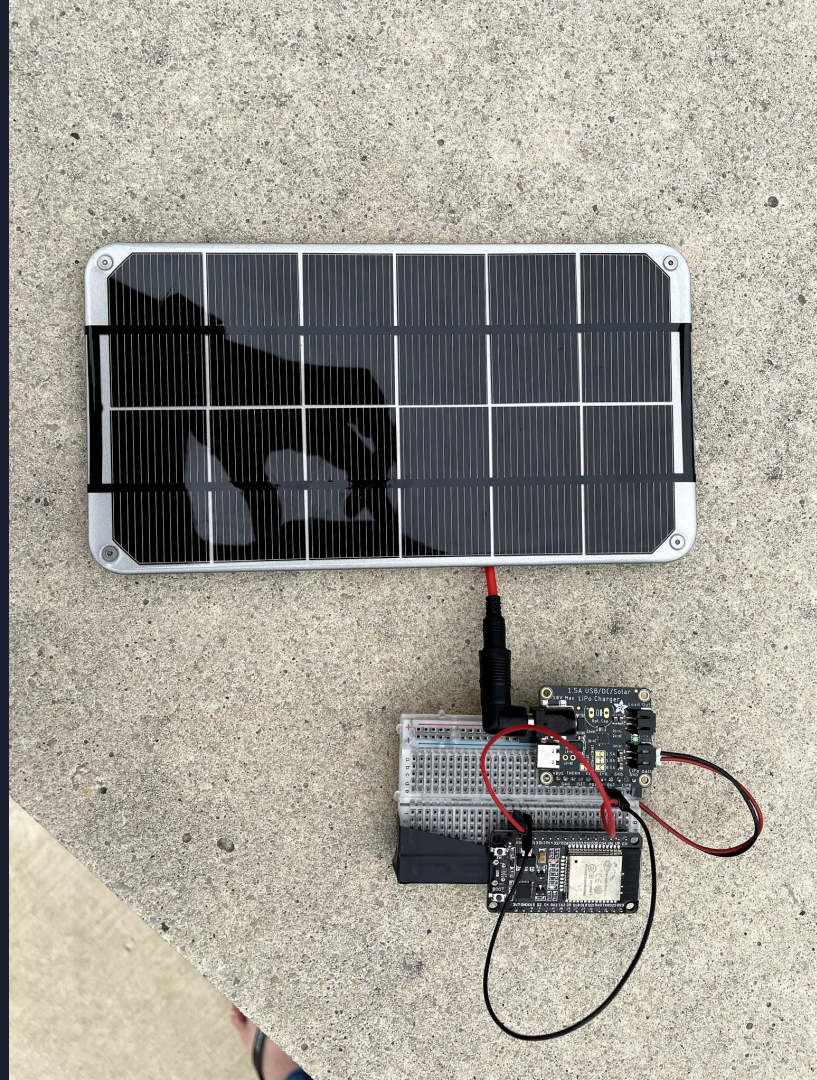
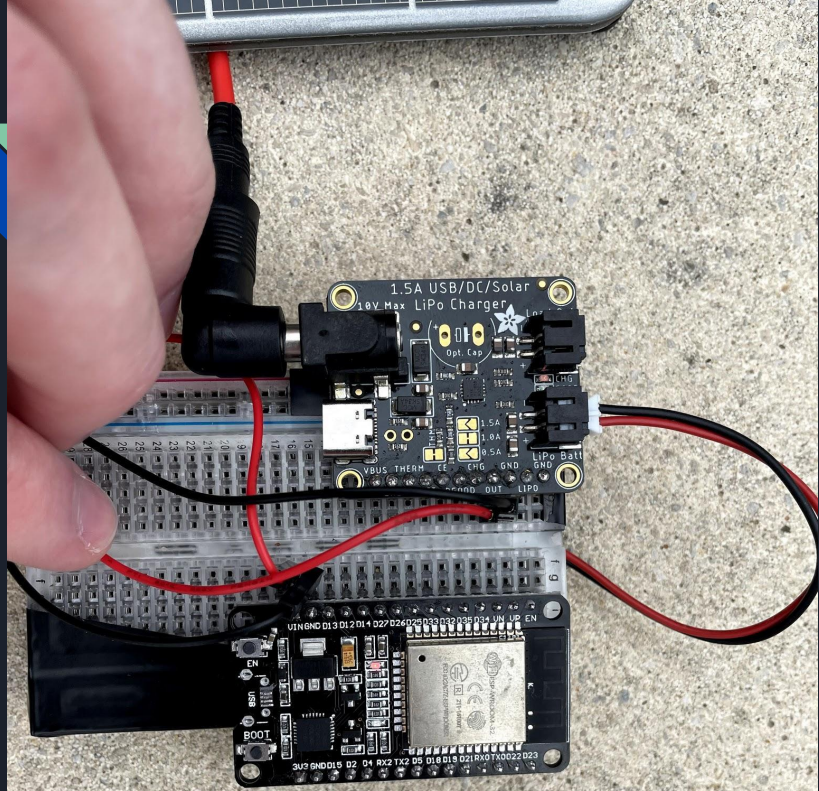
Vibration Motors

ESP32 Microcontroller

JTAG - Check ESP Functionality

Physical Implementation w/o PCB



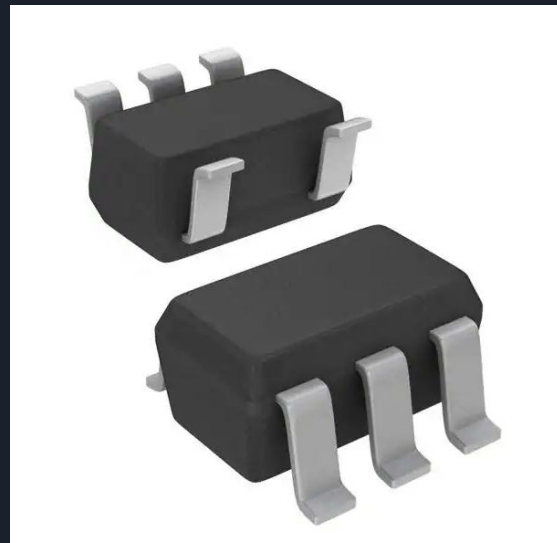


Design Requirements

- Voltage Regulator
 - Regulate 3.7V to 3.3V



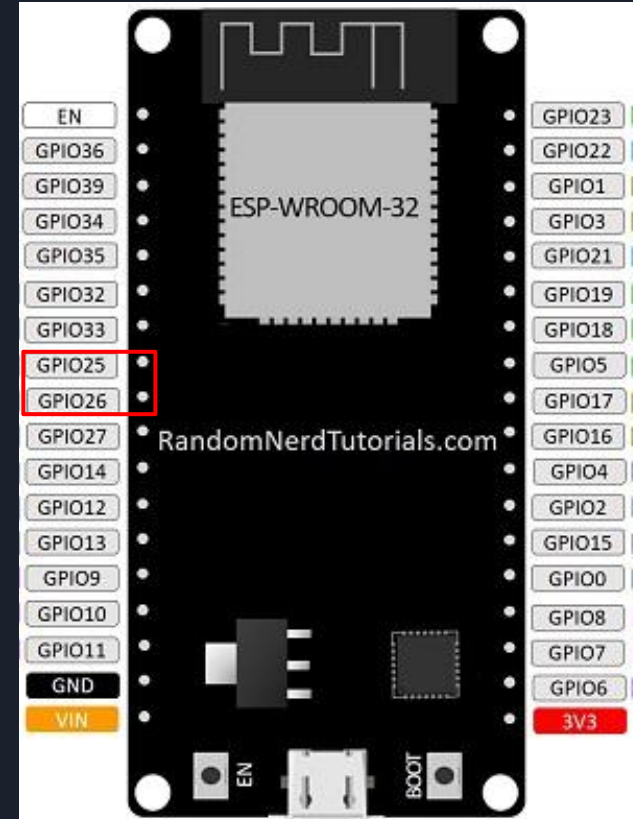
TPS72518 Voltage Regulator



TPS613221 Voltage Booster

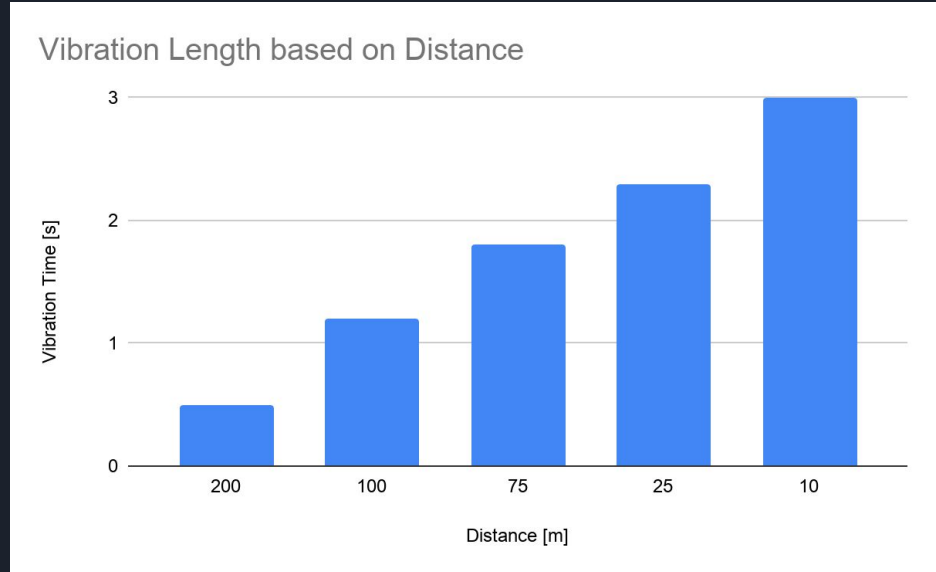
Design Requirements

- Microcontroller/Bluetooth (ESP32)
 - Control 2 unique signals
 - 40mA each
 - Receive and interpret Bluetooth Signal



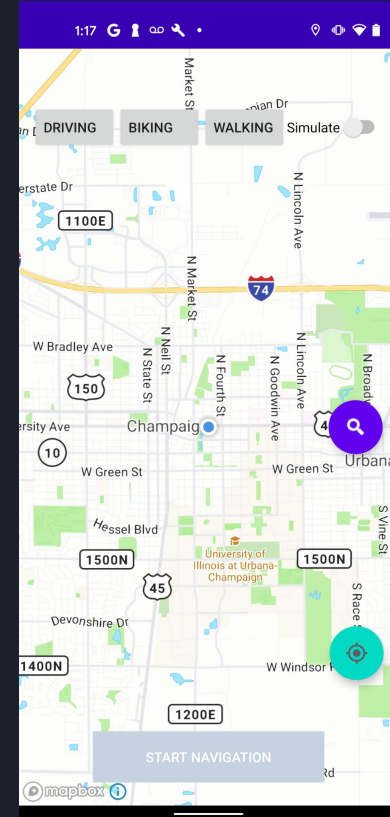
Design Requirements

- Vibration Motors
 - Vibrate for 10 seconds continuously
 - Be distinguishable on the arm
 - Vibrate independently



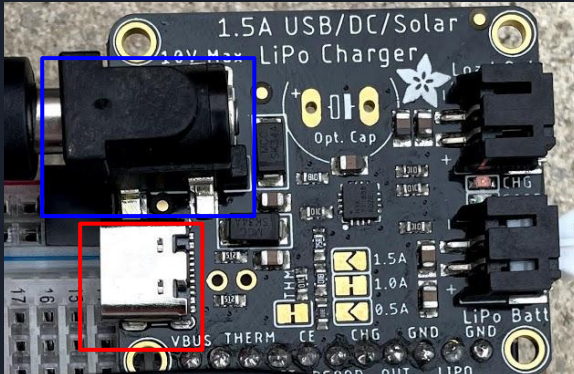
Design Requirements

- Android App
 - Enter destination
 - Determine route
 - Transmit directions via Bluetooth
 - App has the ability to reroute

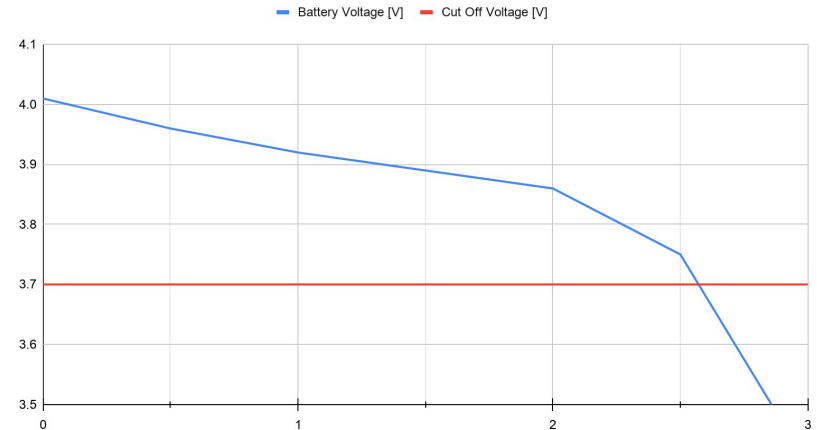


Design Requirements

- Battery
 - Charge from wall and Solar Panel
 - Provide 1.5 hours battery life



Discharge over time



Design Requirements

- Solar Panel
 - Charge battery in sunlight
 - Provide at least 3V





Successes

- All components passed verifications
- Successful integration of components on a breadboard
- Able to navigate using the device only
- Device able to reroute



Challenges

- Unit testing components
 - Difficult creating test circuits
- Software bugs
 - Signals sent at the wrong time
 - Did not send a clear signal after the turn
- Integration of different components together



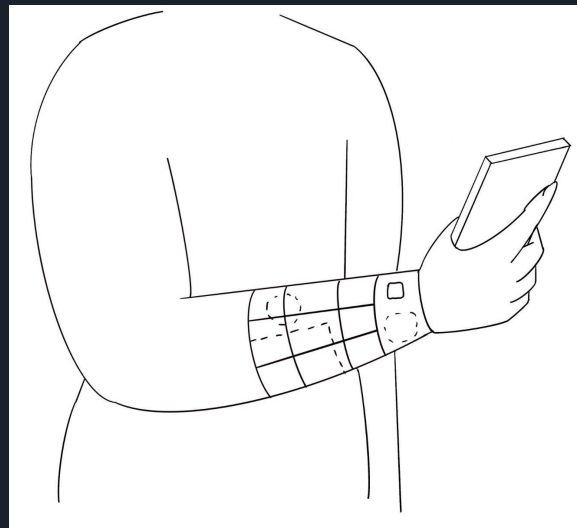
SECTION 3



Future Work and Review

Future Work

- Optimize design to fit wrist band
 - Reduce PCB design
 - Change mount design
- Look into alternatives for solar panel
 - Larger battery
 - Flexible solar panel
- Implement BLE
- Optimize software for improved battery life
 - Background Navigation
 - Optimized signal transmission





Conclusion

- Components passed all unit tests
- Successfully demoed app and microcontroller
 - Done using dev boards
- Look forward to future PCB integration



Thank You

Any Questions?

