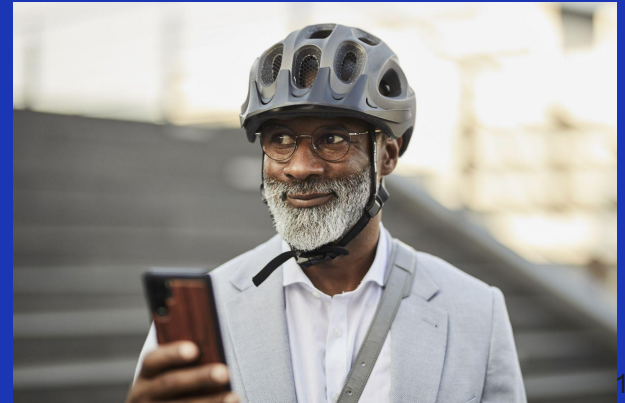# **Smart Helmet:** A gesture controlled smart helmet for safer cycling

Group 3: Yanni Speron, Lucy Harck, Dominik Zielinski, Chaitanya Gummalla

Final Project, 12/5/2024

AGENDA

01 BACKGROUND
Our Device
Market

02 Hardware
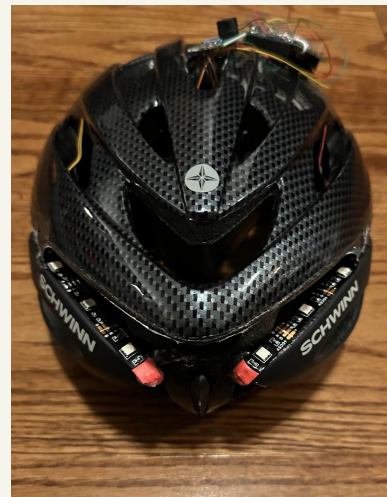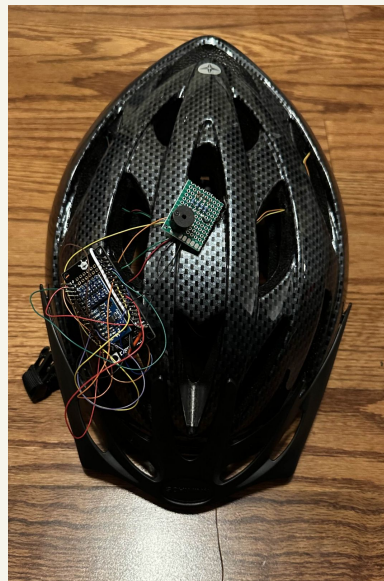Enclosure
Sensors

03 Circuit Diagram

04 Software
Data Processing
UI breakdown

05 CLOSING
Summary
Future Work

Our Device

- Our device has two parts
  - Hand device
  - Helmet Device
- Hand device looks for signals
- Sends to helmet to turn on signal
- 4 FSR sensors detect if a sudden collision to the head has occurred
  - Send signal to device informing cyclist
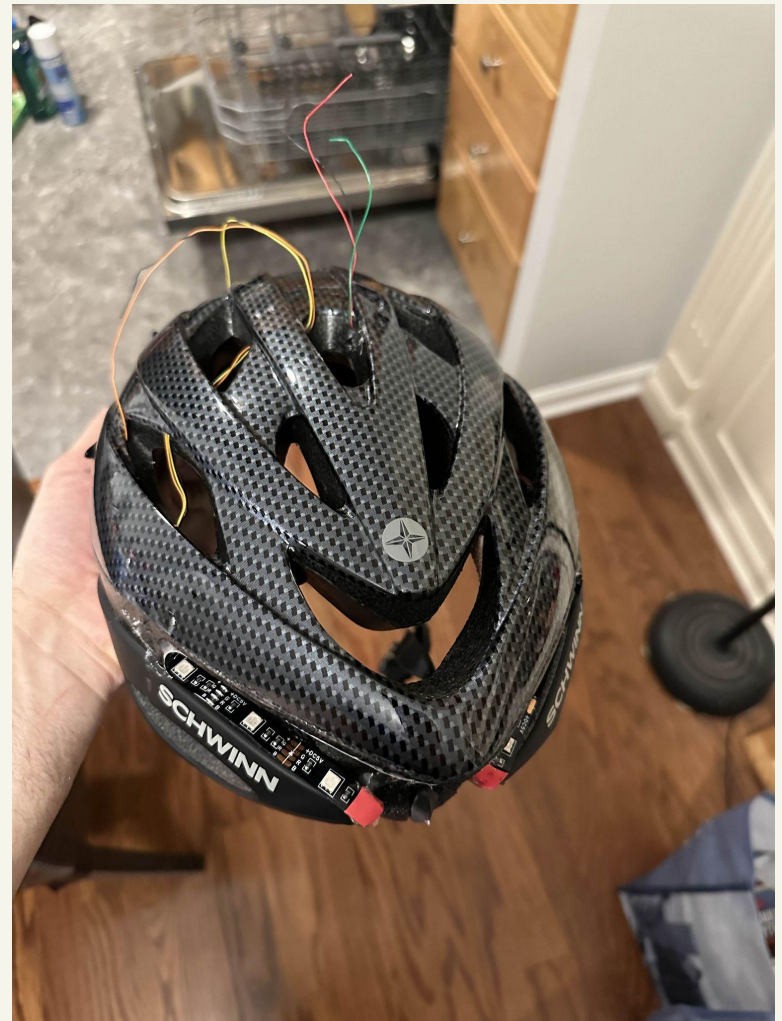 - Call for help

Current Market

- High Visibility Clothing
- Bike lights
- Bike reflectors
 - Front/back
  - Wheel
- Helmet Headlight

Enclosure

- Microcontroller on the inner top of the helmet
- FSR sensors placed in each direction inside the helmet
- LED strips on back to function as turn signals

Sensors

- 2x FireBeetle 328P with BLE 4.1 boards
  - One Peripheral on device, one Central connected to laptop
  - Communication using bluetooth between one another
- 4 (FSR) sensors for helmet collision detection
- Adafruit 9-DOF BNO055 Accelerometer
  - Acceleration, Gyroscopic, and Magnetometer data in X, Y and Z directions
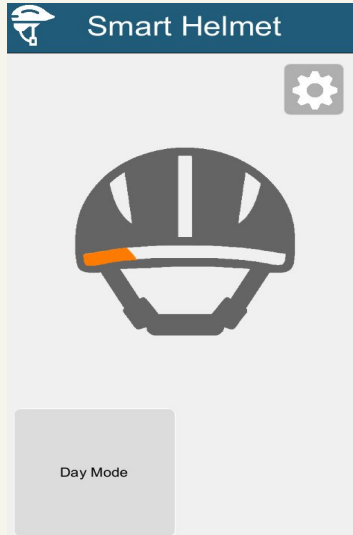
Circuit Diagrams

Helmet Wiring

Hand wiring

Right Middle Left
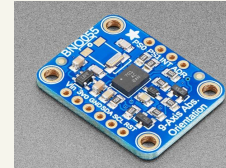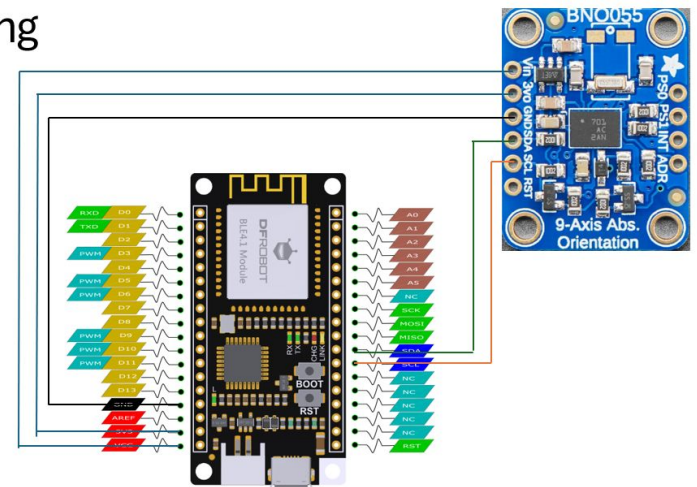
Data Processing

- Arduino code takes data from the BNO055 accelerometer and converts the data to readable degree angles
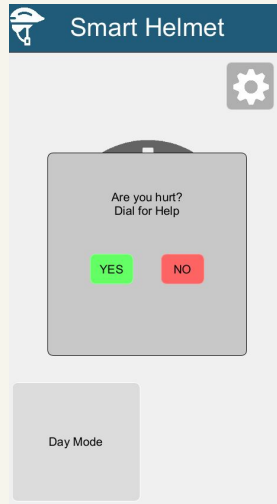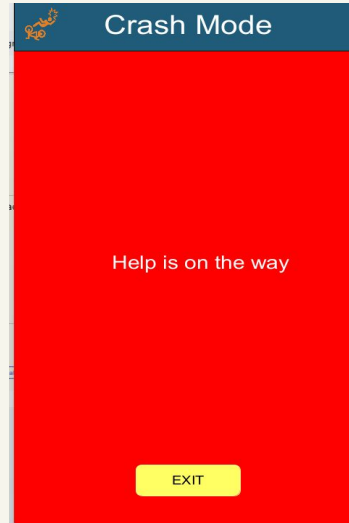- We look at the Z axis to determine the position of the hand signals.

UI Breakdown

Helmet Visualizer

**SOS Mode
Alerts Emergency Services**

**Enable SOS Mode
Day/Night Mode
(Helmet functions as
headlight)**

Conclusion

- Inexpensive and easy to implement
- Pressure sensitivity accurately measured using FSRs
- Adafruit 9-DOF BNO055 Accelerometer accelerometer to track user motion

Future work:

- Make the device more streamlined:
  - Give parts a smaller footprint (gloves are fairly bulky)
  - Have the device initial setup take less steps