Android-Based Application for Wearable Health Monitoring Devices

Shiyi Yang

Department of Computing and Software *Email: yangs192@mcmaster.ca*

Supervisor: Dr. M. Jamal Deen

1. Introduction

Inertial Measurement Unit (IMU) Devices

- The **Inertial Measurement Unit (IMU) Devices** are wearable devices used for measuring and collecting data from the body motions of patients
- IMU devices connect to the mobile application wirelessly using the Bluetooth connection

Figure1: MetaMotionR board and R case [1]

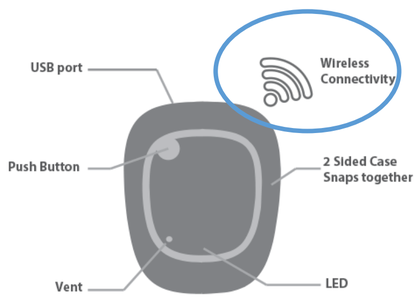

Figure2: MetaMotionR Sensor (MMR) [2]

Limitations of existing mobile applications

- Wearable monitoring systems would:
  - collect data from multiple IMU devices
  - connect to external sensors
  - visualize data
- No existing application supports all three functionalities

2. Objectives

- Collect data from multiple IMU devices and external sensors
- Implement algorithms to analyze data collected
- Visualize real-time data
- Make an app suitable for most types of wearable health monitoring

3. Method

The New App is implemented based on the Wearable Health Monitoring application ***MetaBase*** and incorporates application ***MetaWear's*** external sensors and graphs functionalities

Accessed the source codes of ***MetaBase*** and ***MetaWear*** on Github → Implemented data collection for external sensors (Gpios) → Implemented the graph for each sensor → Implemented the algorithm for the Accelerometer Magnitude:

$$\text{acc-mag} = \sqrt{acc_x^2 + acc_y^2 + acc_z^2}$$

→ Customized the User Interface (UI) of the New App

Figure3: MetaWear logo [3]

Figure4: MetaBase logo [4]

4. Results

1. Home Page

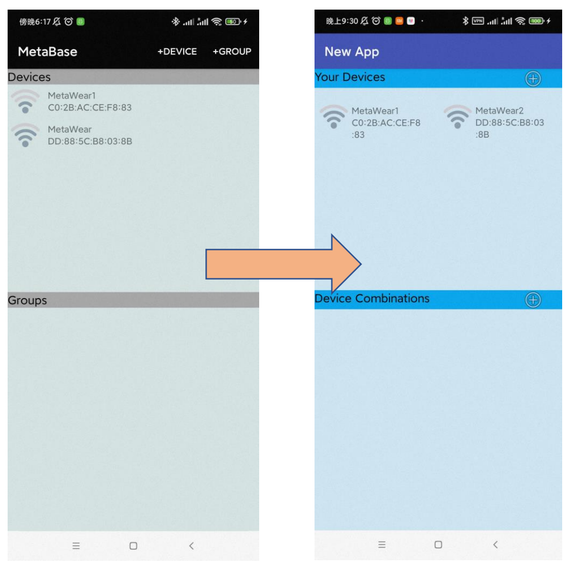

Figure5: MetaWear Homepage [5]

Figure6: New App Homepage

2. External Sensors

- Added external sensors Gpio0 – Gpio5

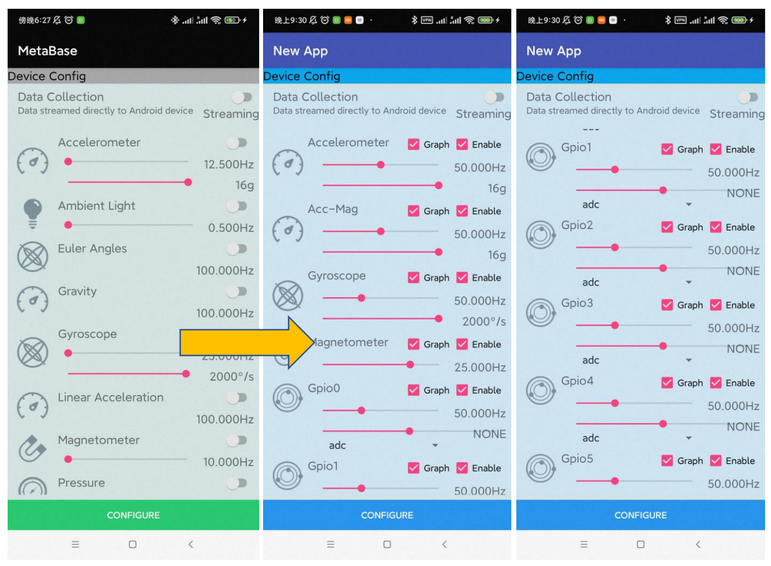

Figure7: MetaWear DeviceConfig page [6]

Figure8: New App DeviceConfig page 1

Figure9: New App DeviceConfig page 2

3. Data Visualization

- Each sensor has a graph, and a graph can be enabled using the Graph checkbox on the DeviceConfig page
- General Graphs: graphs of Accelerometer, Accelerometer Magnitude, Gyroscope, and Magnetometer
- Gpio Graphs: graphs of external sensors (Gpio0 – Gpio5)

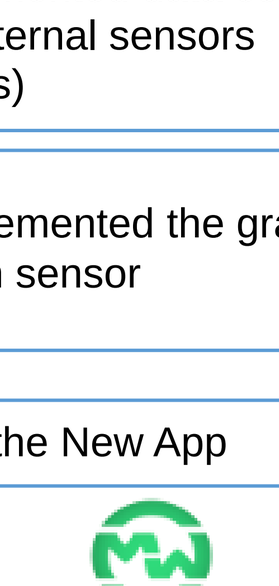

Figure10: MetaWear StreamMonitor page [7]

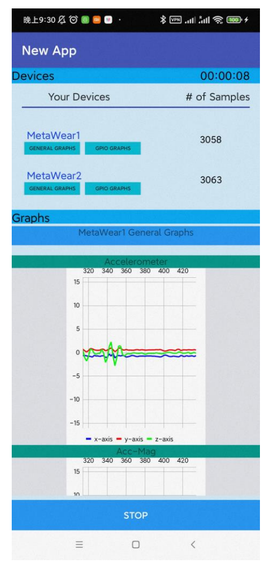

Figure11: New App StreamMonitor page 1(General Graphs)

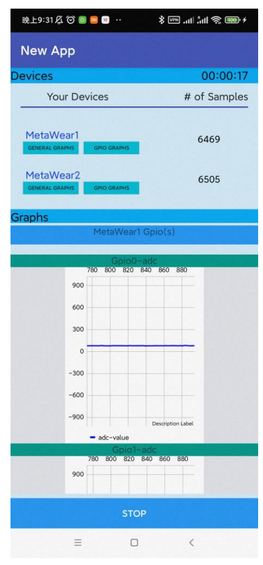

Figure12: New App StreamMonitor page 2(Gpio Graphs)

5. Conclusion

- The new application incorporates the functionalities of existing applications and provides greater flexibility for collecting Wearable Health Monitoring devices' data and monitoring the health conditions of patients

References

[1] : https://mbientlab.com/store/rectangle-case/

[2] : MbientLab, Sphinx, & Read the Docs. (2021). MetaMotionR Sensor (MMR). MetaWear Tutorials. Retrieved August 6, 2022, from https://mbientlab.com/tutorials/MetaMotionR.html

[3] : MbientLab. (2014). MetaWear (3.6.0) [Mobile application software]. Retrieved from https://play.google.com/store/apps/details?id=com.mbientlab.metawear.app&hl=en_US&gl=US

[4], [5], [6], [7] : MbientLab. (2016). MetaBase (3.5.0) [Mobile application software]. Retrieved from https://play.google.com/store/apps/details?id=com.mbientlab.metawear.metabase&hl=en_US&gl=US