Boston University

Electrical & Computer Engineering

EC463 Capstone Senior Design Project

First Prototype Testing Plan

Personal Alert Device

by

Team 19

PAD Group

Richard Yang richy@bu.edu

Tanveer Dhilon tdhilon@bu.edu

Logan Lechuga llechuga@bu.edu

Renad Alanazi reenad@bu.edu

1 Required Materials

Hardware:

- ➢ Raspberry Pi Pico
- ➢ MAX30100 Heart-Rate Sensor
- ➢ MLX90614 Contactless Infrared Temperature Sensor
- ➢ Adafruit ADXL345 3-Axis Accelerometer
- ➢ GT-U7 GPS module

Software:

- ➢ Laptop
  - Android Studio
    - Kotlin, Compose
    - Android Device Emulator
  - Internet Access
    - Firebase

      i. Firestore Database

      ii. Authentication

2 Setup

The setup is to be divided between the Hardware and Software aspects of the Personal Alert Device. The hardware portion represents the functionality of various sensors within the wearable which will aid in determining emergencies within the user. The software portion, an Android native application, serves as an interface between the user and device which also gathers important information dynamically.

Pre-testing Setup Procedure:

Hardware:

1. Connect the Raspberry Pi Pico to the computer using a micro-USB cable for programming and power.
2. Open the Thonny software.
    - Run the program for the GT-U7 GPS module
    - Run the program for the temperature sensor
    - Run the program for HW-827 heart rate sensor

Software:

1. Open Android Studio on a computer
2. Begin an Android emulator using “Medium Phone” API 35 or above
3. Within the emulator:
    i. Navigate to the device settings
    ii. Navigate to the Personal Alert Device app
    iii. Clear Storage & Cache
    iv. Navigate to App permissions and press “Allow” then “Don’t Allow” Contacts permissions.
    v. Begin the App emulator using the green play button
4. Open Firebase console on a computer
5. Within Firebase Console:
    i. Open Firestore Database
    ii. Clear any previous collections
    iii. Navigate to Authentication
    iv. Clear any previous users

3 Testing Procedure

Hardware:

1. Position heart rate sensor in contact with skin to measure BPM
2. Move the device with accelerometer connected to test accelerometer readings
3. Position temperature sensor in contact with skin to measure body temperature
4. View printed data from accelerometer, heart rate sensor, temperature sensor and GPS module on Serial Monitor

Software:

1. Open the Personal Alert Device app
2. Press the “Sign in with Google” button and select a Google account
3. Observe Firebase Authentication and Firestore Database
4. Observe the main screen
5. Navigate to each screen and return to the main screen
6. Navigate to “Contacts” screen and proceed to “Designated Contacts”
7. Press “Request Permission” and try both “Allow” and “Don’t Allow”
8. Select and remove designated contacts
9. Observe Firestore
10. Logout of the app
11. Refresh or close the app

4 Measurable Criteria

The criteria for a successful prototype test is as follows:

Hardware:

1. Raspberry Pi Pico successfully collects:
    a. acceleration data from ADXL345
    b. heart rate data from HW-827
    c. body temperature data from sensor
    d. location data from GT-U7 GPS module
2. Collected data is then displayed on serial monitor
3. Collected data is stored in Firestore

Software:

1. Personal Alert Device successfully opens
2. Successful Google Single Sign-On
3. User account information stored in a Firestore collection
4. User added to Firebase Authentication
5. Navigation functions across all screens
6. User name and profile picture displays on the home page
7. Designated contacts screen requests contact permission
8. User contacts are accessed following accepted permission
9. User designated contacts persist throughout screen navigation
10. Designated contacts appear in Firestore collection
11. Logout navigates user back to Login screen
12. User data should persist in Firestore across an app refresh, close, or sign out