CS695/SWE699 Real-Time Embedded Systems

Final Course Project

Health Monitor- Pulse & Temperature Monitor

**By:**

Aastha Neupane (G01255142)

Gargi Sontakke (G01334018)

Preeti Bhattacharya (G01302375)

Uday Kumar Kamalapuram (G01340201)

**Testing approach:**

Our testing approach was straightforward. For the **temperature monitoring**, since we were testing the external body temperature of our three test subjects (by pinching the sensor between the subject’s thumbs), we could not cross-check and compare the temperature data we received with a household thermometer. Thus, our test approach for the temperature sensor was just by pinching the sensor between the thumb and forefinger.

For evaluating the results we used a more intuitive analysis based on the fact that our test temperature reading should be less than the average body temperature (taken using a thermometer under the arm or under the tongue). Moreover, we could not find multiple subjects with a lot of deviation in the temperature data since there weren't subjects who were running higher (or lower) than the average temperature i.e. we could only test on healthy (non-feverish) subjects.

**For heart rate monitoring**, our approach was to collect the heart rate data from our sensors under **two conditions**: one when the subject is at rest and another after the subject completes a physical activity. The sensor was tied to the subject's forefinger (much like the commonly used oximeter) and the reading was taken within a minute. As a reference or for comparison, we also obtained heart rate data simultaneously from the subject using a smartwatch. Our test result data from the sensors were then compared to the data from the smartwatch and observations were recorded.

Our findings were within the +-5 limit of what the smartwatch reported. This, we took to be an acceptable level since there were many factors to be considered while comparing, such as the difference in the exact timing of when the sensor collected the heart rate data and when the watch did, or any fluctuation in the subject’s emotions or activity.

**Test results:**

**Temperature:**

Result 1 from Subject 1: 89.64 F (32 Celsius)

Result 2 from Subject 2: 95 F (35 Celsius)

Result 3 from Subject 3: 86 F (30 Celsius)

**Heart rate:**

**Test case 1: Resting state**

Result 1 from Subject 1:

Sensor: 82

Smartwatch: 82

Result 2 from Subject 2:

Sensor: 76

Smartwatch: 77

Result 3 from Subject 3:

Sensor: 78

Smartwatch: 78

**Test case 2: After activity**

Result 1 from Subject 1:

Sensor: 112

Smartwatch: 118

Result 2 from Subject 2:

Sensor: 99

Smartwatch: 103

Result 3 from Subject 3:

Sensor: 115

Smartwatch: 115

**Source Code:**

Please see attached files for the source code.

**Source Code references**

In developing our program/project, we referred to a few available resources for our source code. These sources are:

**For Heart Rate Sensor Code:**

[**https://www.electroschematics.com/heart-rate-sensor/#:~:text=Once%20a%20valid%20signal%20is,number%20of%20beats%20per%20minute**](https://www.electroschematics.com/heart-rate-sensor/#:~:text=Once%20a%20valid%20signal%20is,number%20of%20beats%20per%20minute)

**For Tmp36 Sensor code:**

[**https://bwgz57.wordpress.com/2012/04/01/beaglebone-how-hot-is-it/**](https://bwgz57.wordpress.com/2012/04/01/beaglebone-how-hot-is-it/)