SmartWatch IOT - Computer Engineering Technology Capstone Project – CENG355-0NB

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Declaration of Joint Authorship

We, Thomas Aziz, Baltej Bal and Jerreh Janneh, confirm we are submitting the joint work of our group, expressed in our own words. Any content within this submission authored by a non-group member in any form (ideas, equations, figures, texts, tables, programs), is properly acknowledged at the point of use. A list of the references used is included. The work breakdown is as follows: Each group member provided a sensor or effector, alongside functioning and documented hardware for interfacing with it, designed and implemented in a prior, individual effort. Thomas Aziz provided an AXDL345 accelerometer. Baltej Bal provided a ADS1015 pulse sensor. Jerreh Janneh provided the TMP006 temperature sensor. While our work is a joint effort, each member will lead one specific aspect of the design and integration of our sensors. Baltej is the lead for further development of our mobile application. Thomas will lead hardware development efforts, and Jerreh is the lead for connecting the two via a database system.

Proposal

In our program thus far, we have designed and developed a mobile application, worked with databases, completed a course covering the fundamentals of software engineering, and prototyped an embedded system with a custom designed PCB within a custom laser-cut enclosure. Our Internet of Things (IoT) capstone project uses a distributed computing model of a smart phone application, a database accessible via the internet, an enterprise wireless (capable of storing certificates) connected embedded system prototype with a custom PCB as well as an enclosure (3D printed/laser cut). All work done in this capstone project is documented in this technical report, targeting OACETT certification guidelines. Our project makes use of a variety of sensors and effectors, as well as the Raspberry Pi Zero W development platform. These sensors and effectors include: ADXL345 accelerometer, ADS1015 12-bit ADC, SEN-11574 pulse sensor TMP006 IR temperature sensor and LCD160CR color LCD.

We will continue to develop our skills in configuring networks, and designing mobile software and embedded systems by using the aforementioned sensors to design and implement a wearable device capable of measuring and recording movement, body temperature and pulse rate. The sensors and development platform will be integrated and enclosed within a custom designed enclosure meant to be worn on the wrist. Our experience in the Hardware Production Technology course will help us in designing an efficient custom PCB and enclosure. We will also develop a mobile phone application that records and displays the data recorded from the sensor, and a display affixed to the enclosure will display key information to the user without requiring them to open the application.

Our project description/specifications will be reviewed by, Humber College Institute of Technology & Advanced Learning Computer Engineering Technology Capstones, ideally an employer in a position to potentially hire once we graduate. They will also ideally attend the ICT Capstone Expo to see the outcome and be eligible to apply for NSERC funded extension projects. This typically means that they are from a Canadian company that has been revenue generating for a minimum of two years and have a minimum of two full time employees.

The small physical prototypes that we build are to be small and safe enough to be brought to class every week as well as be worked on at home. In alignment with the space below the tray in the Humber North Campus Electronics Parts kit the overall project maximum dimensions are 12 13/16" x 6" x 2 7/8" = 32.5cm x 15.25cm x 7.25cm.

Keeping safety and Z462 in mind, the highest AC voltage that will be used is 16Vrms from a wall adapter from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will not exceed 20 Watts. We are working with prototypes and that prototypes are not to be left powered unattended despite the connectivity that we develop. At our current stage, all sensor/effectors have been built tested and have received satisfactory approval form previous courses to continue to this phase. the development will span a total of 14 weeks each week covering a new phase each handing in a deliverable resulting in a presentation to potential investors

Executive Summary

This report will cover all the aspects involved in our project; software and hardware design, development, integration, cost, security requirements, database configuration, testing, results and any conclusions drawn. The project in general is a key indicator and display of the skills and knowledge we have gained through this program, and can ideally be used as a strong reference towards any further education and industry work that either of us may choose to pursue in the future. As well, this document can be submitted to OACETT and ideally meet their Technology Report standards – a requirement for becoming a certified engineering technologist.