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***Proposal for the development of MiBEAT***

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**Executive Summary**

As the students in the Computer Engineering Technology program, we will be integrating the knowledge and skills learned from our program into this MiBEAT themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as to a mobile device application. The internet connected hardware will include a custom PCB with the IS31FL3731 144-LED CharliePlex driver (0x74), Pulse Sensor Amped, ADS1015 12-Bit ADC - 4 Channel with Programmable Gain Amplifier. The database will store Measured values for heart rate and number of steps travelled. In addition it willl also store user login information and user profile. The mobile device functionality will include the feature of re-examining his/her readings from last 7 captures. Readings here refer to heart rate and total distance travelled. It will also include feature of calculating total number of calories burnt and will be further detailed in the mobile application proposal. We will be collaborating with Humber’s School of Health Science. The hardware was completed in CENG 317 Hardware Production Techniques independently and the application was completed in CENG 319 Software Project. These will be integrated together in this term in CENG 355 Computer Systems Project as a 3 student group.

**Background**

This aim of this project is to create a wearable that can make people more responsible towards their health and help the medical science as well. It is our inexpensive approach so that everyone can own this device and lead a heathier lifestyle. Our project consists of a Pulse Sensor Amped which will further send the analog signal which is received by another sensor called ADS1015 12-Bit ADC. It converts the analog signal to a digital signal and further projecting it to the Charlieplexed PWM LED Matrix to aware the user of any change in heart rate.

In the Computer Engineering Technology program we have learned about the following topics from the respective relevant courses:

* Java Docs from CENG 212 Programming Techniques In Java,
* Construction of circuits from CENG 215 Digital And Interfacing Systems,
* Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
* Micro computing from CENG 252 Embedded Systems,
* SQL from CENG 254 Database With Java,
* Web access of databases from CENG 256 Internet Scripting; and,
* Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable us to build the subsystems and integrate them together as our capstone project.

**Methodology**

This proposal is assigned in the first week of class and is due at the beginning of class in the second week of the fall semester. Our coursework will focus on the first two of the 3 phases of this project:  
 Phase 1 Hardware build.  
 Phase 2 System integration.  
 Phase 3 Demonstration to future employers.

*Phase 1 Hardware build*

The hardware build was completed in the fall term. It fits within the CENG Project maximum dimensions of 12 13/16" x 6" x 2 7/8" (32.5cm x 15.25cm x 7.25cm) which represents the space below the tray in the parts kit. The highest AC voltage that is used is below 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption is less than 20 Watts.

*Phase 2 System integration*

The system integration will be completed in this term.

*Phase 3 Demonstration to future employers*

This project will showcase the knowledge and skills that we have learned to potential employers.

The brief description below provides rough effort and non-labour estimates respectively for each phase. A Gantt chart will be added by week 3 to provide more project schedule details and a more complete budget will be added by week 4. It is important to start tasks as soon as possible to be able to meet deadlines.

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for 0. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating my ability to learn how to support projects such as the initiative described by [3]. We request approval of this project.

**References**

[1] Raspberry Pi Heartbeat / Pulse measuring. (n.d.). Retrieved from https://tutorials-raspberrypi.com/raspberry-pi-heartbeat-pulse-measuring/

[2] Adafruit Industries. (n.d.). Pulse Sensor Amped. Retrieved from https://www.adafruit.com/product/1093

[3] Institute of Electrical and Electronics Engineers. (2015, August 28). IEEE Xplore Digital Library [Online]. Available: https://ieeexplore.ieee.org/search/advsearch.jsp

[4] H. Liu, "Interior Decoration System Design Based on 3D Scene Modeling," 2017 International Conference on Smart Grid and Electrical Automation (ICSGEA), Changsha, 2017, pp. 493-496.