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***Proposal for the development of Senzer Room Monitor***

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*Computer Engineering Technology Students*https://github.com/KogulB/CENG355Project

**Executive Summary**

As a student in the Computer Engineering Technology program, I will be integrating the knowledge and skills I have learned from our program into this Internet of Things 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 following sensors and actuators YL-40 PCF8591 (0x48), AMG8833 IR Thermal Camera Breakout (0x69), BME280 Temp/Barometric/Humidity (0x77). The database will store Infared Temperature data, Occupancy and Luminosity of The room(how often light is left on). The mobile device functionality will include Being able to see what room is in use at what time. Checking whether the light is on in the room and have the ability to turn it on and off with the app. Finally being able to view the temperature of the room and adjust it accordingly. Any data taken from the sensors is stored and can be viewed with adminstrative privileges. and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Conference Services. In the winter semester I plan to form a group with the following students, who are also building similar hardware this term and working on the mobile application with me Samuel Dadet, Kyele Haynes and Kogul Balasubramaniam. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated together in the subsequent term in CENG 355 Computer Systems Project as a member of a 2 or 3 student group.

**Background**

The problem solved by this project is In this day and age meeting rooms are essential for day to day business ventures and or group projects. There is no way of understanding if the room is empty or being used by someone who booked it or decided to drop in or even checking if the rooms light has been turned on or off. Which in turn affects productivity and effeictviely costs the users time and or money.. A bit of background about this topic is Office Buildings and schools tend to have day to day problems of rooms being in high demand. These rooms are essential for day to day life operations and provide schools and businesses space to plan out crucial things. However, they are not monitored properly to ensure that people are using them efficently or if anyone is using them at all even when there is a booking. Having a device that monitors if these rooms are being used or check whether that light is on and even being able to detect room temperature provide vital information..

Existing products on the market include [1]. I have searched for prior art via Humber’s IEEE subscription selecting “My Subscribed Content”[2] and have found and read [3] which provides insight into similar efforts.

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 me to build the subsystems and integrate them together as my 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. My 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 will be completed in the fall term. It will fit 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 will be used is 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will be 20 Watts.

*Phase 2 System integration*

The system integration will be completed in the fall term.

*Phase 3 Demonstration to future employers*

This project will showcase the knowledge and skills that I 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.

We will be purchasing a Rpi 3 to use as our main circuit board and a Thermal Camera to detect human heat signature. As well as a Light Sensor(PCF 8591) to detect if the rooms light was left on or not and a BME280 to detect the temperature of the room when people enter and exit.

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for Our device is suppose to use thermal cameras in each of the desired rooms to detect human heat signature to determine number of people in the room. The light sensor will determine if room light is on give the user the ability to shut it on and off through the app and effeciently control electrcity bills. Finally, the BME280 will be used to determine the room temperature for user comfort. All this info will be sent to a device and transmitted to the app. 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]. I request approval of this project.

**References**

[1] DiLouie, C., Peat, A., & Alexander, G. (2017, August 22). All About Occupancy and Vacancy Sensors. Retrieved January 17, 2019, from https://lightingcontrolsassociation.org/2017/08/21/all-about-occupancy-and-vacancy-sensors/

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

[3] L. D. Tran et al., "A smart meeting room scheduling and management system with utilization control and ad-hoc support based on real-time occupancy detection," 2016 IEEE Sixth International Conference on Communications and Electronics (ICCE), Ha Long, 2016, pp. 186-191.

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keywords: {infrared detectors;local area networks;scheduling;sensor fusion;transport protocols;smart meeting room scheduling and management system;ad-hoc support;utilization control;real-time occupancy detection;meeting room occupancy status detection;scheduling application;ease-of-implementation solution;PIR sensor fusion device;Ethernet connectivity;UDP;IP protocol;web application;Scheduling;Servers;Real-time systems;Software;IP networks;Microcontrollers;Sockets;meeting scheduling;room management;real-time occupancy detection;utilization control;ad-hoc meetings},

URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7562634&isnumber=7562597