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Proposal for the development of HVAC

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https://github.com/fntj0052/HVAC

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 Touch sensor, moisture sensor, LCD touchscreen, and sound sensor. The database will store Operational status/condition and maintenance reminder. The mobile device functionality will include Ability to toggle operational mode and set maintenance schedule and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department School of Applied Technology. 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 Jan Fontanosa, Vyacheslav Perepelytsya, and Maasha Maheson. 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 creating and improving upon the monitoring of Heating, Ventilation and Air Conditioning (HVAC) systems with a user-friendly interface, with the ability to remotely control the system activities using a mobile device, and to fetch stored information on the system's condition from a cloud database.. A bit of background about this topic is HVAC systems are useful in all kinds of building applications: a smarter system can provide significant energy and financial savings while scheduling usage and allowing more granular control for systems used in specific applications (a HVAC system used to monitor an industrial refrigerator room will require different settings in comparison to one used in a residential building). By providing the ability for remote control using an Internet of Things(IoT)-based HVAC system, administrators of the system can ensure that the system is working as intended and can administrate changes to the system in a secure manner..

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.
No additional planned purchases

Concluding remarks

This proposal presents a plan for providing an IoT solution for for a user-friendly, Internet of Things-based HVAC system. 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] Ecovent Systems Inc. (n.d.). Ecovent. Retrieved from https://www.ecoventsystems.com/smart

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

[3] Al-Ali, A. R., Alikarar, M., Gupta, R., Rashid, M., Zualkernan, I.A. (2017). A smart home energy management system using IoT and big data analytics approach. IEEE Transactions on Consumer Electronics, 63(4), 426-434. Retrieved from http://ieeexplore.ieee.org/document/8246800