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Proposal for the development of IoT for NFC/RFID Reader

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https://https://github.com/RDinh/NFCRFID

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, actuators, and PN532 NFC/RFID controller. The database will store Student ID and Parts Crib Inventory. The mobile device functionality will include Queuing items, signing in/out items and generating NFC/QR codes that later can be scanned at the parts crib to indicate that students have arrived and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Humber College's Parts Crib. 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 Johnathan Luong and Colin LeDonne. 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 the current Parts Crib has some flaws that should be addressed to help it operate more efficiently. It has lost some of its items and is unable to effectively hold students accountable for them. It also wastes a lot of paper when they assign items to students.. A bit of background about this topic is The mobile phone has been very convenient for users especially with the emergence of contactless payment. This type of technology that resolves around Near Field Communication (NFC) can be applied to modern day problems such as the Parts Crib. Having a contactless transaction of information will allow the Parts Crib to operate efficiently and effectively without requiring any extra manpower. Since students carry around their phones everyday, it is simpler to just tap their phones than to rummage through purses and wallets. This will allow student's to securely transfer their information to the Parts Crib for easy access..

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.
#REF!

Concluding remarks

This proposal presents a plan for providing an IoT solution for The ability to queue items, sign in/out items and genereating NFC codes with a mobile device will make the process more convenient for both the students and the Parts Crib. Students will able to select their items before they reach the parts crib and the Parts Crib will be able to view the items when they arrive once the students have tapped their phones using NFC.. 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] ENAiKOON. (n.d.). ginstr apps instead of paper forms! Retrieved from https://www.nfc-tracker.com/

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

[3] A Canakit Raspberry Pi 3 B+ Starter kit and the Adafruit PN532 NFC/RFID controller breakout board.