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Proposal for the development of Parts Crib Sign In/Out Solutuon

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https://asperham.github.io/Parts-Crib/

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 Sensors: NFC/RFID, LCD Display, Luminosity. I will be doing the Luminosity Sensor.. The database will store The database will store the Students ID, studens email, student name, Parts Signed out, The Date and time of signout, date and time signin. And total parts avilable.. The mobile device functionality will include The modile device will allow the user to queue items before they arrive at the crib. This will then create a QR code or NFC tag that the user can scan at the Crib to borrow the parts they need. The app will also have a searh fuction that will allow the user to find parts more easily and will need WI-FI access so the app can check the database to insure that the parts are available to sign out. The hardware will allow students to scan their code which will then add an entry to the database and allow students to sign out matterials. My sensor, the luminosity sensor, will be used to power the NFC reader when the user hovers their phone over the unit. This is so the reader is not always running saving on power consumption. and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department We will be collaborating with the parts Crib at Humber north and the Company contact is Kristian Medri.. 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 The group in the Winter semestar will remain the same including: Colin LeDonne, Robert Dinh, Jonathan Luong. 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 problem to be solved by this project is the frequent loss of materials to unidentified students and the cost of manpower used at the Crib. Also, to eliminate the cost of paper used by the students to manually sign out parts.. A bit of background about this topic is A bit of background about this topic is simply the collection of the necessary student data like student names, student numbers, student email addresses etc. This will associate the student with randomly generated and registered barcode/QR code to easily identify students by scanning the barcode/QR code. Essentially, this will allow students to easily borrow materials from the crib. It will be an online system consisting of a mobile and web application, as well as a remote database for fetching the necessary user or item information. The goal is to reduce material loss and speed up the lending procedure..

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.
Raspberry PI 3 B+ ($85.00) and a luminosity sensor (~$10.00). In total approximatly $90-$100

Concluding remarks

This proposal presents a plan for providing an IoT solution for The solution to this problem is to reduce the loss of parts from the parts crib. Utizling an system that better keeps track of studnts can help in reducing the loss of parts. This is accomplished by requiring the students to create an account with the application which will add their information to a database. Thus, if they do not return the materils they borrowed within 24 hours, they will be sent a email telling them to return it. If the student still does not return the materials they will be emailed a bill.. 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] ada, lady. (n.d.). Adafruit TSL2591 High Dynamic Range Digital LightSensor. Retrieved from https://cdn-learn.adafruit.com/downloads/pdf/adafruit-tsl2591.pdf

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

[3] Cho, B. R., Koh, S., Park, J.-K., Kim, C.-H., & Lee, S. (2019). Fundamental Experiment on Relationship Between External Force and Light Intensity in Soft Tactile Sensor Using Sponge. 2019 International Conference on Systems, Signals and Image Processing (IWSSIP). doi: 10.1109/iwssip.2019.8787264