SmartParkingLot Project

Projects website: https://bigbosstony.github.io/

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Proposal

Proposal for the SmartParkingLot Project* Prepared by Yan Yu Computer Engineering Technology Student*

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 sensors and actuators for detective car entry, taking pictures and trigger the parking gate. The database will store the number plates. The mobile device functionality will include checking the plate number and parking time and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Humber Department of Public Safety. 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 Thomas Chang, Alisha Singh Chauhan. 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 project is when we entering a parking lot, we need to stop to take a ticket and when we left we have to go the ticket machine to pay our ticket. By working with this project we take pictures and read the plate number automatically, so we can save more time and be environmental friendly. Background ANPR – Automatic number plate recognition is a technology for automatically reading vehicle number plates. And OpenALPR is a similar system, accuracy above 97 percent and it is open source. We can adjust OpenALPR to Raspberry Pi 2. HD camera for taking pictures at both Entry and Exit. Database used to store plate numbers and then calculate the duration of how long the car has been parking. Infrared ray to detective the car in the entry or exit. Driver could pay at the exit by using Interac™ Card, smartphone with NFC or cash.

I have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content"[1] and have found and read [2] which provides insight into similar efforts.

The first article I found discusses how Automatic license plate recognition (ALPR) extract vehicle license plate information from an image or a sequence of image.(Du, Ibrahim, Shehata, & Badawy, 2013)

The second journal talks about why we use python programming language.(Lindstrom, 2005)

The third article gives the information how to set up your own database by using PHP & MySQL. (Veglis, Leclercq, Quema, & Stefani, 2005)

The last one covers how to improve user experience on our application.(Liu, Xu, & Cheung, 2015)

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 tables below provide 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.

Labour Estimates Phase 1	Hrs	Notes
Writing proposal.	9	Tech identification quiz.
Creating project schedule. Initial project team meeting.	9	Proposal due.
Creating budget. Status Meeting.	9	Project Schedule due.
Acquiring components and writing progress report.	9	Budget due.
Mechanical assembly and writing progress report. Status Meeting.	9	Progress Report due (components acquired milestone).
PCB fabrication.	9	Progress Report due (Mechanical Assembly milestone).
Interface wiring, Placard design, Status Meeting.	9	PCB Due (power up milestone).
Preparing for demonstration.	9	Placard due.
Writing progress report and demonstrating project.	9	Progress Report due (Demonstrations at Open House Saturday, November 12th, 2016 from 10 a.m. - 2 p.m.).
Editing build video.	9	Peer grading of demonstrations due.
Incorporation of feedback from demonstration and writing progress report. Status Meeting.	9	30 second build video due.
Practice presentations	9	Progress Report due.
1st round of Presentations, Collaborators present.	9	Presentation PowerPoint file due.

2nd round of Presentations	9	Build instructions up due.
Project videos, Status Meeting.	9	30 second script due.
Phase 1 Total	**135**	
Phase 2		
Meet with collaborators	9	Status Meeting
Initial integration.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Meet with collaborators	9	Status Meeting
Incorporation of feedback.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Prepare for demonstration.	9	Progress Report
Complete presentation.	9	Demonstration at Open House Saturday, April 8th, 2017 10 a.m. to 2 p.m.
Complete final report. 1st round of Presentations.	9	Presentation PowerPoint file due.
Write video script. 2nd round of Presentations, delivery of project.	9	Final written report including final budget and record of expenditures, covering both this semester and the previous semester.
Project videos.	9	Video script due
Phase 2 Total	**135**	
Phase 3		
Interviews	TBD	
Phase 3 Total	**TBD**	
Material Estimates	**Cost**	**Notes**
Phase 1		
RaspBerry Pi 3 Starter Kit	$89.99	https://www.amazon.com/Vilros-Raspberry-Ultimate-Starter-Kit-Clear/dp/B01CYWE20U
Pi Camera Module with Case	$38.79	https://www.amazon.com/Raspberry-Pi-Camera-Module-Megapixel/dp/B01ER2SKFS/ref=sr_1_2?s=pc&ie=UTF8&q 2&keywords=raspberry+pi+camera
Piezo Buzzer Element (Vibration Sensor)	$5.19	Canada Robotix
LED	$0.50	Canada Robotix
USB GPS Dongle.	$50	Amazon
Phase 1 Total	**>$200.00**	
Phase 2		
Materials to improve functionality, fit, and finish of project.		
Phase 2 Total	**TBD**	
Phase 3		
Off campus colocation	<$100.00	An example: [4].
Shipping	*TBD*	
Tax	*TBD*	
Duty	*TBD*	
Phase 3 Total	**TBD**	

Concluding remarks

This proposal presents a plan for providing an IoT solution for Parking Lot. 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 (Generated in pdf)

Du, S., Ibrahim, M., Shehata, M., & Badawy, W. (2013). Automatic license plate recognition (alpr): A state-of-the-art review. *IEEE Transactions on Circuits and Systems for Video Technology*, *23*(2), 311–325. https://doi.org/10.1109/TCSVT.2012.2203741

Lindstrom, G. (2005). Programming with python. *IT Professional*, *7*(5), 10–16. https://doi.org/10.1109/MITP.2005.120

Liu, Y., Xu, C., & Cheung, S. C. (2015). Diagnosing energy efficiency and performance for mobile internetware applications. *IEEE Software*, *32*(1), 67–75. https://doi.org/10.1109/MS.2015.4

Veglis, A., Leclercq, M., Quema, V., & Stefani, J. B. (2005). PHP and sql made simple. *IEEE Distributed Systems Online*, *6*(8). https://doi.org/10.1109/MDSO.2005.42