Submission January 17, 2017

Proposal for the development of Collision Detector

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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 /or actuators for detecting car collision and save the captured image/video in a black box The database will store the timestamp and the folder location of the video that were saved in the blackbox. The mobile device functionality will include notifying the car owner of an accident happening and if possible, an image or video capture of the accident and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department _____. 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 Jerome Aganon and Jaewoong Kang. 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 to not to prevent any accident but to get evidence if an accident happened. Having a dash cam does not mean that if an accident happened there would be footage of what happened. Sometimes, accident happens on the side or back of the car. In the event that such thing happened, the people will rely on the story of a witness or the victims. Sometimes the people will try to change their story in order for them to get away with it. If such thing happens, the police will have to look around and see if a CCTV has captured the accident.

The first journal that we found presents " the approach to use smartphones as a multi sensor platform in a field operational test respectively a naturalistic driving study". (Pfriem & Gauterin, 2014)

The second journal talks about optical camera used for vehicles. (Nguyen, Islam, & Jang, 2016)

For the last journal, it then talks about inevitable accidents that can happen with motorcycles and automobiles. (Savino, Giovannini, Fitzharris, & Pierini, 2016)

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.

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	**Hrs**	**Notes**
Phase 1		
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&q2&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 mini computer and black box for car. 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)

Nguyen, T., Islam, A., & Jang, Y. M. (2016). Region-of-interest signaling vehicular system using optical camera communications. *IEEE Photonics Journal*, *PP*(99), 1–1. https://doi.org/10.1109/JPHOT.2016.2644960

Pfriem, M., & Gauterin, F. (2014). Employing smartphones as a low-cost multi sensor platform in a field operational test with electric vehicles. In *2014 47th hawaii international conference on system sciences* (pp. 1143–1152). https://doi.org/10.1109/HICSS.2014.148

Savino, G., Giovannini, F., Fitzharris, M., & Pierini, M. (2016). Inevitable collision states for motorcycle-to-car collision scenarios. *IEEE Transactions on Intelligent Transportation Systems*, *17*(9), 2563–2573. https://doi.org/10.1109/TITS.2016.2520084