43482

***Proposal for the development of SenzerCar***

Prepared by Kogul Balasubramaniam, Kyele Haynes, Samuel Dadet  
*Computer Engineering Technology Students*https://github.com/KogulB/CENG355Project

**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 YL-40 PCF8591 (0x48), AMG8833 IR Thermal Camera Breakout (0x69), BME280 Temp/Barometric/Humidity (0x77). The database will store Engine Temperature, Air Intake Pressure and Luminosity of the headlights. The mobile device functionality will include Being able to see basic maintenance information for the Baja racing vehicle. Checking the headlight luminosity coming from the car to check if it is reaching high levels. The app will respond by changing colors to let the vehicle owner know that something is wrong. The Air Intake Pressure will also be available to let the driver know if there is any concerns. The value can be seen in Hpa or PSI. Finally, The Engine Temperature reading will also be present to let the driver know if the engine is overheating or not. This value is also available to be seen in Celsius or Fahrenheit and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Baja Racing Vechicles. 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 Samuel Dadet, Kyele Haynes and Kogul Balasubramaniam. 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 In today's society many automobiles come equipped with various sensors that provide the driver with basic maintenance information so he/she knows when to take it in for service. This informations helps the driver diagnose the problem and even possibly let them know before hand if there vehicle is in possible engine failure. Our projects focus is on providing a simple telemetry system for Baja racing vehicles. We provide simple maintenance information for the racer to diagnose their own vehicle. Information such as Air Intake Pressure, Engine Temperature and Headlight Luminosity.. A bit of background about this topic is Baja Racing Vehicles are raced in the SAE off-road motorsport competition every year by competing universities all over the world. The vehicles require less maintenance than your common automobile. However, some maintenance is still required. Our product is engineered towards helping the user distinguish if is vehicles is experience simple maintenance issues or is on the way to shutting down due to engine failure. Are three sensors used with a Rpi 3 powered with a step down converter connected to the vehicle provides crucial information that helps the driver diagnose there vehicle and provide simple maintenance..

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-labor 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.

We will be purchasing a Rpi 3 to use as our main circuit board and a Thermal Camera to detect heat signature. As well as a Light Sensor(PCF 8591) to detect if the headlight was left on or not as well as if its reaching high levels. A BME280 to detect the pressure of the intake in the vehicle.

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for Our System uses the thermal sensor to detect the engine temperature and changes the background if engine is starting to overheat. The Light Sensor detects Headlight luminosity and then displays it as a value and changes application background depending on if the light is reaching high levels. Finally, a pressure sensor to detect the intake pressure.. 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] Gilsdorf, J. M., Vercauteren, K. C., Hygnstrom, S. E., Walter, W. D., Boner, J. R., & Clements, G. M. (2008). An integrated vehicle-mounted telemetry system for VHF telemetry applications. Journal of Wildlife Management, 72(5), 1241-1246. Retrieved from http://ezproxy.humber.ca/login?url=https://search-proquest-com.ezproxy.humber.ca/docview/234179670?accountid=11530

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

[3] Leonardo Presoto de Oliveira, Marco Aurélio Wehrmeister, AndréSchneider de Oliveira, "Systematic Literature Review on Automotive Diagnostics", Computing Systems Engineering (SBESC) 2017 VII Brazilian Symposium on, pp. 1-8, 2017.