Individual Capstone Assignment

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Our senior design project is going to be a smart data collector and display device for cars. This unit will connect to the car through the OBD-II port, allowing the device to collect all available information the car can store. This connector will then connect wirelessly and/or wired to a small display with a raspberry pi to show all diagnostic data. This display will be powered by either a power line from the OBD-II connector, USB port, or an auxiliary power outlet in the car. To connect to the internet, the raspberry pi will connect to a phone through a mobile hotspot, which will allow it to send data to Losant. From there, we collect the data and allow users to login through a web domain to view diagnostic information they have access to.

Within my part of the project, I will focus on embedded system design to use a microcontroller for processing of the data from the car. Classes like Embedded System Design (EECE 4038C), Intelligent Machine Design (EECE 5128C), and Embedded Systems (EECE 5117C) have all contributed to helping me understand how to program a microcontroller and utilize its peripherals. I will also create a board for the OBD-II connector to manage connections between the microcontroller and surrounding components, like status and power LEDs. Classes like Electronics 1 (EECE 2070), Electronics 2 (EECE 3071), and their respective labs (EECE 2070L and EECE 3071L) have all contributed to helping me understand how electronic systems work and how to effectively create useful circuits. I have had some programming classes during college, so I will also be making the web application through Losant to allow users to see diagnostic data, which classes like Intelligent Machine Design and Embedded System Design helped reinforce. Non-technical skills I acquired through these classes include working in a team and communicating in a clear and concise manner. This will be applied for this project as we have divided the work needed for the project to function properly, and we will meet weekly to make sure we are on track to finish.

At my co-op rotations as an electrical engineer, I have learned important skills that will help me with this project, such as board design and layout. I was able to use software like Altium, OrCAD, PADS, and KiCAD to design a Bluetooth audio board for streaming wireless music to wired headphones. This will help me in this project as I will need to design and lay out the components for the OBD-II connector. I have had extensive practice soldering at my previous co-ops, like reworking 680 boards, so hand soldering the components will also not be a difficult task. Another important skill I learned at my co-ops is how to source parts and look for replacements if needed. I was a part of keeping track of all of the components for the electrical team for the recent laser eye surgery project, so finding components, getting replacements, and organizing them will be easier due to this. Non-technical skills I acquired include working in a team, effective communication, respecting others time, and research. These build off the skills I strengthened through college classes, and also will help in the project so I can find solutions in a timely manner.

I am excited to participate in this project because it is an interesting idea and there are many different angles, we could approach it and add to it. I have not worked with IoT much in the past, so being able to learn more about it and apply it to this project should be enjoyable. One of the exciting aspects of it for me will be to see real-time data, or however fast our refresh time is, with our application updating the car’s information on our web domain. This will be a satisfying moment as all of the work and learning in college will have helped us make a useful device that could be used by anyone. Another interesting aspect of the project I am looking forward to is working with the microcontroller. I have enjoyed learning about programming microcontrollers throughout my embedded systems classes, so being able to apply this in a project I want to work on is exciting.

My preliminary approach to designing a solution is to use a microcontroller, like the SAMD21, to control all the information coming from the car and send it either through a wired connection, or through Bluetooth. This OBD-II custom connector is going to be compact with several LEDs to indicate data transmission, power, and status. There will also be a USB port on the connector for the optional wired connection stated previously. The display will be about 7 inches and contain a raspberry pi on the back of it to receive information from the connector, show diagnostic data on the display, and handle the transmission of data to Losant. Our expected results are to have the device operational only during the use of the car and for it to accurately display data from the car at the specified refresh rate. Accomplishments throughout the project include having a functional web domain for logging in to see diagnostic data, data being read through the OBD-II connector, getting Bluetooth to send data to the raspberry pi, getting the pi to display the diagnostic data, and having each sub system work together smoothly. We will self-evaluate our contributions and seeing if we are done by going through each of the listed accomplishment goals. Goals we have not met yet and are a prerequisite for the following goals will be prioritized.