Preliminary Report

A Report
Presented to
The Department of Electrical & Computer Engineering
Concordia University

In Partial Fulfillment
of the Requirements
Of COEN 320

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Tools

Our team will use multiple tools to develop the project in an efficient manner. The project will be developed using C code language in the QNX IDE. Due to the current situation, we will have to work remotely therefore we will need to use different communication and management tools to work together as a team. We will use Facebook Messenger as a communication channel and for management tools, we will use Github and Google drive to manage our codes and files in an organized way.

Project Components

Preprocessing of dataset

The data set that is given contains many variables that are not needed for the project. Only a subset of these variables will be used, so to save memory space the data set needs to be reduced to only the required variables. The dataset only has sample values every one second. These variables need to be sampled at a higher rate in the system. The dataset therefore needs to be extrapolated so the resolution of the sample data matches the periodicity required to read the variables.

Reading Data thread

Each variable of interest will have its own thread that consists of reading a specific variable from the dataset and then updating a shared variable in memory. Each thread will have a period variable that will be used by the scheduler to schedule each thread as a task and place them in the appropriate queue.

Scheduling Algorithm

Earliest deadline first will be used as the scheduling algorithm for the system. Specifically non-preemptive EDF, this will simplify the implementation by avoiding the need for context-switching. One scheduler class will be created with functions for managing the queues of tasks to be performed. The scheduler will implement data structures for the ready, waiting and running queues.

Display Data thread

The result of the system will be outputted using a command line interface and if time allows us we will also have a GUI to display the data collected from the ODB 2. The display will be implemented using its own thread. This will result in the display will run independently from the rest of the components. The display thread will get its data from the shared memory where each of the variable threads will update its own charred memory.
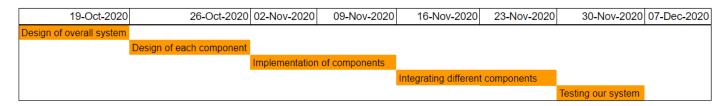
Shared memory

The data producer threads need to communicate with the data consumer thread to give it the periodic data gotten from the vehicle dataset. To facilitate this communication we will implement the concept of shared memory in our project. To use shared memory, we need to use semaphores and mutexes to protect it from mishandling and errors. We will use one semaphore that is used for each data variable of the vehicle. When one of our threads that wants access the variable, it has to first acquire the semaphore, to acquire it the semaphore must be free (i.e. non-zero). If the semaphore is 0, it cannot access it. When the thread is done using the variable, it releases the semaphore (i.e. increases the semaphore counter).

Project Schedule

To finish our task on time, we will have weekly meetings of 2 hours every Wednesday. This meeting will help us align on our tasks and make sure we complete our milestones. The milestones that we have set for the project are:

- Design of overall system (October 19)
- Design of each component (October 26)
- Implementation of components. (November 9)
- Integrating different components (November 23)
- Testing our system (November 30)

19-Oct-2020		26-Oct-2020	02-Nov-2020	09-Nov-2020	16-Nov-2020	23-Nov-2020	30-Nov-2020	07-Dec-2020
Design of overall system								
		Design of each component						
				Implementation of components				
						Integrating different components		
							Testing our system	

These major milestones will ensure we achieve our project's objective on time. These milestones represent the major steps of the project.

Team Contribution

The project will be split between each other to accomplish it in time and in an efficient way. To start we all work on 3 of the following variables; Full Consumption, Engine Speed, Engine Coolant Temperature, Current Gear, Transmission Oil Temperature, Vehicle Speed, Acceleration Speed Longitudinal and Indication of break switch. Once the data retrieving threads for each variable are done we will start working on the thread to display the vehicle data to the user in a clear and readable way. Then these threads need to be scheduled together with a scheduler. To do the display thread and scheduler, we will use an Agile methodology where everybody will work together on the main entity of creating a working display thread and scheduler. The entity may be divided into smaller subtasks later on when we get to this stage.

When we get into the project and learn more about the skills of each team member in every aspect of the project, we may redistribute the different parts to different people who are better suited for the task.