

E29 Final Project Proposal

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Introduction

Our project will be to implement a cruise control system in a car. Cruise control systems allow the driver to set a speed they would like to travel at and release their foot from the gas. Most systems then use a PID controller to get to within a certain threshold of a speed that is requested. Using RIMS, we are able to simulate the operation of a car speed and the feedback loop that is required when using a control system.

Theory of Operation

The basis of our project will be implementing a PID controller. This will be done in RIBS to start as a state machine. From there, we will export C code to RIMS. RIMS will require a user to turn the system on and enter a desired speed using UART. This value is what the controller will read as a desired output. A feedback loop will calculate the error between desired and actual output. This output will be sent back into the loop for how much the speed should be adjusted. The controller will have the ability that if a user changes the value at any point, it will readjust just as a real car would. The user will also be able to turn it off at any point, and it will release at the current speed. We will be able to use the RIMS PID tool in order to test our PID feedback loop. This should be very helpful in how we fine tune our controller.

As a stretch goal once the initial cruise control system is implemented, we would like to find a way to take the output from RIMS and plot it in MATLAB. This would allow us to show plots of how the control system can be fine tuned using certain parameters. Plots of this would be very helpful in an explanation of how PID controllers and more specifically how cruise control systems work.

Timeline

In the first week, we will create the cruise control system using a PID controller in RIBS as a state machine. This will allow us to do what we want at each state in terms of calculations. This will also involve us implementing the PID tool in RIMS to debug our code as well as help figure out how to set up our PID to our specific specifications. When finished with that, we will export the C code to RIMS. This allows us to begin implementation of the UART part. This section will give the user a platform of interaction with the implemented system. We will have to implement all of the features described in the section above, so this might spill into week 2.

The second week will start with us continuing on the implementation of giving the user the ability to interact with the system. After this is complete, week 2 will consist of us attempting to complete our challenge goal. We could not find many resources on how to do this easily in original research, so we are not sure how long this may take.

The short part of week 3 that we have would consist of us continuing to work on the MATLAB output plots as well as completing the presentation.

Week 4 would be completing the report that is required.

Budget

This project will not require any budget given that it will be done all through simulation. We will just use RIMS, RIBS, and Matlab which are given through the school or free online.