Matlab Homework Assignment - Template solution

The `CruiseControl.mdl` **Simulink model was posted on iLearn. Questions:**

1. Leaving the control gains (orange block) at their default values, plot the response of the system to a step input in the speed reference value: at time $t = 0$ we go from an initial reference speed of 40 mi/h to a final speed 50 mi/h. Measure the time it takes for the system error to settle within 1% of the desired final speed (50 mi/h).

2. Tune the control gains (orange block) and design a controller that settles at least 50% faster than the default controller provided. Include the gains you used, a plot of the closed loop response, and describe any undesireable features in the solution you obtain.

3. Now add a hill (cyan block) of 30% slope (0.3) at time $t = 60$ and comment on the performance of your controller in rejecting this disturbance.

Your homework must be a typeset report which includes a printout of the Simulink model, plots with labeled axes, having reasonable axis limits, captions and well written response to both questions.

1. Controller with default gains. Specify a) Initial and final speed, b) settling time you found and how you processed the speed data to find it (specify Matlab code used).
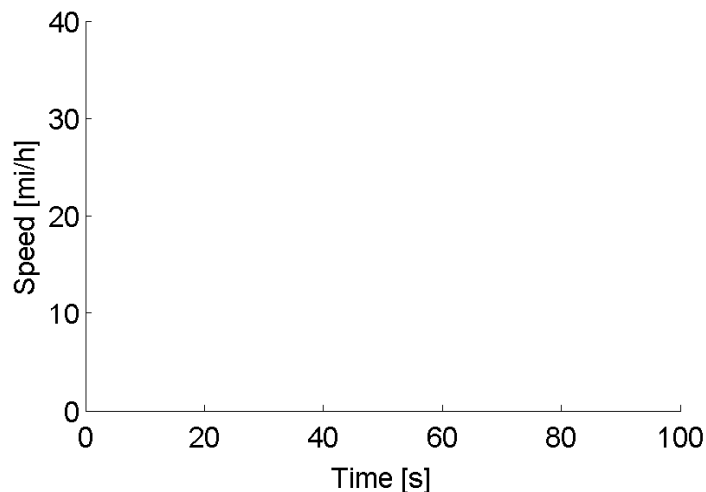

Figure 1: Plot for part (1). Speed vs. time with default gains.

2. a) Specify your target settling time (50% of what you found with the default controller parameters). b) Specify the new controller gains you picked. Comment on the resulting speed profile and the magnitude of the gains you chose.

3. Add the requested hill disturbance, plot the car speed vs time in a new plot (Figure 3), and describe the performance of the controller.
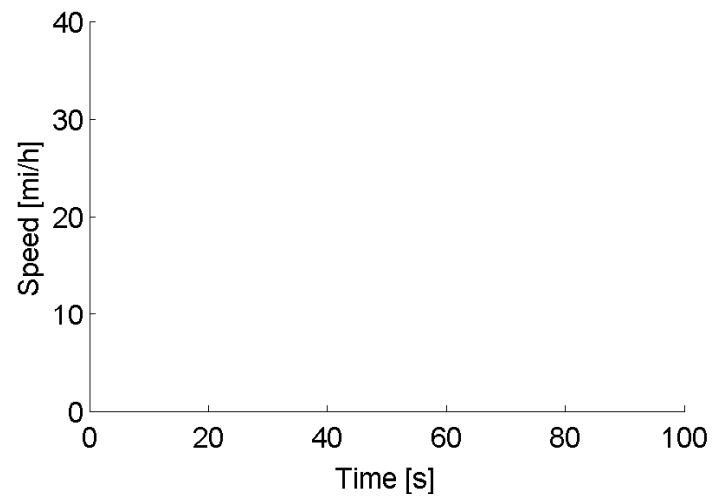
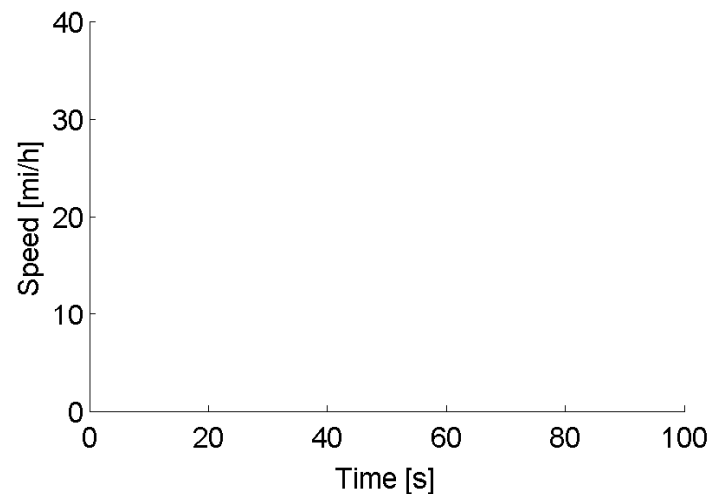Figure 2: Plot for part (2). Speed vs. time with modified gains, compared to original gains.

Figure 3: Plot for part (3). Speed vs. time when the hill disturbance is present.