Cruise Control

Dynamics (Engr 2340), Fall 2008

Instructions

In this example we will use MATLAB to analyze one example of a first order model - the response of a car with cruise control (figure 1).

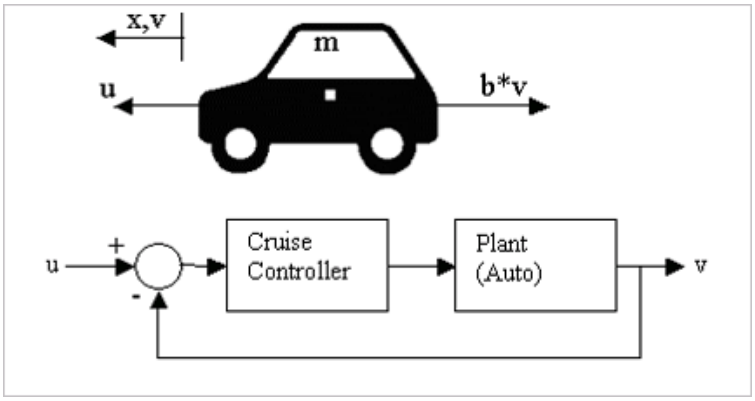

Figure 1: Cruise Control

1. Write the equations of motion for the speed and forward motion of the car shown in figure 1. Assume that the engine imparts a force $u(t)$ as shown. Drag is modelled as a linear function of velocity. Take the Laplace transform of the resulting differential equation and find the transfer function between the input u and the output v.
2. Use MATLAB to find the response of the velocity of the car for the case in which the input jumps from being $u = 0$ at time $t = 0$ to a constant $u = 500$ N thereafter. Assuming the car's mass is 1000 kg and b = 50 Ns/m.
3. What is the steady-state speed increase for the specified input?
4. How long does it take for the car to reach this steady-state speed?