2.14/2.140 Lab 1

Assigned: Week of Feb. 10, 2014
Due: Week of Feb. 17, in your lab session

For Lab 1, we ask that you install and run Labview on your own laptop computer. You will also need to install the CD&Sim and Mathscript RT modules. Please see instructions posted on the course web page.

Please load and run the file `URACTLR.vi`. This file lets you implement on/off and linear control of 4 different plants. You can also test automatic (machine) on/off and linear control. The system runs as a 10 second simulation. During this run, your goal is to use the control input to keep the plant output at a level of 0.5. Deviations from 0.5 are errors; the square of these errors is integrated over the 10 second run, and displayed on a gauge and as a numerical output. The lower the integrated square error, the better.

By the end of the lab session, conduct your own experiments with this control system. Look at how each system is controlled by the machine automatic control. How well do you (human) control the 4 different systems? How well does the machine control work? For the second-order system, explore changes in ω_n and ζ, and see how these affect the control. Before leaving lab, meet with one of the lab staff one-on-one to explain what you've observed. Be prepared to explain the loop behavior in light of the plant dynamics for each plant.

A report documenting your experiments is due the following week (week of Feb 17) at the start of your assigned lab session. Reports will not be accepted more than 10 minutes late, *i.e.*, after 2:15 pm. We will not accept reports turned in to other lab sections. This report should show time traces from some of your best runs and for your best tunings of the automatic controller in on/off and linear modes for each of the four plants. Explain the observed signals (control effort and plant output) in terms of the plant dynamics and controller charcteristics.

Your Lab grade will be based 50% upon your understanding as shown to in the face-to-face lab meetings and 50% upon the data and understanding shown in your written report. Grades for each of these components will range from 0 (worst/not there) to 5 (excellent) for a total lab grade of 0 to 10.

We will not make up lab sessions. If you miss a lab session, except for medical or emergency reasons, your lab grade will be 0.

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Spring 2014