

EE/AA 448: Sensors and Actuators

Laboratory Module #4

Controller Design and Sensitivity

Assigned: Feb. 2, 2009

Due: 12:30 PM, Monday Feb. 9, 2009 (In Class)

Objectives

The objective of this lab is to build a controller that does not wind up and that is robust to changes in the parameters of the plant (such as might occur if the heat sink were replaced).

You Will Need...

To complete this module, you will need

1. Some time outside of the laboratory to work on your simulation and controller design.
2. A TCL Board, IO Card and Computer, configured the same way as in Module 3.

Impliment Anti-Windup and PID

Add both an anti-windup subsystem and a D term to your realistic simulation and to your controller code. Use `sisotool` in MATLAB to choose the gains for your controller.

Sensitivity

Consider the model of the system $G(s) = K/(\tau_d s + 1)$. For a PID controller, determine how much the steady state error and settling time change when the parameters K and τ_b vary from the old values to the new values of these parameters.

Controller Performance

Use your controller to track a square wave. Suppose the square wave oscillates between 0 to 10 degrees difference from the bottom block. Find the period for which you can get the signal settled 90% of the time.

This task should challenge your anti-windup compensator. Compare the performance with and without the antiwindup controller, using the same K_p , K_i and K_d gains.