EE443 Lab 9: Ball & Beam Control Experiment

Introduction

The "inner-loop" PD beam controller along with the "outer-loop" PD ball controller investigated in last week's simulation lab will be implemented on the ball and beam system.

Procedure

1) Characterize the Sharp GP2D12 distance measuring sensors used in this experiment to measure the ball location on the beam. Record the ball positions along one side of the beam (we'll only be using one of the sensors) and the corresponding voltages using LabVIEW to display the voltages. Enter the distances and voltages into the Maple script provided to fit a second and third order polynomial to the data. Choose one of the curves and record its coefficients for entry into LabVIEW.

2) Download lab8.vi and its related subVIs. Edit the subVI vtox.vi that performs the voltage to distance conversion by implementing your curve found in part 1. Once this is changed, run lab8.vi to verify correct ball position measurements through your conversion.

3) Add PD beam control using gain ratios determined in the previous simulation lab. You may need to lower your gains since only a limited supply voltage is available as opposed to the availability of any voltage in simulation. Determine gains such that a reasonable beam step response is achieved for a desired angle of 10 degrees. Demonstrate this response and print out the recorded response from LabVIEW.

4) Add PD ball control using gain ratios determined in the previous simulation lab. After tuning the gains so that the ball can be positioned approximately 5cm from its initial value (small angle approximation in controller design limits us to small beam angles), demonstrate the response and print out the recorded response.