Department of Chemical Engineering
University of California, Santa Barbara

ChE 152B **Winter, 2010**

Lab 3: Pendulum swing-up control

1. Introduction

In this lab, you will design a PID controller for the cart component of the pendulum experiment. You will employ tuning methods from your textbook. In this particular exercise, the pendulum control is not addressed, so you can treat that as a disturbance.

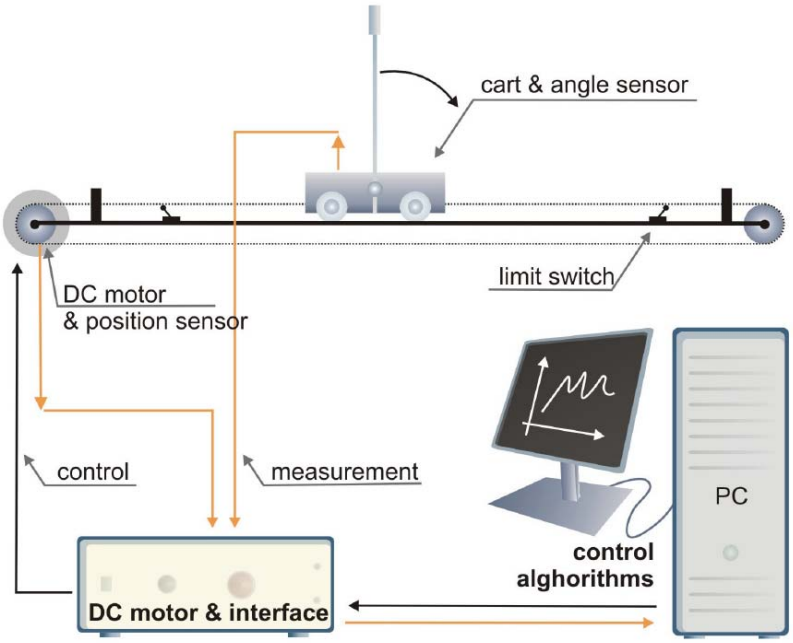

Figure 1 – Pendulum Control System
[from Feedback Instruments, Ltd. manual]

2. Pre-lab Analysis

Review the documentation provided to the groups for lab 1, so that you are familiarized with the mechanics of the pendulum/cart experiment.

- Using the Simulink file provided, design a controller to bring the pendulum to within a certain angle of the up position
- Tune the controller to minimize cart movement
- Also tune the controller to minimize the time to erect the pendulum

3. Experimental Activities

- Implement, test, and improve the controller you designed in prelab (refer to the attached pages from the pendulum manual
- Evaluate performance using criteria of your choice

4. Lab Report

Analyze your results and prepare a lab report using the memo/personal file format described in previous handouts. (Recall the limits on the maximum numbers of figures and tables in the Memo.) Compare the controller settings for different design/tuning methods. Which controller design/tuning method provided the best results?

5. Appendices

- Lab2_W10_pendulum_results.doc
- Lab3_W10_ModelSwingUp.mdl