ME 576 Lab 12 Digital Control of Servo Trainer and Command Generation

1. PD control implementation of the Servo Trainer

Using the values of c and J obtained from the system ID in the previous lab, the objective of this lab is to implement the PD controller as shown in Figure 1 to meet the following specifications: (Ts=0.004 sec)

– the closed loop system natural frequency $\omega n = 0.9$ Hz,

– and the damping ratio of 0.15.

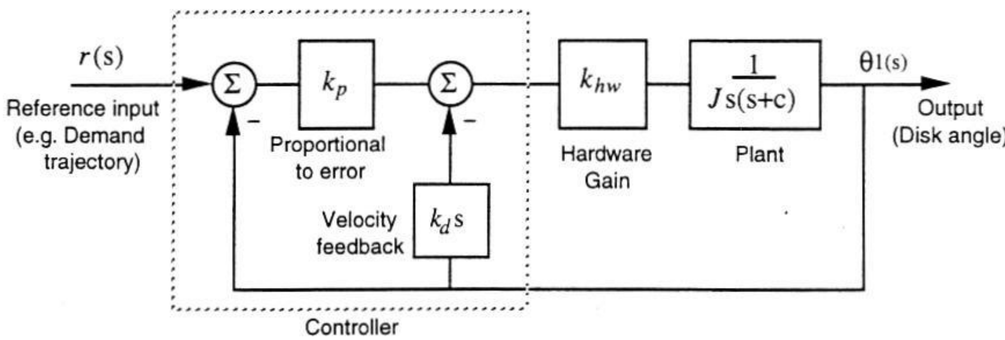

Figure 1 Controller Configuration for Plant Identification

Control Implementation Procedure

Procedure (Continuous Time Control)

(a) Open the Motion Controller Labview VI, enter Ts=0.004s and the control gain values you designed.

In this and all future work, be sure to stay clear of the mechanism before doing the next step. If the system appears stable after implementing the controller, first displace the disk with a light, non sharp object to verify stability prior to touching the plant.

(b) Enter the 45 degree as the reference commands.

(c) Right click on the encoder 1 chart and click export as excel file. You will obtain the disk time response data.

2. Command Generation II

INTRODUCTION

This week's lab assignment is to continue the experiment with more advanced features pertaining tomotion control of the servo table. In the last week's lab, you were exposed to simple command structures for the compumotor AT6400 indexer. You will be required to use the handout given to you during the last lab along with the attached documents in order to complete this week's assignment.

Motion synchronization of multiple axes

If individual axes are controlled separately, the beginning and ending times of each axis would not be same. In order to avoid this problem, coordinating velocity profiles is necessary as we discussed in the lecture.

In this experiment, the normal command mode will be used to synchronize the motions of two axes in order to have a straight line motion in x-y plane. Assume that the maximum velocities for axis 1 and 2 are 5 and 10 rad/sec and maximum accelerations for axes 1 and 2 are 5 and 8 rev/sec2 respectively. The distances to travel are 0.5 and 0.25 inches in x and y directions. First, generate synchronized trapezoidal velocities of both axes (to be done with a pencil and a paper). The number of pulses per one revolution is 25,000 for both axes. The pitches are 0.2 in/rev and 0.02 in./rev. for axes 1 and 2 respectively.

Note : Modify the program motion.prg in order to perform this task.

While executing this program, measure the velocity profiles of axes 1 and 2 using the Labview and plot the profiles.

<u>Items to be included in the report</u>

a) Printout of the measured velocity profiles.
b) Theoretically calculated velocity profiles.