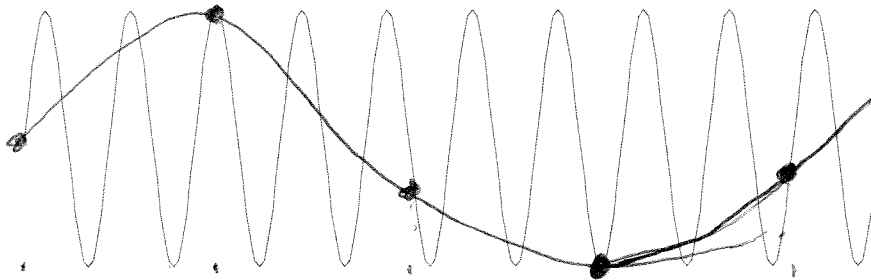


MAE 106 Laboratory Exercise #7 Post-Quiz Computer Control of a Motor

In this laboratory exercise you used a computer and the Labjack to control a motor. You changed the gains of a PD controller in software and observed their effect on position tracking.

- 20 pt 1. Assume you are using a 10 bit A-D converter to reads in a voltage between -5 and 5 volts. What is the smallest voltage change you can detect? $2^{10} = 1024 \text{ levels}$ $\frac{10 \text{ Volts}}{1024 \text{ levels}} = .98 \text{ mV} \approx 1 \text{ mV}$
- 20 2. In order to accurately reproduce a sine wave at 10 Hz, the Sampling Theorem states that you must sample the sine wave at at least 20 Hz.

- 20 3. Below is a sine wave. Illustrate how a sampled version of the sine wave can be interpreted as arising from a slower sine wave (i.e. aliasing), if the sampling rate is too slow.



Samples should be evenly spaced and connected w/ a sinvsoid

- 20 4. In the first part of the lab, you read in a sine wave generated by the function generator through the AD converter. In the second part of the lab, you generated a sine wave with the DA converter and read it into the AD converter. Why was the sampling rate slower when you used the DA converter to generate the sine wave?

Matlab had to make two software calls to the Labjack instead of one

- 20 5. Below are the parts you need to make a computer-controlled feedback system. Connect the parts with arrows that show the flow of information. Draw a thick line to indicate the connection that is typically made by the laws of physics rather than by a wire.

