Lab 3 Experiment Steps for AAE364L Fall 2020

September 12, 2020

1 The Lab steps to balance the pendulum

i. Open matlab, and make sure the working directory is set to your section's working folder
Desktop $\rightarrow$ AAE364L_Fall2020 $\rightarrow$ Date_time_sectionXXX $\rightarrow$ lab3
where Date_time_sectionXXX is your specific date and time of your lab session

ii. open the setup file **setup_ip02_spg.m**. Make sure the type of pendulum is set to PEND_TYPE = 'MEDIUM_12IN'. Run the setup file

iii. Enter in your gain K from your prelab for **Pole Placement Method** in MATLAB, that is $K = [K(1)\ K(2)\ K(3)\ K(4)]$

iv. Open **labpinv1.mdl** in Simulink

v. Put the cart at the center of the track, with the pendulum in the gantry or downward position. The computer thinks that this position is the angle π, so make sure that the pendulum is not swinging.

vi. Click **Quarc - Build**. Select **Simulation - Connect to Target**, and **Quarc - Start**. Now slowly move the pendulum to the upright position. As soon as the angle reaches zero, the controller will be activated. In case your controller does not work, be prepared to hit stop. In other words, if the pendulum falls or the cart runs off the track hit stop

vii. Have the TA tap the pendulum to see if the controller can balance the pendulum and return the cart to the zero position.

viii. After the system response returns to zero, click Stop.

ix. Save the angle history and cart position structs in MATLAB (File - Save - Save as Mat file).

x. Enter in your gain K from your prelab for **LQR Method** in MATLAB, that is $K = [K(1)\ K(2)\ K(3)\ K(4)]$

xi. Repeat steps (v) – (ix)