

Intelligent Control – Interactive Session Dynamic Simulations

January 24, 2018

Problem 1:

(a) **Equations.** Derive the equation of motion for a single pendulum modelled as a long rod with length l and mass m .

(b) **Euler integration.** With the initial angle of $q = \pi/4$ above horizontal use Euler integration to solve your equation of motion from $t = 0$ to $t = 5$ s and store the values of q and \dot{q} in vectors.

(c) **Check energy conservation.** Plot the total kinetic plus potential energy as a function of time. If this is not close to constant, decrease your time step until it is.

(d) **Animation.** Animate your pendulum in Matlab. Write a function in Matlab called `mySinglePendulumAnimation(t,q,l,fig)` that takes as inputs a vector of times, a vector of joint angles, the length of the pendulum, and a figure number and produces an animation of a pendulum. Use `hLine = line([],[]);`, `set(hLine,'XData',[])`, and `drawnow`.