Introduction to Dynamic Simulations

# I. Objectives

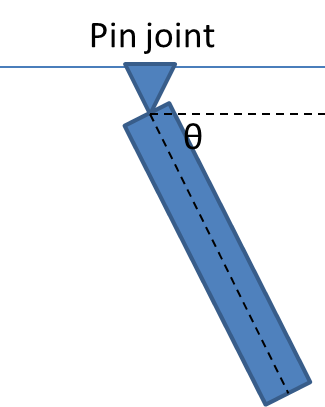
## Purpose

The purpose of this lab is to get familiar with the steps used in creating a model and performing a simulation. In this tutorial, you will:

* Use computer programming (e.g. Matlab) to solve the equations of motion for a suspended pendulum
* Use computer programming (e.g. Matlab) to visualize the motion of a pendulum for 2 seconds

# II. Suspended Pendulum

A pendulum (mass 25kg, moment of inertia 0.625 Nms2, length 0.5m) starting at θ = 20 degrees swings from a frictionless pin joint. Use a computer programming language (e.g. Matlab, C, C++, etc.) to plot θ, , and as a function of time for 2 seconds. Plot these on a single figure with 3 subplots. A numerical integrator (e.g. Matlab’s ode45 function, Euler, Runge-Kutta, etc.) must be used to solve the equations of motion. For extra credit, create an .avi file animating the motion of the pendulum (hint: see Matlab ‘VideoWriter’ function).



# Deliverables

Turn in your report electronically (as a .docx format ) using Blackboard. Be sure to include a copy of your code in the report. The report will be graded as follows:

|  |  |
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| **Item** | **Points Possible** |
| Free body diagram of pendulum | 1 |
| Equations of motion | 1 |
| Numerical integrator used to solve equations of motion | 1 |
| θ as a function of time for 2 seconds | 1 |
| as a function of time for 2 seconds | 1 |
| as a function of time for 2 seconds | 1 |
| Copy of code | 1 |
| Movie animation of pendulum motion | 3pt Extra Credit |
| **Total** | **7 + 3EC** |