PHYS-4810 Project Proposal:

A Double Pendulum on a Cart

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19 April 2013

The Physics

1. Establish a force diagram and extract the component equations of the forces acting on each center of mass.

2. Manipulate force equations via substitutions/simplifications in order to obtain the coupled second order differential equations of motion.

Algorithmic Considerations

1. The above system of second order ODE's must be transformed into canonical form in order to be solved numerically.

2. Remain aware of rounding errors and their affect upon solutions.

Obtaining a Solution

1. Establish tolerance criterion and assumptions for the model
(Reaction times, maximum angular displacement, etc.)

2. Implement Runge-Kutta 4 to solve the system.

The Goal

1. To program a dynamic solution which manipulates a cart
into establishing and maintaining balance in a double pendulum

2. Establish a thorough appreciation of the model by displaying an understanding of the:

    - Theoretical derivations
    - Physical limitations
    - Usefulness in 'real-world' applications

3. Produce an animation of the model