Poster text:

Validation:

The model includes no friction or air resistance. As such, energy should be conserved. The above plot contains energy vs time for one run of the model. It is notable that the potential energy in the initial condition was used as the zero for potential energy, so the amount of energy in the system should be a constant zero.

Energy very closely tracks zero for the first hundred and fifty seconds, after which the energy starts to increase exponentially due to integration error in the solver. This is irrelevant because over those timescales with not large pendulum masses friction would start to be significant.

Visualization:

The above visualization is a position trace of the pendulum over several seconds. It sufficiently demonstrates the seemingly random and chaotic behavior of the double pendulum.

Future work:

There are several possible futures for this model. If data was available on how much force is required to remove the legs of a human, this model could be used to predict what initial conditions of trapeze length and angle would dismember a trapeze artist. This model with additional constraints could also be used to better understand the motion of a tennis racket or golf club.

It would also be prudent to include hinge friction and air resistance so that the model’s motion is damped.