Goal

Simulate a spring-mass-gravity system

Constants

$k = 100$

$l_0 = 1$

$m = 1$

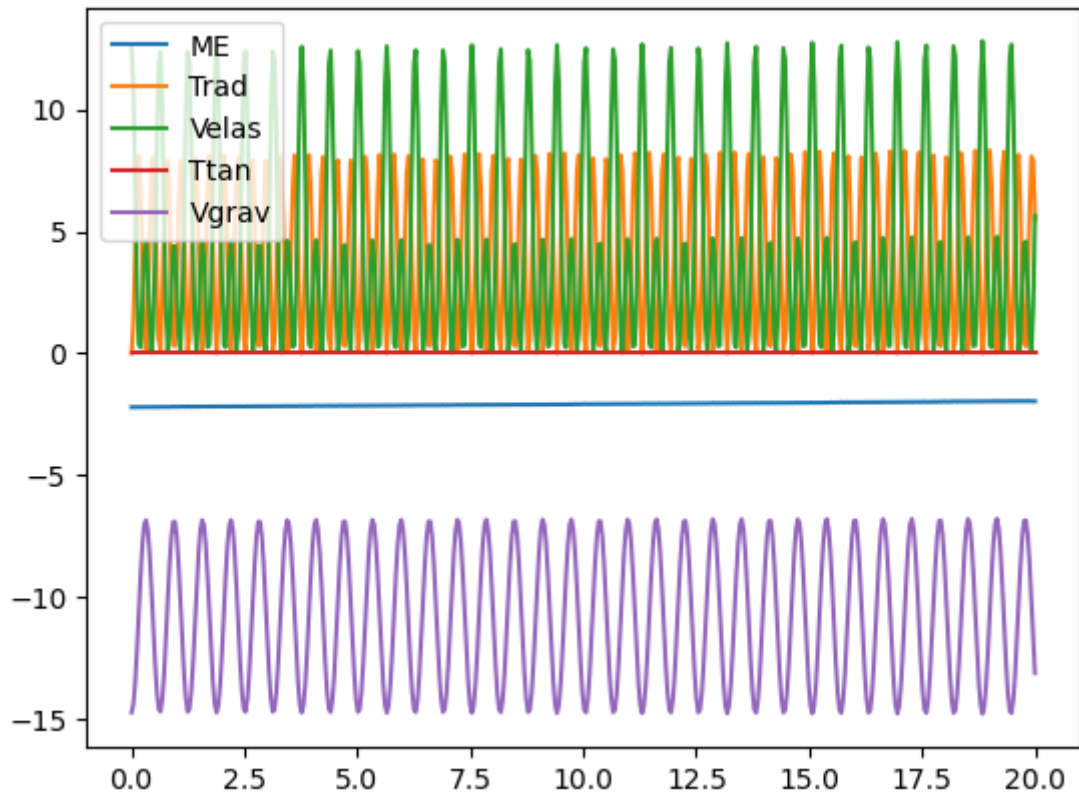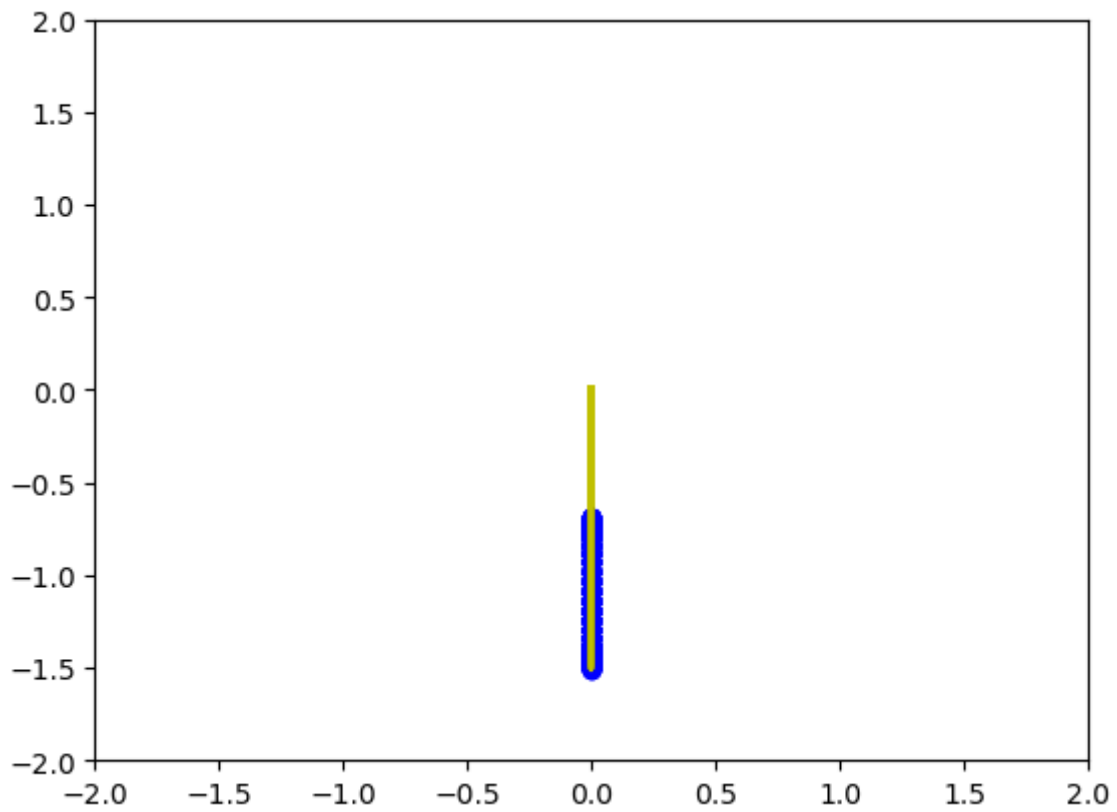$g = 9.8$

Duration: 20s

Framerate: 25fps

Initial Values

$l = 1.5$

$\dot{l} = 0$

$\theta = 0$

$\dot{\theta} = 0$

Results

In which ME stands for mechanical energy, T_{rad} stands for radical kinetic energy, T_{tan} stands for tangential kinetic energy, V_{elas} stands for elastic potential energy, V_{grav} stands for gravitational potential energy.

The theoretical mechanic energy is -2.200000000000001 J

The average calculated mechanical energy is -2.0769138619149143 J

The Root Mean Square Error of mechanical energy is 0.1424396880941304

the standard deviation of mechanical energy is 0.017137885306576336

Therefore the calculated energy stays close to the theoretical energy, meaning the energy of this system converges to the theoretical value. This simulation has a high accuracy and a high preciseness.