Mass-Spring Systems
Modeling Motion Week 2 Computer Lab

This week we will model the behavior of several physical phenomena by building structures of multiple masses connected by springs.

1) First download the `massspring.py` module from the Modeling Motion website as well as `three.py` which contains a simple example of using the mass system. Execute `octahedron.py` to run its test program to verify it is working correctly.

2) Using `octahedron.py` as an example, create a horizontal row of 10 masses connected by springs. Start the simulation and see if this elastic "string" behaves correctly. Note how one mass is created but not added to the `MassSpringSystem`. It remains fixed because its position is not updated

3) Fix both ends of the string. The string should droop into a catenary curve. Adjust the spring constant and damping factor of the springs and the resistance of the masses to control the system.

4) Set gravity to zero and drive one end of the string and down with a sinusoid to set up waves moving across the string. After tuning the damping, resistance and spring stiffness, you should be able to set up standing waves in the string. Increasing the frequency of the driving force should increase the number of nodes.

5) Make a separate program with gravity and a set of eight masses connected into a cube. Put a ground (a box in vpython) beneath the cube and try to constrain the motion of the masses so they cannot fall below the ground. The cube will not be stable unless you add some cross members to it.

6) Write a program to build tower at least 10 units high using springs no longer than 3 units. Again, tuning or the parameters will be necessary to create a structure which can withstand its own weight.