

Resonance

Modeling Motion Week 1 Computer Lab

In this week's lab we create a harmonic oscillator simulation to model the vibration of a musical instrument and determine its natural frequency.

- 1) A `Driver` class is provided in a `driver.py` module on the website.
- 2) Create a `String` class similar to the `Driver` class that implements the equation of motion for a damped driven harmonic oscillator. Do not save this in a file called `string.py` as this will prevent you from using Python's existing `string` class for printing and making labels on graphs.
- 3) Write a program to create a `Driver` and a `String` and plot the position of the string as a function of time.
- 4) Modify your program to simulate the vibrating string long enough for it to settle into periodic behavior and then measure its amplitude.
- 5) Now make a loop which does the simulation described above for a range of different driver frequencies.
- 6) Plot a graph showing the different driver frequencies used on the horizontal axis and the amplitude of the string's oscillations (after it settles into periodicity) on the vertical axis. You should see a peak in this graph. This is the resonant or natural frequency of the string
- 7) Turn in your program, including the `String` class and a plot of the graph in step 6.