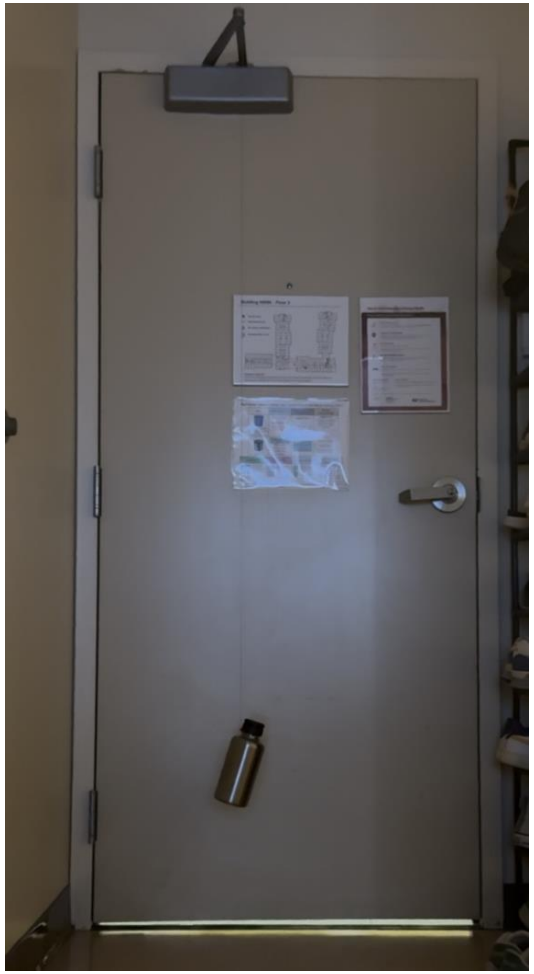
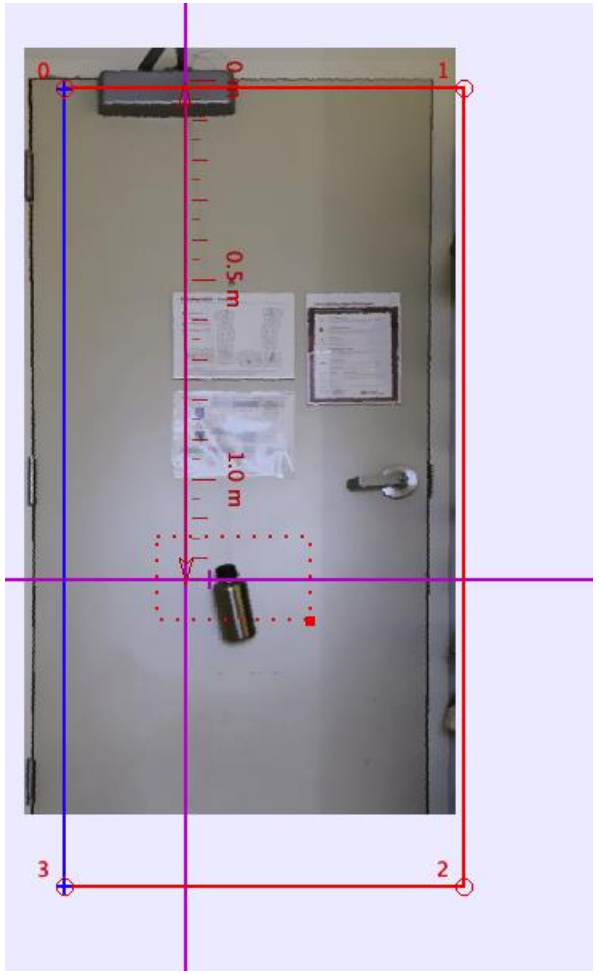
Pendulum Setup





Apparatus:

A 2m wire (from bike), a cylindrical water bottle full of water. The wire is attached to the neck of the water bottle. The other end is tied to the door hinge protruding away from the door.

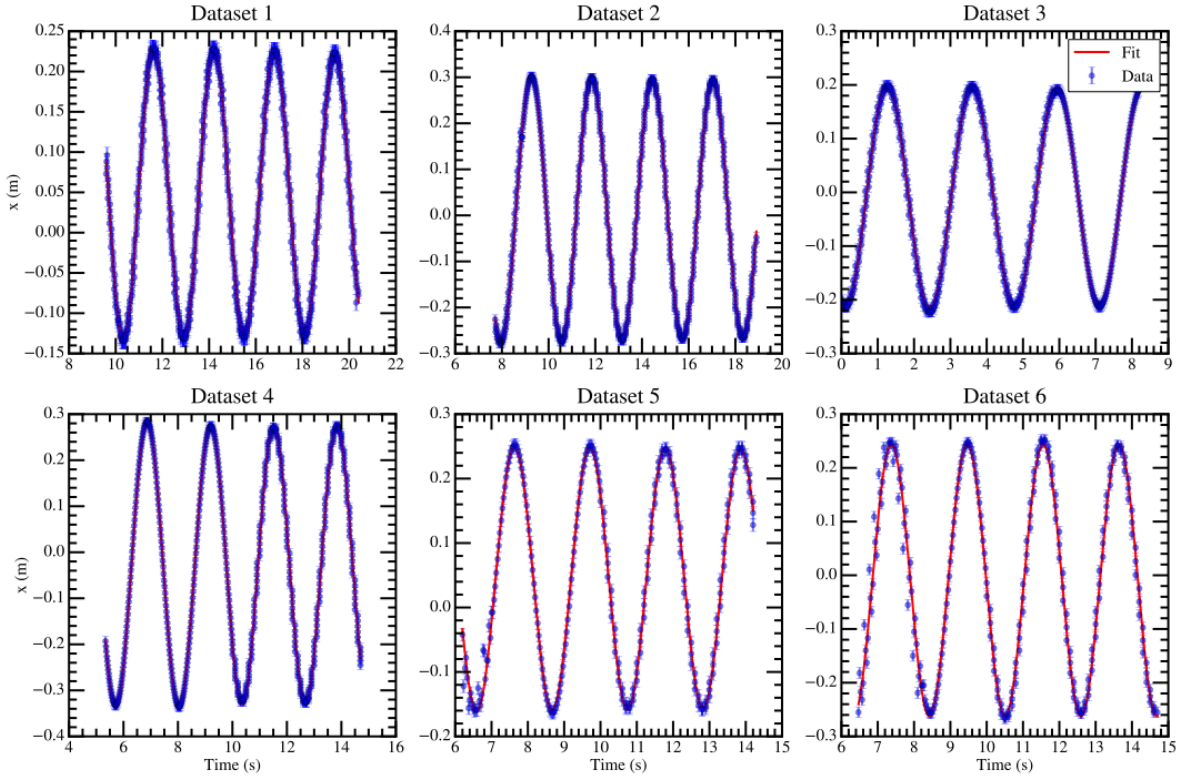
Procedure:

1. Measure the width and the height of the door
2. Tie the string to the full water-bottle.
3. Tie the other end of the string to the hinge of the door
4. Perturb the pendulum and take a video
5. Import the video into Tracker
6. Adjust the perspective using the door rectangle frame
7. Calibrate the length using the height of the door
8. Measure the string length, add half of length of the cylindrical bottle for center of mass
9. Track the movement of the bottle
10. Fit a damped oscillation to the t-x graph
11. Repeat the measurement
12. Repeat 3-11 for 2 different lengths

Result

$$x = A\,\mathrm{e}^{-\gamma t}\cos\left(\frac{2\pi}{T}t + \phi\right) + x_0$$

Length of String (m)	g ($\mathrm{m\,s^{-2}}$)
1.591	9.88 ± 0.12
1.591	9.85 ± 0.12
1.267	9.77 ± 0.15
1.267	9.90 ± 0.15
0.988	9.80 ± 0.18
0.988	9.70 ± 0.18



Result: $g = 9.82 \pm 0.03(\mathrm{stat}) \pm 0.15(\mathrm{sys})$