

In future weeks, you'll need to have the free software package "Tracker" installed on your computer. It is a video analysis package. You can go to the site directly (<http://www.cabrillo.edu/~dbrown/tracker/>), and there is also a link to this site on the course homepage (<http://www.geneseo.edu/~pogo/AnalytI/Labs/p124home.htm>).

This assignment will help you install it and learn how to use it. It should take you about 15 minutes to complete. It is due before you leave after the Force Table Lab (just show your laptop to Dr. Pogo).

Assignment:

1. From the Tracker site, download and install the Tracker software.
2. We will practice on a video file called "dropping" that you can access from the course homepage listed above. It's just a short movie of the motion of a small ball dropped by Dr. Fletcher. Don't merely open that link, save the file to your own computer.
3. Run the Tracker program. The image on the next page was created for a different experiment than the one in our practice video.
4. In Tracker, go to "File/Open File", and open the video you saved in step 2.
5. Near the top-left, turn on your "axes". Drag your origin to the top of the meter stick, and rotate it to make sure that it runs along the meter stick. This defines the x and y directions and origin so that Tracker can give you numeric values for x and y positions.
6. Next, we need to be able to tell how many inches on your screen is equivalent to a meter in real life. Turn on the "scale" near the top-left, then select "New/Calibration Stick". Drag the endpoints of the calibration line to each end of the meter stick. These points are already known to be 100 cm apart from each other, so the default scale of 100 cm is perfect for (although you can change it if you need to in other experiments, for example).
7. Next, we need to identify the locations of the ball in each frame of the video. Go to "Tracks/New/Point Mass. A small dialog box will appear, but you don't need it. Hold down the shift key, and then click on the **center** of the ball in each video frame for which the ball is visible. Tracker will automatically advance through all of the frames.
8. Tracker now has enough information from you to calculate the position of the ball for each video frame. It already knows that video is recorded at 30 frames per second, and it provides columns of data for t , x , and y that you can copy and paste into Excel. The position columns are in cm, and the time is in seconds. Unfortunately, tracker has rounded the time data to only 3 decimals; we will re-create the time data from scratch (using $t = n/30$) once it is pasted into Excel so that we have more sig-figs.
9. For this practice experiment, there should be no motion in the x -direction. In Excel, plot the y vs. t results. Use Trendline and Linest to get the coefficients of the best-fit parabola for this data.
10. Use the results from Linest to determine $(a_y \pm \Delta a_y)$. How does it compare to the expected value for a_y ?

Example Screen Shot For Tracker

The screenshot shows the Tracker software interface with a video of a ball being dropped. The interface includes a menu bar (File, Edit, Video, Tracks, Coordinate System, Window, Help), a toolbar, a video window, a plot window, and a table window.

Step 6a points to the **Tracks** menu.

Step 7 points to the **Track** tool in the toolbar.

Step 5a points to the **Coordinate System** tool in the toolbar.

Step 5b points to the **Coordinate System** tool in the toolbar.

Step 7b points to the **Track** tool in the toolbar.

Step 6b points to a vertical blue line in the practice video.

Step 8 points to the **Table** window.

The **Table** window displays the following data:

t	x	y
0		
0.033		
0.067		
0.1		
0.133		
0.167		
0.2		
0.234		
0.267		
0.3		
0.334		
0.367	-5.256	-93.782

The **Plot** window shows two graphs: **mass A (t, x)** and **mass A (t, y)**. The **mass A (t, x)** graph shows a plot of x versus t, with a data point at $t=0.37$ and $x=-5.26$. The **mass A (t, y)** graph shows a plot of y versus t, with a data point at $t=0.37$ and $y=-93.78$.

The status bar at the bottom of the video window displays: **mass A selected (set mass on toolbar, shift-click to re-mark highlighted position)**.