

Momentum Explosion Support Document

I intended to put a zip file containing these handouts and some video files for video analysis in the podcast stream. Unfortunately only video files and PDF files are supported. In order to avoid confusion the videos for analysis are not in iTunesU but can be gotten from the links below.

All cans in my videos are launched with "energy sticks". They are definitely not firecrackers, those are illegal in Michigan.

The video files:

- Momentum 2 identical cans.mov - Shot with a regular video camera and you can just barely do the video analysis. Both cans have a mass of 25 g.
 - <http://blip.tv/file/get/Falconphysics-ConservationOfMomentum317.mov>
- Unequal Cans Momentum.mov - Shot at 500 frames per second. The heavy can has a mass of 48g, but if you do the calculation based on momentum you'll get about 36g. I figure it's because the light can deforms, but that's just a guess.
 - <http://blip.tv/file/get/Falconphysics-ConservationOfMomentumCansOfUnequalMass237.mov>
- Can Launch.mov - Shot at 500 Frames per second. I like to ask students how we start with zero momentum and seem to end with non-zero momentum.
 - <http://blip.tv/file/get/Falconphysics-CanLaunch623.mov>

If you have any questions, would like a version of this handout in Microsoft Word format, or have problems downloading the videos, just send me an email:

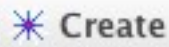
dickie@divinechildhighschool.org

Video Analysis in Tracker

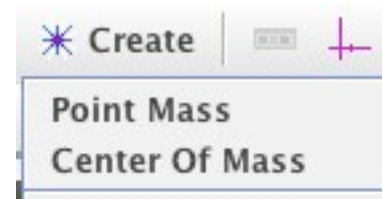
- Download Tracker from: <http://www.cabrillo.edu/~dbrown/tracker/>
- You may need to install QuickTime and Java. Both are required to use Tracker.
- Goto “File” Menu and select “Import” and import your video
- We need a known scale in the video window. I always put scale information in the first frame of a video. This is our known distance in this video.



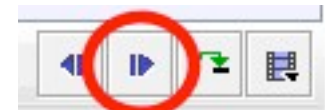
- Click on “Tape Measure”. Look for the blue double-headed arrow that has appeared on your video; drag its ends to the ends of known scale.
- Click on the number and enter your known length.



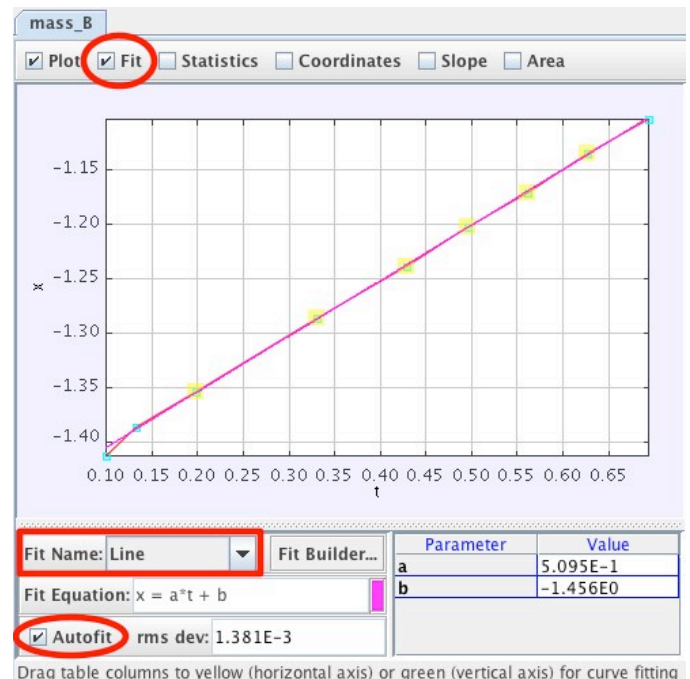
- Now Click on “Create”.
- A menu will appear. Click on New and select “Point Mass”
- Play the video a few frames forward, until you get to the motion you want to track. While Holding the Shift key down click on your object of interest.
- The video will advance one frame. Click the spot again. Keep clicking until you’ve got all of the motion you’re interested in. Try to click the same spot on the object in each frame of the video.



- If you have trouble seeing your spot you can advance the video a frame or two with the advance frame button (lower right).
- You should notice a position graph appearing to the right.
- If you click on the “x” on the axis label you can graph different quantities. “x” means position in the X direction. The list of graph-able quantities is pretty long and totally awesome.



- When you have the graph you want double click it. (Yes, right in the center of the graph)
- Click and drag over a part of the graph you want to analyze. For example: if it were a projectile I might be interested in the slope of the X-Position to get V_x , or Slope of the Y-Velocity to get the acceleration due to gravity.
- Click in the “Fit” Checkbox (top left). Notice the window change. Make sure “Fit Name” is Line then place a check mark in “Auto Fit”. You should notice your slope and y-intercept. All values are in scientific notation.



High Speed Video Analysis in Tracker

Videos that are shot at “High Speeds” have an actual frame rate different than the frame rate associated with the video file on your computer. The videos from my camera show up as being 10 frames per second on the computer even when filmed at 125, 250, or 500 frames per second. We need to tell Tracker how to deal with this.

- Determine the frame rate. I always put frame rate information on the first frame of my video.
- Click the “Clips Settings” button, Lower right of your video



window

- You’ll need to set “Frame Rate” to your desired frame rate.
- If you find you have too many frames to click you may want to change your “Step size”. This will then cause the video to advance by multiple frames for each point you place.
- Now you can complete your video analysis as you would for a standard video.

