MouseTracker 1.0

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Freeware: *Please distribute freely, but do not modify.*

Instructions

MouseTracker records the *x*-*y* coordinates of all mouse clicks received by the Macintosh.

Command	Keyboard equivalent	Where command works
Wipe Clicks	Command-W	MouseTracker only
Save Clicks As...	Command-S	”
Quit	Command-Q	”
Start/Resume Mouse Click Recording	Command-option-control-G	Any application, or the Finder (while MouseTracker is running)
Stop/Pause Mouse Click Recording	Command-option-control-S	”

Physics

MouseTracker was originally designed as part of a procedure that simplifies difficult length and time measurements in mechanics experiments. When used simultaneously with video software, MouseTracker lets the user easily make measurements from any or all of the frames in a video sequence of a dynamic mechanical system.

Here’s how to make measurements from video using MouseTracker:

1. Point a video camera directly at the mechanics experiment, so that the long axis of the camera is perpendicular to the plane of motion. (If there is no one plane of motion, multiple cameras may be necessary.)
2. Measure the length in meters of some object in the experiment that is perpendicular to the camera’s long axis.

3. Position the camera as far away from the experiment as possible, to reduce the effects of perspective.
4. Use the camera's zoom lens so that the experiment appears as large as possible within the viewfield.
5. Film the experiment.
6. Using a stopwatch, film this sequence after the experiment: hold the stopwatch in front of the camera (so it is clearly visible in the viewfield.) Start the timer, and after approximately 10 seconds, stop the timer. Write down the exact interval in seconds.

7. Transfer the video sequence to a relatively fast Macintosh computer. In an experiment I conducted in my high school AP Physics class, I used the VideoSpigot extension and the video-capturing/playing application ScreenPlay, but many other similar software products will work just as well.
8. Launch MouseTracker and, using ScreenPlay, display a large window containing the first significant frame of the experiment's video sequence.
9. Press **Command-option-control-G** to begin mouse recording.
10. Click on the center of an important point on the image, such as the center of a spherical projectile, a previously marked point on a rotating object, a certain spot on a person's elbow, the bob on a compound pendulum, etc.
11. Advance the video sequence to the next frame. Do not move or resize ScreenPlay's window, or the coordinates system will change mid-measurement!
12. Repeat Steps 10 and 11 until the position of the given point has been recorded on all significant frames. Be careful not to make any other clicks—you don't want to intersperse random numbers in your results! *Click, advance, click, advance, click, advance...*
13. Return to the first frame of the sequence, and click on both ends of the object you measured in Step 2.
14. Move to the stopwatch sequence, and count the number of frames between the instants that you started and stopped the timer. Now you have frames-per-second; write it down. Although ScreenPlay and other video programs may purport to give time or fps, it's better to trust your own measurements.
15. Press **Command-option-control-S** to stop mouse recording.
16. Return to MouseTracker, and select **Save As...**. Name the file; **Quit.**
17. Double-clicking the file you have created will automatically launch the spreadsheet application Microsoft Excel, if it's

available. If not, you can open the file with any text editor, spreadsheet or graphing program.

The two columns of numbers in your file give the screen *x*-*y* coordinates of each of your mouse clicks, in pixels. Remember, the last two pairs of coordinates are the two ends of the stationary object you measured in Step 2. Write down the last two pairs of coordinates, and delete them from the list. Calculate the distance between these two points (in pixels). You can now calculate the ratio of centimeters/pixel, and convert the pixel-coordinates to metric coordinates. The time interval between each pair of coordinates is naturally the inverse of what you calculated in Step 14. Now you have position and can calculate velocity and acceleration at any instant.

I strongly recommend that you use a spreadsheet to make and graph calculations; drudgery is not the goal of most experiments.