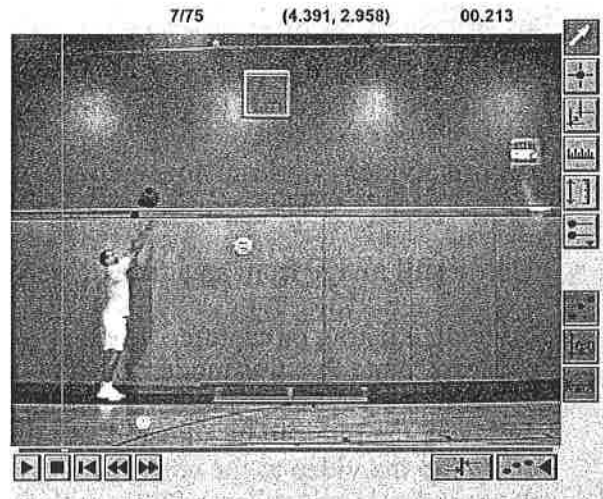## Video Analysis

You can use the Video Analysis tool to create a graphical representation of the motion you see in a movie or picture[1]. This is ideal for mathematically analyzing real-world events.

A tutorial covering video analysis is available. Select Open from the File menu, and open 12-Video Analysis in the Tutorials folder. Follow that tutorial to try video analysis yourself. The discussion below explains some of the functions available to you.

After you insert or capture a movie, you can open the Video Analysis toolbar. The motion that you mark directly on the movie will be displayed on a linked graph. After the desired range of motion has been graphed, you can use Logger *Pro*'s analysis features to study the plotted data.

**Movie Buttons** There are five buttons in the bottom left corner of the movie object shown here. The button farthest on the left is the Play button. Click it to play the movie. The next button to the right is the Stop button. It will stop the movie during replay. The third button resets the video to the beginning. The next two buttons move the video to the previous or next frame.

Click ▣ in the bottom right corner of the movie object to display the Video Analysis Toolbar. A graph will also be displayed. A new set of X and Y columns will be added.

### Video Analysis Toolbar Buttons

**Select Point** Highlight a trace point in the movie object. This mode is for editing existing points. Once a point is selected, it will be highlighted. Highlighted points can be deleted or moved. Move the point using the mouse or by nudging with the cursor keys.

**Add Point** Enters the mode for marking the location of an object in a frame. Click this button, and then click on the object location in the movie. The movie will advance one frame; continue marking the object as desired. The frame time, as well as the X and Y location of the point is recorded in the data table.

**Set Origin** Click this button, and then click on the movie to set the location of the origin. If needed, this coordinate system can be rotated by dragging the yellow dot on the horizontal axis.

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[1] Instead of marking one object across frames (time) as you would in a movie, analysis of a picture allows you to mark many points on one frame. This is useful in getting the points along a curve, for example.

**Set Scale** When you mark points on the movie, the program initially records the coordinates of each point in screen pixels. Setting the scale allows you to convert those coordinates to a physical measurement, e.g. meters. In the example shown above, a meter stick appears in the same plane as the motion. That meter stick can be used to set the scale. Click this button, and then drag across an object of known length in your movie. Record that distance in the resulting Scale dialog. Note that the reference scale object must be in the same plane as the motion, or parallax error will create proportional scaling errors.
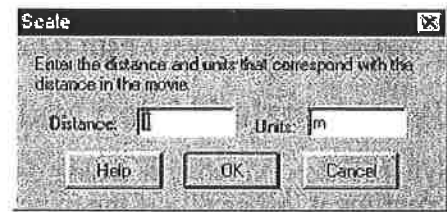
**Photo Distance** Use this tool to measure a distance on the video after setting the scale. This is essentially the inverse function to setting scale; you draw a line on the video, and Logger *Pro* provides the distance.

**Set Active** Adds new point series for tracking additional objects, and selects between existing series. If a series has not been used before, the button adds new $x,y$ columns and creates a new series to track a new object. The active point set is indicated in the popup menu. If there are two or more point series, use the menu to create a center of mass calculation. You can assign each tracked object a mass, and then Logger Pro will find the location of the center of mass of the objects in each frame. The CoM can then be plotted on the video, and graphed or used in other calculations.

**Toggle Trail** Displays or hides all the points that have been added up to the current time.

**Show Origin:** Display the origin on the movie object. Click again to remove the origin. The origin is set with the Set Origin button

**Show Scale:** This will show the line that was used when setting the scale (see **Set Scale**).

## Movie Options

A number of important settings are found in the Movie Options dialog, accessible either by selecting the video and choosing Movie Options from the Options menu, or by double-clicking the movie when not in add point mode.

Of particular note are the options to:
- Override the frame rate when the video is not marked with the correct frame rate.
- Set the time associated with the First VA point to zero. This option will "start the clock" at the first marked frame, regardless of the time stamp on the frame.