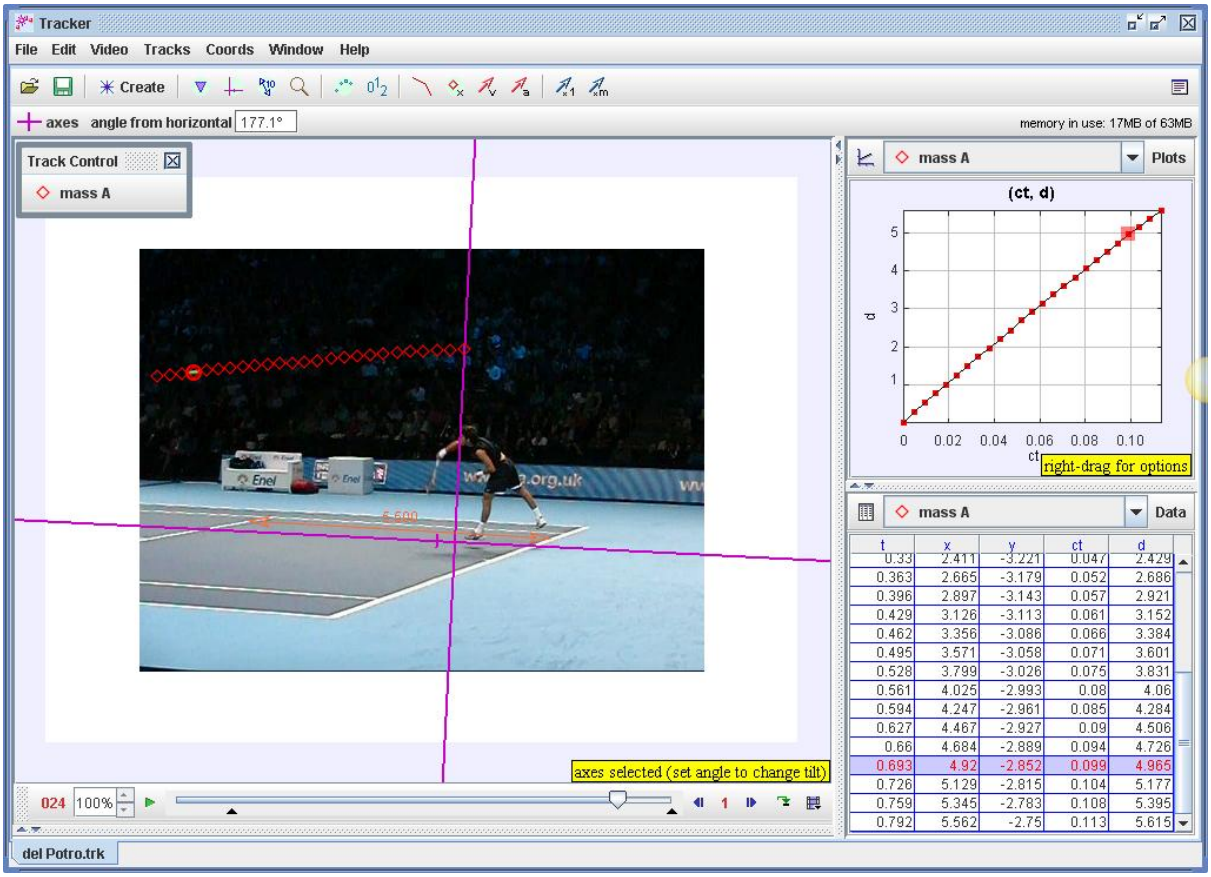
How fast was del Potro serving? Adrian Oldknow aoldknow@yahoo.co.uk

I had a good seat ringside at the O2 arena in London recently when Juan Martin Del Potro played Fernando Verdasco during the 2009 Barclays ATP Mens World Tour Finals. I had my compact Casio Exilim EX-FC100 camera with me, but no tripod – and no flash allowed. Using the High Speed video capture at 210 frames per second I was able to shoot, and edit, an AVI clip at 480 x 320 pixels.

I was delighted this week to find that there is a new release (V3.00) of the US Open Source Physics software Tracker at http://www.cabrillo.edu/~dbrown/tracker/ which now has the ability to autotrack an object of interest. So here is the analysis of my video clip for a del Potro serve which the courtside display show clocked at 115 mph.



On importing the clip you find that while it was recorded at 210 fps, it is recognised for playback at 30 fps, since it only makes sense to show the action in slow motion (at full speed it appears no different from a 30 fps movie). Because I had no tripod there is a small amount of wobble. Because I couldn't choose where I filmed from, there are clearly some issues of perspective to be sorted out.

I decided to mark as my reference line a 5.5m distance between the base line and the service line roughly between del Potro's feet. I choose to make the *x*-axis parallel to this and with the origin roughly on the ground beneath where the ball was struck. The auto-tracking of the point mass worked very easily and so I had the table of (*t,x,y*) data with time *t* measured from the apparent frame rate of 30 fps, and displacements *x,y* measured using my base distance of 5.5m.

Using the Data Builder I was able to define two new variables *ct* and *d*. Dividing the apparent time *t* by 7 gave the calculated time *ct*. The approximate distance travelled, *d*, is calculated from (*x*,*y*) by Pythagoras.

Extra columns were added to the Data table, and the graph was plotted of displacement *d* against time *ct*. Using the Data tool for analysis we can see that this suggests that the speed of the ball was about 50 ms^{-1} for the first 0.1 s, which agrees well with the speed gun.