Constant acceleration: two methods of measurement

A cart rolls down a ramp on low friction wheels. The accelerating force is parallel to the ramp: the sum of the component of gravity ($mg \sin\theta$) down the ramp minus the small rolling friction force. The unbalanced force is constant, the acceleration will be constant, and can be measured with a motion detector and computer calculation, or by taking position data from a video clip. In this exercise you are asked to compare the accuracy of the two methods.
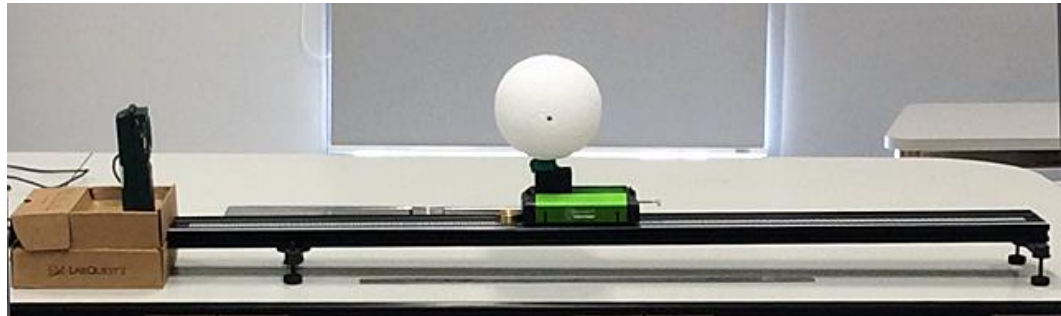

Fig 1 - a cart and polystyrene ball accelerate right to left down a ramp (inclined plane). The steel ruler on the table is 60 cm in length and the angle of the ramp is 0.50 degrees.

Method 1: motion detector

Download the Logger Pro file [Data]. Plot the velocity-time graph. Fit a straight line to the velocity data and find the acceleration with a likely error.

Method 2: video clip

Open and read the demonstration: Free Fall with a Data Logger [pdf].

Download the video clip [Media]. Open Logger pro. Insert the movie clip which is at ~30 fps. Following the method in the reading, plot the velocity time graph. Find the acceleration with a likely error.

Homework

Put together a one page word document with your name, class, and screen captures of your two velocity graphs. State the measured accelerations with errors.

Email the file to Dr Ian ….