

# Motion Analysis Using Digital Video- Windows Movie Maker

## Speed of a Radio Controlled Car

Following our piece in SSERC Bulletin 221 [1] on the use of digital video cameras in science classes, we take a look at simple motion analysis using the video editing software supplied with later versions of Microsoft Windows® operating system. The screen shot below comes from Windows Movie Maker 2, a free video editor that comes with Windows XP Service Pack 2. If you do not have it, it is available from Microsoft [2] as a free download. The clip opposite shows a radio controlled car driving along the length of a metre stick. It was loaded into Movie Maker by clicking Import Video.

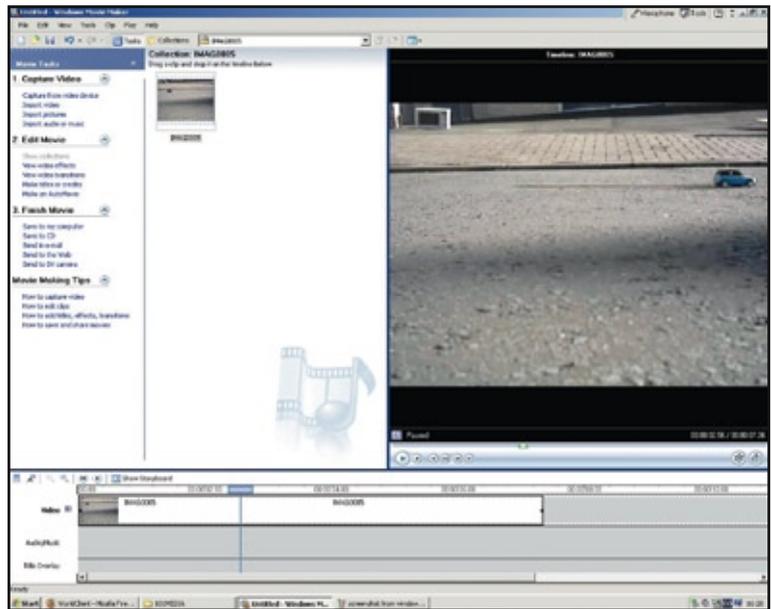


FIGURE 1: WINDOWS MOVIE MAKER

- The controls shown in figure 2 allow the video to be played, stopped or advanced backwards and forwards one frame at a time.

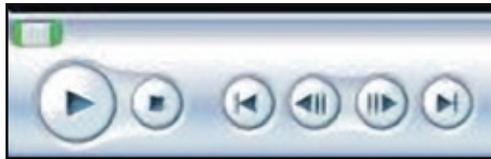


FIGURE 2: MOVIE MAKER CONTROLS

- In figure 3, the controls have been used to step through the film until the model car is at the start of the one metre run. At the bottom right of the screen is a timer showing that this occurred 1.36 seconds into the clip.

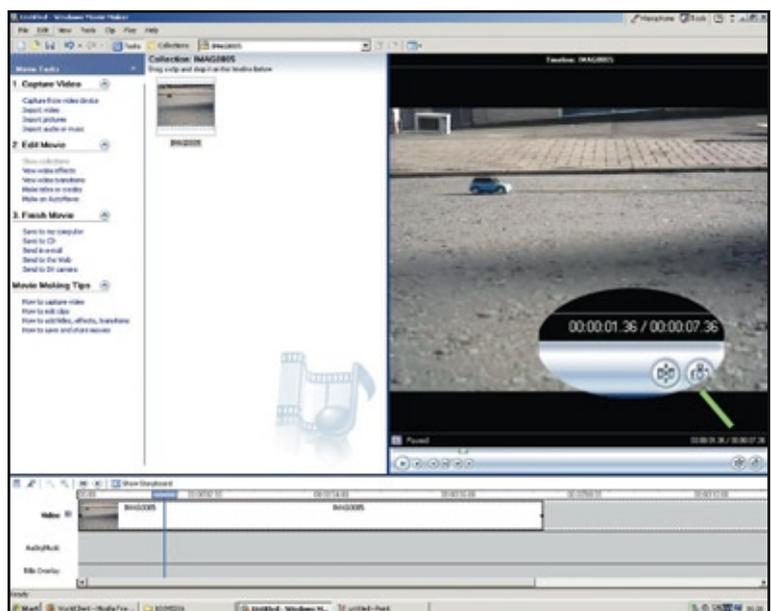


FIGURE 3: REMOTE CONTROLLED CAR AT THE BEGINNING OF ITS 1 M RUN. INSET SHOWS TIMER READINGS

- We have now advanced through the clip to the point where the car is at the end of its run. The time is now 2.56 seconds. It has taken the model  $2.56 - 1.36 = 1.20$  seconds to cover 1 metre. The car's average speed can therefore be calculated.

### ● Is this Nissan Micra speeding?

In this example, a similar technique was used to estimate the instantaneous speed of a Nissan Micra, filmed passing a road sign. The time to pass the sign was found by analysing the clip using Movie Maker. The car's length was found by "Googling". (In this case, the car's speed turned out to be a sedate and legal  $11 \text{ ms}^{-1}$ , i.e. around 24 mph.) This could be set as an open-ended challenge to pupils to get them thinking about average and instantaneous speeds. One scenario is that pupils are told that the car in the movie clip was caught on CCTV just before an accident. Was it going too fast? How could they find out?

- Note that Windows Movie Maker shows the time in the format hours:minutes:seconds:tenths and hundredths of seconds. Other video editors give it in the form hours:minutes:seconds:frames. For these applications, the calculations are less intuitive.
- It is not suggested that these techniques are used for serious quantitative work. With frame rates of between 10 and 25 frames per second, the cameras are not really suitable for detailed analysis. A video camera does not take a series of sharp images. Rather, moving objects appear blurred in individual frames, making precise measurement impossible. It is still possible to do qualitative work. By looking at the approximate distances moved between each clip, pupils can work out whether vehicles were accelerating, decelerating or travelling at a constant speed.

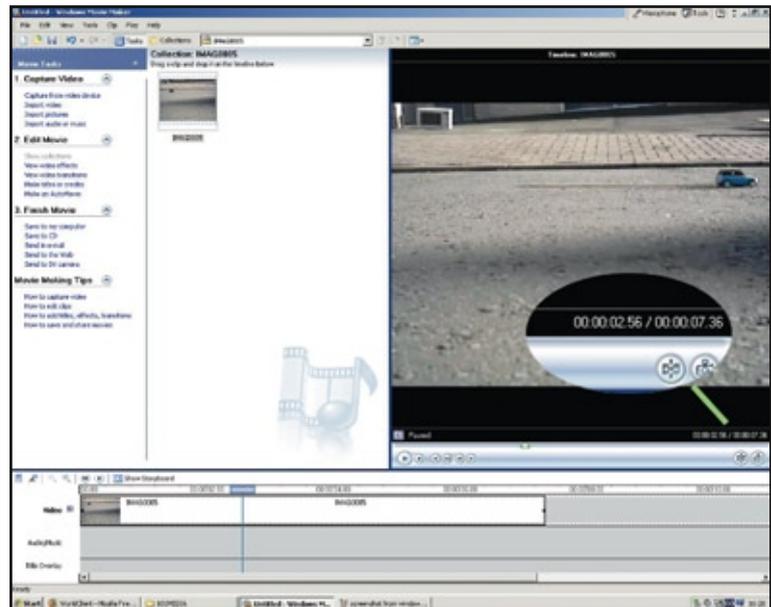


FIGURE 4: REMOTE CONTROLLED CAR AT THE END OF 1 M RUN.



FIGURE 5: A SINGLE FRAME FROM THE NISSAN MICRA CLIP.

A future article will cover the advanced analysis possible using free-to-download software.

<sup>1</sup><http://www.sserc.org.uk/members/SafetyNet/bulls/221/ICT.htm>

<sup>2</sup><http://www.microsoft.com/windowsxp/downloads/updates/moviemaker2.msp>