

"Motion and friction"



Sensor: Motion sensor

Overview:

By using a ramp and a model car, the motion sensor can be used to plot a distance time graph showing the movement of the car as it travels down the ramp. By adding layers of material, the friction of the ramp can be increased and the car's movement can be compared to those where the friction is less. It is hoped that this will show pupils how friction can effect the speed of the car and also by overlaying the graphs, how the graph changes as the speed of the car is altered.

Equipment required: LogIT Explorer
LogIT Motion sensor
Ramp
Toy car
Card
Modelling clay
Clamp stand (optional)
Materials to be placed on the ramp. eg. carpet, fine cloth etc

Hazards:

Take care if using clamp stands that they cannot fall off the bench.

This experiment can be done on the floor if space allows.

Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous material or procedure.

Setup:



1. Put the ramp in front of the Motion sensor at a small angle.
2. Connect the Motion sensor to channel 1 of Explorer.
3. Mount the sensor in a clamp stand or similar at least 200 mm in front of the closest point that the car will reach.
4. Place a piece of card at least 10 cm square on top of the model car with the modelling clay.
5. Connect the Explorer to the computer and start the datalogging software. If using LogIT Lab select 'Autolog' when prompted from the 'Select New Activity' screen.

Note: The Motion sensor needs to be aimed at the card on top of the model car. If the sensor misses for any reason, then large 'peaks' will be seen on the graph where no reflected signal was recorded.

Method:

1. Put the car at the top of the ramp.
2. Start logging and release the car down the ramp.
3. Stop logging and note the material used.
4. Select 'Logging' and select 'Overlay' from the top menu.
5. Put a different material on the ramp.
6. Start logging and release the car from the same place as before.
7. Repeat from stage 3 for each sample.

Results:

Right click the 'Distance' field on the right of the screen under 'Elapsed Time' and select 'Smooth' to smooth the graph plot. From the plotted graphs, can the pupils see which material slowed the car the most? How can they tell?

Going further:

From the graph, you could get more advanced pupils to see if they can calculate the speed of the car for each material.

Using the same procedure, the angle of the ramp can also be investigated to see the effect on the car's motion.

