

1D Motion Activity

This activity is meant to introduce students to the principles of movement, particularly velocity and acceleration. Because so much of the physics of music is based around discussions of oscillation, firming up student belief about the differences between velocity and acceleration is critical. It is a good first-day activity to establish expectations for the kind of active learning that gets the students engaged in the material and will hopefully be continued throughout the course.

Materials

Computer
Vernier computer interface
Logger Pro
Masking tape

Vernier Motion Detector
Physics with Vernier programs
Meter stick

Part I: Setup

1. Connect the Motion Detector to the DIG/SONIC 1 channel of the interface, and place it so that it points toward an open space at least 4 m long. Use strips of masking tape on the floor to mark the 1, 2, 3, and 4 m positions from the motion detector.
2. Open the *Logger Pro* program by clicking Start → All Programs → Physics Programs → *Logger Pro*.
3. Open the file "01a Graph Matching" from the *Physics with Vernier* folder. Explore how to make position vs. time graphs using *Logger Pro*. Click the >Collect button, and walk slowly in front of the detector. Get a feel for how the program makes graphs in response to your movements.

Part II: Investigation of Position vs. Time Graph Matching

1. Open the file "01b Graph Matching". A position vs. time graph will appear. Discuss how you would walk to reproduce this graph, and then attempt to do so. If you are not successful, repeat the process until your motion closely matches the given graph. Show your best attempt to your instructor.
2. Repeat step 2 for "01c Graph Matching".

Part III: Velocity vs. Time Graph Matching

1. Open the file "01d Graph Matching". A velocity vs. time graph will appear. Discuss how you would walk to reproduce this graph, and then attempt to do so. If you are not successful, repeat the process until your motion closely matches the given graph. Show your best attempt to your instructor.
2. Repeat step 1 for "01e Graph Matching".
3. Using your velocity vs. time graph as a starting point, sketch the position vs. time graph for the graph from "01e".
4. In *Logger Pro*, switch to position vs. time graph by clicking on the y-axis and selecting position to check your answer from the last trial.

Follow-up discussion questions

1. How can you tell from a position vs. time graph if an object is accelerating?
2. How can you tell from a velocity vs. time graph if an object is accelerating?
3. How does this all relate to music?