Simple Motion

Equipment

- LoggerPro (data acquisition software)
- Motion detector
- Cart, track and kinematics container
- Various objects (bowling balls, dodge balls etc.)

Objective

Learn how to use the computer probes

- Identify different LoggerPro versions
- Connect and configure sonic motion detector

Graph the position and velocity as a function of time for a variety of objects.
Use correct significant figures
Recognize uncertainty

Conceptual (C-level)

Imagine you are biking (or watching someone bike) along a flat street at a constant rate.

- Describe in words the velocity and position as a function of time for the bike.
- Draw graphs of both the position and velocity as a function of time for the bike.
- Test your solution using the on-line simulation ("Walking Man")

SIMULATION:

- Can you create a "W" in the position vs time graph? What shapes can you make?
- Can you create a "W" in the velocity vs time graph? What shapes can you make?

EXPLORATIONS:

- Use the motion detector to plot your movements
- By clever movement trace the letter "N" and/or "U" on your position vs time graph and on your velocity vs time graph. What other letters can you 'draw'?

Basic Lab (B-level)

For at least two different rates, graph the position as a function of time and velocity as a function of time for:

- A ball (a ball with about the same diameter as the track width is good)
- A cart on a track

Clearly mark on your graph when you are touching the object. The region of interest (ROI) is the time after you start and before you stop the object (when you are not touching the object).

What is the shape of the position as a function of time curve for an object moving horizontally (with no outside pushes)? Compare to the shape of the velocity vs. time curves.

Advanced/Extended Lab Ideas (A-level)

- Analyze the velocity of objects from position vs time graphs and compare to velocity vs time graph.
- Vary the angle of the track and graph the position and velocity of the cart as a function of time. Try this for a variety of angles. Do you notice a pattern?
- When can you tell when something is pushing the object? What evidence do you have for an external "push" for an object not moving horizontally?
- What are you curious to investigate?

NOTE: You only need to complete one A-level lab exploration.