Motion 2 - Graph Matching

Graphs are most common way of representing motion. To help you develop a feel for how graphs represent motion, you are going to mimic bats. Bats find things by sending out a sound pulse, like a squeak, then listen for the echo. By timing how long it takes for the echo to come back to it, the bat knows how far away it is. With a little more effort, and two ears, the bat knows which direction too!

The distance sensor you will be using 'clicks' instead of squeaks, but the phenomena is exactly the same as a bat.

Notes

Motion Definitions

Date
Notes

	Unit	Definition
Distance	meters (m)	how far
Velocity	meters per second $\left(\frac{m}{s}\right)$	how fast
Acceleration	meters per second squared $\left(\frac{m}{s^2}\right)$	how much faster
Time	seconds (s)	how long
Slope	change divided by change	

Standards

Distance The distance from nose to finger tips is about 1 meter.

Velocity Walking speed is about 1 m/s. The fastest a human can run is about 10 m /s, 100m in 10 seconds.

Acceleration Gravity accelerates at about 10 m/s^2

Time A second is about how long it takes to say 'Mississippi'.

Setup

- Get a sonic sensor from your teacher.
- Carefully remove the sensor from its wrapper, and place it down on the table with the sensor facing the ceiling.
- Carefully open the sensor (there is a hinge on the end), so that it is pointed horizontal to the ground.
- Open 'Logger Pro' on your computer.
- Connect the USB cable between the sonic sensor and your computer.
- Logger Pro should change and be ready for data collection.

Activity

The first thing to do is to play with the sensor. Click the green 'Collect' button that has an arrow. You will hear the sonic sensor click, indicating that it is collecting data.

Notes:

- To add more collection time, press 'ctrl + t'.
- To reset the plot, 'ctrl + n'. This will open a new data collection and reset everything.

Once you are comfortable, press the button just to the left of the 'Collect' button. It will add a line to the graph. Try and move yourself to match the graph. Every time you press the button, it will make a new graph for you to match.

Prompts

Answer the following questions in your lab notebook as you are playing with the sensor and matching the graph.

- What does the x-axis of the graph represent?
- What does the y-axis of the graph represent?
- What does the graph look like if just stand in front of the sensor?
- What happens to the graph as you get farther away from the sensor?
- What happens to the graph as you get closer to the sensor?
- What does a constant distance look like on the graph?
- What does a constant velocity walk look like?
- What do you have to do to get a steep slope on the graph?
- What happens if you speed up as you walk towards or away from the sensor?