Lab 2-2: **Constant Velocity**

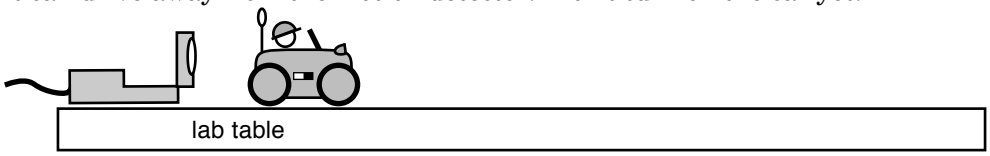
Purpose:
1. To learn how to use Logger Pro and the motion detectors in lab.
2. To define the term *velocity*.
3. To differentiate between speed and velocity.

Materials: 1 car 1 motion detector

Procedure:

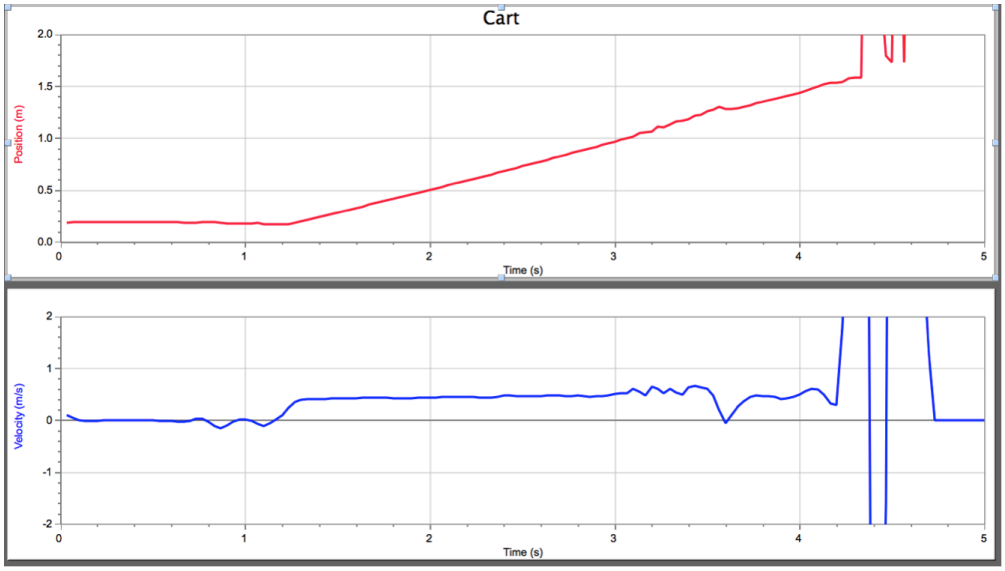
1. Start up Logger Pro and open the file "02_Cart.cmbl" which is in the folder called "Physics with Vernier."

2. Set up the motion detector on the lab table as shown below. Make sure that the switch on the motion detector is set to the cart and not the ball. Place the car so that it can drive away from the motion detector. Don't turn on the car yet.



3. Make sure someone is ready to catch the car if it goes off the edge of the table. Click on the "Collect" button to start recording data. Once you hear the motion detector making noise, turn on the car. Don't let it fall off the table.

4. Assuming the car was lined up with the motion detector, you should have two relatively nice graphs on your screen that look similar to the graphs below.



   - *On the graphs shown above, circle or label the portions where the car was moving with a constant speed.*

5. We will use the motion detectors a lot in this class, and we will always be measuring a slope of a graph. There will ALWAYS be a lot of "extra stuff" in the graphs made by Logger Pro that we will ignore. We will often simply ask you to sketch the appropriate part of the graphs into your lab. For this lab, in your data section, sketch (including labels and units) the graphs of position vs time and velocity vs time while the car was moving with a constant speed.

6. On YOUR position vs time graph, determine the slope of the line while the car was moving with a constant speed by highlighting the middle half of that region of the graph. Then click on the button labeled "Linear Fit". Write down the slope of the

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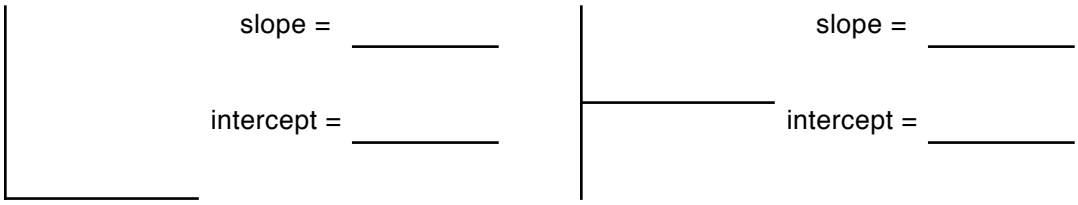
line, including units next to the sketch you made in the data table. When a graph is horizontal, don't bother doing a linear fit - just call the slope zero.

7. We will NEVER use the y-intercept calculated by Logger Pro when using the motion detectors. They will ALWAYS be nonsense because a time of zero will always be way before the part of the graph we care about. However, you should think about what the intercept should be, if we imagine time starting when we care about the data.

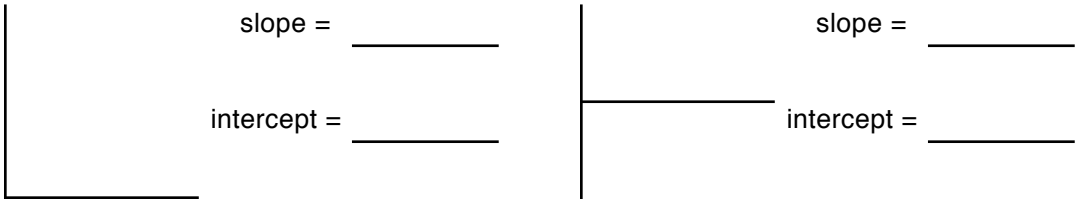
8. Repeat the above to find the graphs of position and velocity vs time when the car is going with a constant speed, but heading towards the motion detector. (i.e. start the car at the other end of the table.)

Data:

Car moving away from the motion detector:



Car moving towards the motion detector:



Questions:

1. What are the definitions of speed and velocity?

2. Compare and contrast the two position graphs.

3. Compare and contrast the two velocity graphs.

4. You have used these cars before. You know they travel with a constant speed. How do these graphs show that constant speed?

5. How does speed relate to velocity?