# Lab 0 Changing Motion

## A Prelab

Question 1: Can one have a constant speed in the presence of an acceleration that acts along the line of motion?

Question 2: Can one have a constant velocity in the presence of an acceleration that acts along the line of motion?

Question 3: Can instantaneous velocity and average velocity have the same value? If you think 'yes', give an example.

Question 4:

Make v-t graphs for the following cases of one-dimensional motion

a – A person walks at constant negative acceleration. The person starts walking at x= +5[m].

b – A person experiences positive acceleration, which increases at a small constant rate. The person starts with an initial speed – 2[m/s].

# B Experiment

## Purpose of experiment

To get familiar with the use of the lab software and the motion detector.

This is not a full lab because it accompanies the 'lab0' introduction.

### 1-Inv 2 Act 2.1 Making velocity graphs

Set up to graph velocity. Open the experiment file called Velocity Graphs.

Graph your velocity for different walking speeds and directions:

Walk away from the detector slowly and steadily

*Repeat until you make nice smooth graphs*

*Adjust the velocity scale so that the graph fills the screen nicely.*

*Sketch or print your graph.*

Walk toward the detector slowly and steadily, stand still for 3 seconds, then walk away from detector fast and steadily.

*Graph and sketch or print the data*

## Inv 3, Act 3.2: Calculating average velocity

Open the velocity file called Velocity from position. Clear any previous graphs.

Give the glider on the frictionless track a push and let it go back and forth a few times. When you got a feeling for how long it takes the glider to traverse one full distance, switch the motion detector on to record the run.

Use the analysis feature in the software to read 10 values of velocity. Use the portion of your graph where your velocity is relatively smooth and use them to calculate the average (mean) velocity.

Use the analysis feature of the software to read the position and time coordinates for two typical points while as far apart as possible. *Look out to avoid parts of the graph where the motion was distorted*.

The statistics feature in your software also allows you to find the average velocity. *Using fit: First select the portion of the position-time graph that you want to fit. Next, select 'linear fit' to determine the equation that fits your data line.*

## 2 Inv3 Slowing Down and Speeding Up

In this investigation we will study how velocity and acceleration change over time. *Use the SpeedUp file.*

Fit the cart with a fan and maximum batteries. Arrange such that the fan pushes the cart toward the motion detector and give the cart a push away from the detector with the fan on. As a result, the cart will slow down while you graph the motion. *You may have to try a few times before you get a good run. Sketch or print your results and put the data to persistent display mode.*

Repeat experiment but this time starting far away from the detector and pushing the cart toward the detector and the fan also pushing toward the detector. *Sketch or print your results.*

*Determine the average speeds for both runs and the accelerations.*

# C Postlab

Not applicable

***For all following labs: Keep your prelab answers and hand them in with the postlabs.***