PHYSICS 190: MECHANICS and HEAT; Lab 1: One Dimensional Distance and Velocity Graphs

1. Set up

a. materials needed: Motion Detector, Universal Lab Interface (ULI) and computer with Logger Pro software
b. attach Motion Detector, to ULI using Dig/Sonic 1 channel
c. cautions about using the Motion Detector
   1. the detector is not accurate for distances of less than 0.4 meters or more than about 5 meters
   2. the transmitted signal fans out like a cone whose apex angle is about 30^0.
   3. The closest strong reflector inside the cone will be detected. If you have trouble being detected try holding a book in front of you.
   4. the detector is very sensitive; it will detect your arms swinging, clothing flopping around even your breathing. Therefore, it is very difficult to get smooth graphs.

2. Collecting data

(Predicting the shape of the distance and velocity graphs for a moving object)

a. scenario number 1. the object is moving toward the detector at a constant speed (by the way you are the object!)
b. predict what the distance and velocity graphs for this object's motion will look like (actually sketch the graphs) (**do not print out the graphs from the computer**)
c. using the Motion Detector and Logger Pro to produce the distance and velocity graphs for an object moving as described in part "a"
d. make a sketch of the computer's graphs
e. Repeat part "a" through "d" for the following scenarios

   2. scenario number 2. initially you are moving away from the detector at a constant speed and stop 3 meters from the detector and stay there
   3. scenario number 3. initially you are moving slowly at a constant speed away from the detector after moving 1 meter you gradually increase your speed
   4. scenario number 4. initially you are standing facing the detector you jump toward the detector and stop where you land
   5. scenario number 5. initially you are moving rapidly toward the detector gradually stopping and then you move slowly away from the detector

3. Questions

a. do your predictions match the computer output? if not why?
b. on the distance vs time graph what indicates the object's speed?
c. on the distance vs time graph what indicates a change in direction?
d. if the velocity vs time graph is a horizontal line what does the distance graph look like?
e. if the velocity vs time graph is a non-horizontal line what does the distance graph look like?