Lab #1 1D Kinematics: Graphs and What They Mean!

The following lab exercise consists of 3 parts:

1. An in-class discussion of 1D Kinematics with emphasis on a graphical approach to understanding motion
2. Introduction of LabPro and CBL interfaces to investigate motion
3. Preparation of 1D kinematics graphs and brief description of each

Part One

An in-class discussion of graphical representation of motion and how to represent this using EXCEL

Part Two: LabPro Interface and Using Logger Pro Software

In this part of the experiment we will spend a few minutes familiarizing you with the interfaces and software that you will be using.

The LabPro consists of two distinct parts:

- The LabPro unit and associated probes/detectors
- A computer that you can connect to and download data.

In this experiment you will use two probes. One probe is the Motion Detector and the other is an acceleration sensor. The LabPro interface works under control of the Logger Pro software package.

How to Download Experiments for the LabPro

1. A quick way to set up the interface is to use pre-scripted labs. I have created 3 lab set-ups for you to choose. Save the following lab files to a convenient location ("my documents, temp, desktop etc):
    - motion.MBL
    - accel05g.MBL
    - accele25g.MBL
2. Next, choose file/open under the file menu and browse to the experiment.MBL file that you want.
3. When you have loaded the experiment file, all of the interface settings and probe settings will be changed for you. You can, if you wish, override these settings.

Using the Motion Detector:

T he Motion Detector works by sending out a series of ultrasonic pulses (it would drive bats crazy!) that are reflected back to the sensor. It is basically a very sophisticated echo measuring device that measures how far and object is from the sensor as a function of time. To detect and measure motion you merely point the Motion Detector at the test subject and then activate it using the TI-83. Here are the steps you need to use:

1. Plug in the Motion Detector to the correct port on the LabPro (the plug will only go into one of the two sonic ports on the rhs of the unit)
2. Make sure that you have loaded the correct lab file (see section above).
3. If you wish to use the LabPro away from the computer then click on the Remote option (top menu bar) and "Set Up LabPro...". This will transfer the instructions to the LabPro.
4. If you have done a remote experiment then transfer the data back to the computer by again using "Remote" and this time select "Retrieve Data...".
5. We will practice some of this during the first part of the lab.

Using the Acceleration Probe:

The acceleration probe is similar to the motion detector. This time, instead of choosing "Motion" from the Select Probe Menu you choose "Accelerometer". Just follow the menu choices that the CBL or LabPro presents you with.

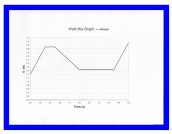
How to View and Download Your Data

Same as you did with the Motion detector!

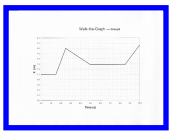
Part Three: From Interface to Spreadsheet

1. ***Making an X-t graph***:

   Each group will be given a sample X-t graph. You will be required to "walk" this graph using your Motion Detector. That is – you will need to try to reproduce the same graph that you are given by walking either toward or away from the CBL at the correct rate. You will need to download this data into EXCEL and graph if.



Group 1



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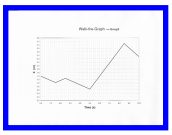
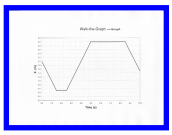


Group 3



Group4

2. ***The Road Test, "Table Jump" or Rez Elevator Ride!*** Attach the acceleration sensor to the dash of your test vehicle, or yourself or the wall of the Rez Elevator. Sample both the accelerating and decelerating phase of your motion. Note – you will probably have to do this in two separate runs and then combine the data when finished. Again, this data will be exported into EXCEL and graphed. You will be required to make both a v-t and an x-t graph from this data. To help see how to do this in EXCEL, download roadtest.xls.
   Sample runs:
   - my Toyota
   - my son's 1974 Dodge Dart

What to Hand In

Each group should provide me with the following graphs done using EXCEL and a brief (typed) summary as needed:

1. The challenge X-t graph from #1. Include in this a brief (1 paragraph or point form summary) script that you followed to reproduce this graph.
2. Acceleration-Time graphs for one of the options in #2. Again the graph should be accompanied by a brief description of key points on the graph. **From your data you are also asked to produce v-t and x-t graphs.**

Date Due: One Week from Today