Appendix C

Making Graphs with LoggerPro

C.1 INTRODUCTION

For most of your work, you will use `LoggerPro` to perform simple calculations and plot your results. These instructions will assume a basic familiarity with Windows-based computing. If you have any questions, however, please do ask for help.

These instructions will assume you have a set of data for velocity v vs. time t. You should adjust them as appropriate for your own data.

C.2 ENTERING DATA

Launch `LoggerPro`. You will be presented with a blank worksheet having columns labeled "X" and "Y." The first thing you should do is save your worksheet under your own name. To do this, select `File -> Save As` and save the file with a name such as `smithaj1`. Do **not** use a name such as `Expt1` since such a file will likely be clobbered by another group using this lab later in the week. `LoggerPro` will automatically add an `cmbl` extension to your filename. You should get into the habit of saving your work early and often.

If your data represented variables x and y, you could use the columns that are already present in the sheet. However, these are not the correct labels for your data, and `LoggerPro` doesn't allow you to relabel these columns. You must create new ones: From the `Data` menu, select `New manual column`. A data entry box will appear. Fill in the correct full label (e.g., "Time"), a short name (e.g., "t"), and proper units. When you click on `OK`, the new column will appear in the worksheet. Repeat the process for a new manual column titled "Velocity." Finally, enter your data in the columns you have just created.

C.2.1 Performing Calculations

Suppose you wish to calculate the momentum of the object as a function of time and put your result in another new column. From the `Data` menu, select `New calculated column`. Title the column "Momentum" and fill in an appropriate short name and units. In the equation box, put the formula for momentum by selecting the column for velocity, and then multiply by the numerical value for the mass. In other words, if the mass of the object is 2.5 kg you should end up with 2.5*"Velocity" in the box.

C.3 GRAPHING YOUR DATA

Suppose you wish to plot momentum vs. time for your data.[1] Graphing your data in easy in `LoggerPro`. Select `Insert -> Graph`. Move the cursor to the graph that appears and right-click on it, then select `Graph Options`. In the `Graph Options` dialog box, unselect `Connect Points`, then select `Point Protectors`. This plots a symbol centered on each data point to make them more visible. Then click on `Axes Options` and choose "Momentum" for the Y-axis and "Time" for the X-axis. Click `Done` when all is in order.

C.3.1 Linear Fit

1. Highlight the data to be fit by dragging the cursor over the graph (or down one of the data columns representing one of the axes.) Then select `Analyze -> Linear Fit`. A text box will appear on the graph giving the slope m and intercept b. Right-click on the box to select `Linear fit options`. Choose 4 significant figures, `Show uncertainty`, and `Show on graph`. When you click on `Done`, your graph will have the best-fit line drawn through your data, and the slope and intercept will have uncertainties attached.

2. Save your work.

3. Nearly every aspect of a graph can be changed using the `Graph Options` and `Axes Options`. Experiment with them until you become comfortable. (If things get really messed up, you can always re-open the version you saved on disk in the previous step.) Fortunately, the defaults are usually sensible and you usually don't have to worry about the formatting details.

C.3.2 Polynomial Fit

LoggerPro can also do polynomial fits. Make sure the graph is selected by clicking on it, and highlight the data to be fit as for linear fits. Then select `Analyze -> Curve Fit`.

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[1]**Note**: When the instructions say to plot "C" vs. "A", that means "C" goes on the vertical (y) axis, and "A" goes on the horizontal (x) axis.

Choose the appropriate polynomial (e.g., quadratic) to be fit, then click on `Try Fit`. If the curve fit through your data looks alright, click on `OK`. A box will appear giving the coefficients of the polynomial fit. If the uncertainties are not included, right-click in the box to select `Curve fit options`, then choose `Show uncertainty` as for the linear fit.

The default font size is much too small. Right click on the fit box and select `Appearance` and increase the font size to 16.

C.4   PRINTING A GRAPH

To insert your graph into your lab report, use the `Snipping Tool` in Windows to select your graph and save the image.