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1 About LineFit

1.1 History

LineFit was started almost ten years ago as a simple command line program in C written by Dr. Petcher for the Physics department at Covenant College. Since then, it has been worked on by many of the students of Covenant College bringing it to a completed state in the Spring of 2015 as the Senior Intergration Project of Keith Rice. As part of this project, the code was hosted on GitHub in order to facilitate bug fixing and feature adding. This document was created on Tuesday 21st April, 2015 and is current for LineFit version 1.0.

1.2 Philosophy

LineFit, in its essence, is a data graphing program designed to be used in the academic realm. The main idea that drives LineFit is just what its name implies that data with error or uncertainty values can be fit using a line. Often times the relationship of the data is not naturally linear, but it [can be rearranged](#) so that the relationship becomes linear. By forcing the user to do this, it makes their life simpler in many ways because they know they are manipulating the data towards a linear fit instead of trying many complicated fits to see which matches the data best. This also forces the user to learn how to manipulate real data which is a very practical skill in the sciences.

The second driving idea behind LineFit is that fitting a line to data should be simple and intuitive. Many other graphing programs exist, but most allow many kinds of complex fits when a linear fit would often be most appropriate or, at least, work. Because of this, LineFit is designed to be straight forward and easy to understand. A major part of this is to only allow linear fits because it will be in an intuitive and well known form for people in the sciences and this also allows for simpler menus and fewer options. In addition, by default LineFit tries to do as much for the user as it can to make the graph look good, choosing a default scale and values for the axes of the graphs to bring the data points being graphed front and center as well as other things which [can be overridden by the user](#).

The last driving idea for LineFit is that it is an academic tool and, as such, is intended to be an open source project to allow for others to contribute

towards it and improve it. A major advantage of this approach is that it allows others to check the formulas and determine whether they are accurate. In addition, this also provides students with an opportunity to learn about the calculations and even a chance to implement their own, making this a potentially powerful learning tool as well.

1.3 Lisencing

1.4 Contributing

1.4.1 Error Reporting

1.4.2 Adding Algorithms

1.4.3 General Coding

2 Using With LineFit

This section describes how to use the basic functionality

2.1 LineFit Main Display

- **Graph Area** - The main area where the graph and the data points are drawn.
- **Data Set Data Points** - The table where the individual data points in a data set can be added/changed/removed.
- **Quick Bar** - The area that houses many of the currently selected data set's options for displaying it in the graph area.
- **Options** - The button that brings up the [graph options menu](#) where many aspects of the graph can be changed.
- **Results Panel** - The panel that contains the fit results for the currently selected data set.
- **Cursor Postion** - The position of the cursor on the application in the graph area's coordinates

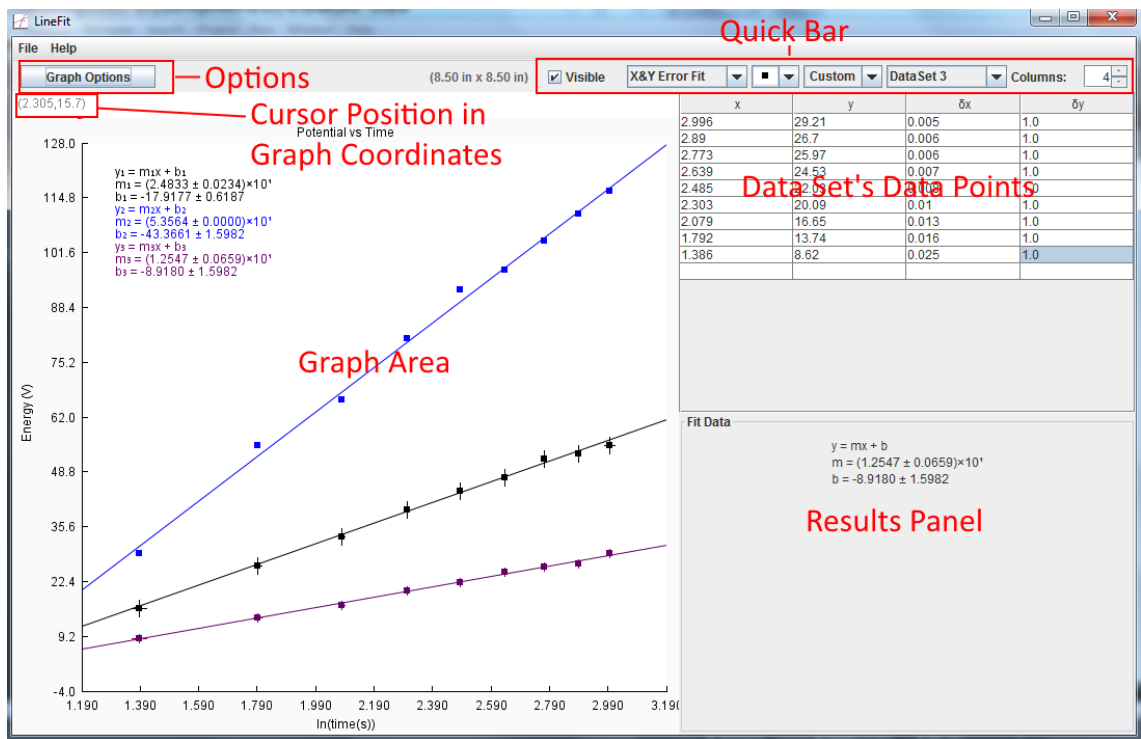


Figure 1: The main view of a LineFit Graph

2.2 Quick Bar

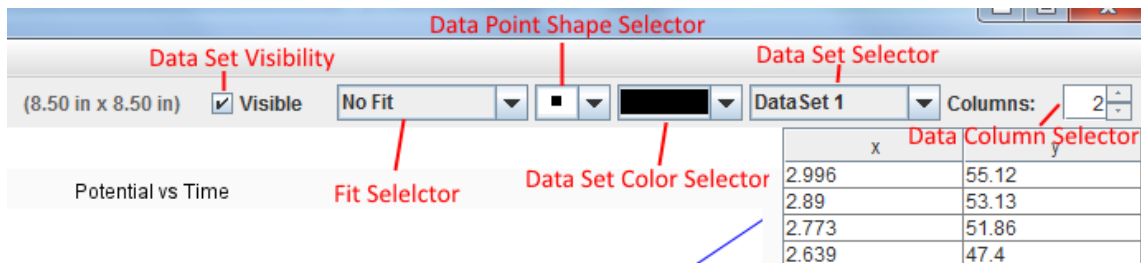


Figure 2: Close Up of the Quick Bar of LineFit Graph

- **Data Set Selector**- Drop down box that allows you to switch which data set's data is displayed in the quick bar, data points and results panel. New data sets can also be added through this selector by selecting the "New DataSet" option.

- **Data Set Visibility Check Box** - Toggles whether or not the currently selected data set is visible in the graph area.
- **Fit Selector** - Specifies which type of fit to use for this data set or if no fit should be used. This list is updated dynamically as data is entered into the data points table for this data set and check to see what, if any, error/uncertainty values are inputted. The possible fits, when the respective error/uncertainty values are present, are: No Fit, Regular Fit (no error/uncertainties), X Error Fit, Y Error Fit, and X&Y Error Fit.
- **Data Point Shape Selector** - Changes the shape to be displayed in the graph area for the data points in the currently selected data set. The current options are: Square, Circle, and Triangle.
- **Data Set Color Selector** - Changes the color of the points, line, and results of the currently selected data set in the graph area. There is also the ability to choose any color by selecting the "Custom" option in the drop down. The current options are: Black, Yellow, Blue, Green, Orange, Red, and Custom.
- **Data Columns Selector** - A number spinner between 2 and 4 that is used to add or remove columns from the currently selected data set. The order the columns appear is: x, y, δy , then δx . If all four columns are being displayed, then δx is displayed before δy . If only errors in the x coordinates are desired then you must select the "use x errors" checkbox in the [graph options menu](#).

2.3 File Menu

- **New Window** - Opens a new blank instance of LineFit. Key shortcut: ctrl + N
- **Open** - Opens the LineFit file (selected in the dialog that pops up) into the current instance of LineFit, putting the data sets read after any existing data sets. Key shortcut: Ctrl + O
- **Open in New Window** - Opens the LineFit file (selected in the dialog that pops up) in a new instance of LineFit, not the current one. Key shortcut: Ctrl + Shift + O

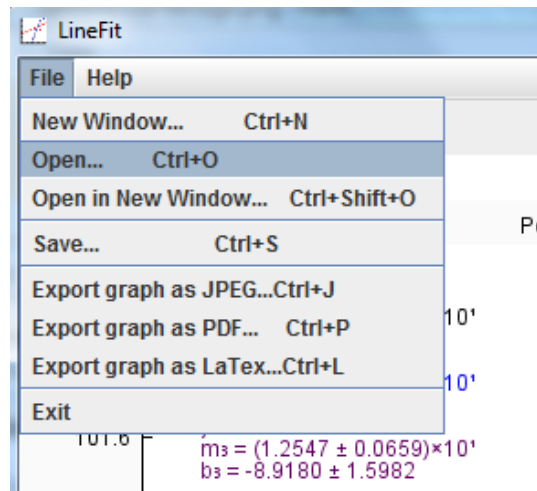


Figure 3: The File Drop Down Menu

- **Save** - Opens a dialog that allows you to name and save the LineFit graph and options into a .txt file to be opened later by LineFit. Key shortcut: Ctrl + S
- **Export graph as JPG** - Opens a dialog that allows you to name and export only the content displayed in the graph area as a JPG image file. Note: This is not WYSIWYG so you should check to make sure it exports in a suitable fashion. Key shortcut: Ctrl + J
- **Export graph as PDF** - Opens a dialog that allows you to name and export only the content displayed in the graph area as a PDF file. Note: This is not WYSIWYG so you should check to make sure it exports in a suitable fashion. Key shortcut: Ctrl + P
- **Export graph as LaTeX** - Opens a dialog that allows you to name and export only the content displayed in the graph area as a LaTeX LineFit graph file. In order to use this in LineFit, you will need the linefit.sty file. Note: This is not WYSIWYG so you should check to make sure it exports in a suitable fashion. Key shortcut: Ctrl + L
- **Exit** - Closes this instance of LineFit.

2.4 Help Menu

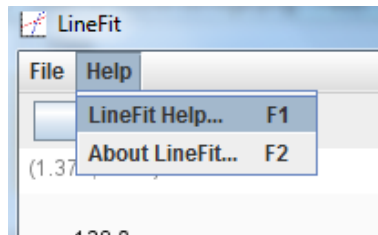


Figure 4: The Help Drop Down Menu

- **LineFit Help** - Opens up this PDF help document...
- **About LineFit** - Open up a small dialog that highlights some aspects of LineFit

3 LineFit Options

3.1 Axes

3.2 Results

3.3 Export

3.4 DataSet

4 Saving and Exporting Graphs

4.1 LineFit File Format

4.2 Exporting the Graph

4.2.1 Export as a JPG Image

4.2.2 Export as a PDF Image

4.2.3 Export as a LaTeX Graph

5 Linear Fit Algorithms

5.1 Data Manipulation to be Fit With Lines

5.2 Partial Derivative Minimization

5.3 Another One