Using coffee filter csv data

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1 Graphical Analysis 4 software(tm) by Vernier

Graphical Analysis 4 is a software program that Vernier Co. lets users download and use for free at their website: https://www.vernier.com/product/graphical-analysis-4/

It is useful for:

- reading csv files generated by Vernier sensors (e.g., the ultrasonic motion detector);
- performing linear curve fits on portions of the data;
- plotting the data and line-of-best fit and saving the plot;
- some additional analyses.

2 How to find the linear curve-fit parameters (slope and intercept)

1. Open the Graphical Analysis program.
2. Under OPEN SAVED FILE, click on CHOOSE FILE.
3. In the lower right corner pulldown menu, click and select "Comma Separated Values."
4. Select a CSV file on your computer.
5. Click on the "y-axis" plot label, then, under "Columns", click on "Position" and "Velocity" and, under "Data Sets", click on "CSV dataset.
6. You should see two plots displayed. The blue plot represents the velocity of the falling coffee filter as a function of time, while the red plot represents the position of the coffee filter as a function of time.
7. Using your mouse, highlight a portion of the decreasing position plot for curve fitting purposes. You are interested in the region of the position (red) plot that is linearly decreasing in value as this portion represents the period of time that the coffee filter is falling at its terminal velocity.
8. A few suggestions: (a) Since you are interested in the time after the coffee filter has reached terminal velocity, the highlighted region should be the later portion of the downward line. (b) You can use the (blue) velocity

plot to check if you have highlighted the correct portion of the position plot by noting whether the velocity curve is horizontal. If so, that means that the velocity is constant in the highlighted region and you have successfully selected the terminal velocity time period. (c) Please don't include in your highlighted region any portion of the position curve that does not have constant velocity. Otherwise you will be including data in your curve fit that doesn't belong there. While it's good to include as much relevant data as possible in your curve fit, using less data is preferable than more data if the more data includes irrelevant data.

9. Click on the graph icon in the lower left and select "Apply Curve Fit."

10. Click on the thick best fit line created by the software. A small window will open with the linear curve fit parameters. Write down the value of m (the slope). It represents the terminal velocity of the falling coffee filter. Check the values for r and RMSE. The r value (correlation coefficient) should be close to 1 (r^2 represents the percentage of the variation in the dependent variable that can be accounted for by a variation on the independent variable based upon a linear model). The RMSE value should be very small (RMSE « 1 or close to 0). If r or RMSE are not as expected, please double-check your steps or ask for assistance.