

LINTRP 1.4

AN EXCEL MACRO FOR LINEAR INTERPOLATION

written by

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INTRODUCTION

I wrote LINTRP because I wanted to compare changes in area of river cross-sections surveyed at different times. The simplest way to do this was to use linear interpolation to estimate the ground elevation at regularly spaced distances between survey points in each cross section, and then to subtract the elevations at each distance and sum the differences. Since my survey data was in columns in Excel spreadsheets, I decided to use Excel to carry out the interpolation. The result is LINTRP.

Although LINTRP was created to interpolate Y (elevation) values based on X (horizontal distance) values, LINTRP is a general purpose linear interpolator and can be used for any two-variable linear interpolation problem. For example, it could be used to estimate values between data points in a time series, as long as *linear* interpolation is appropriate.

DATA LAYOUT

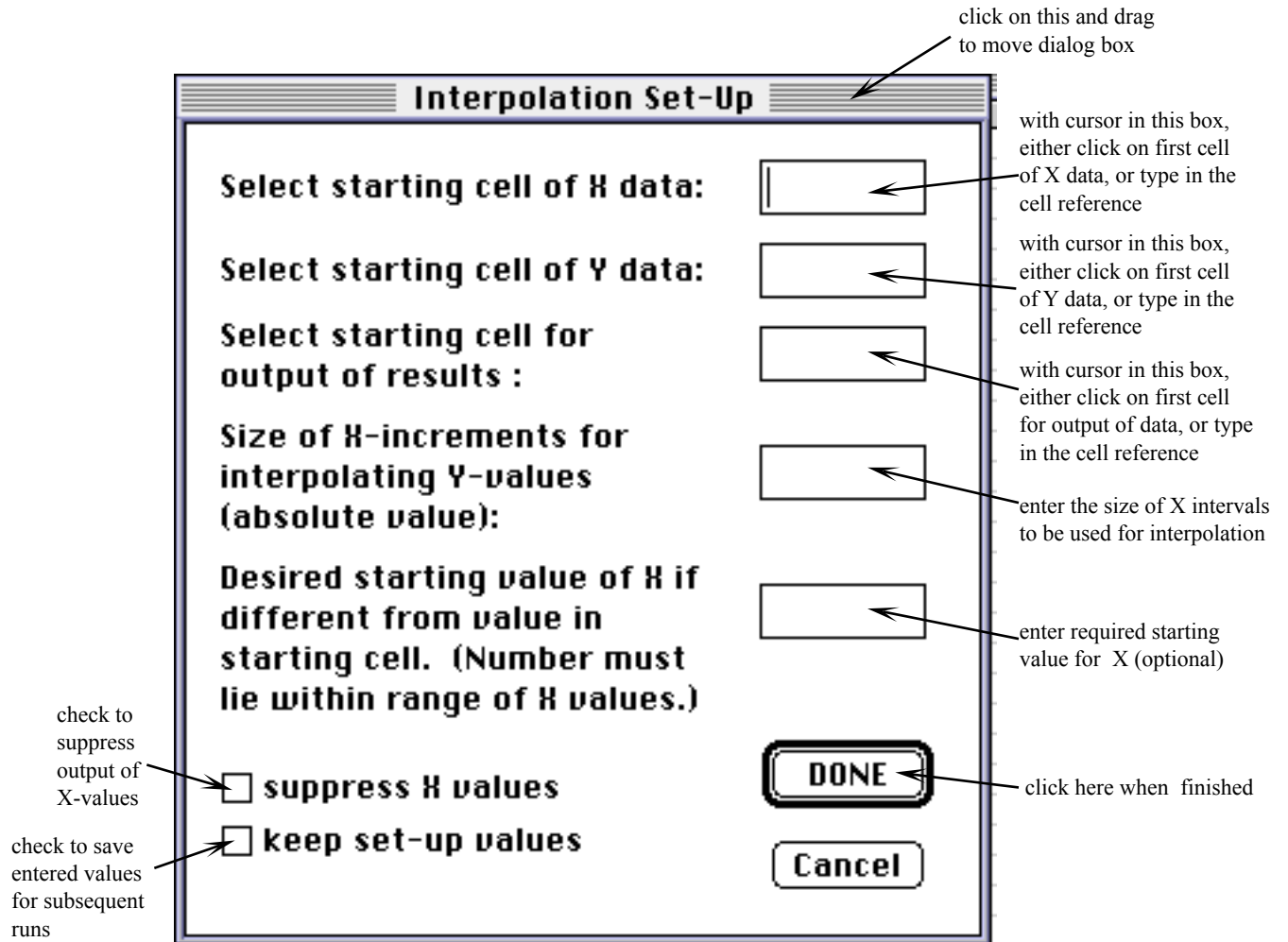
LINTRP expects the data for interpolation to lie in columns on an Excel worksheet. An example is given in the accompanying worksheet named “**testdata.xls**” Here X data (distances) occupy one column, and Y data (elevations) occupy another. The data columns need not be adjacent, but they *must* be on the *same* worksheet. LINTRP cannot interpolate along rows, or between different worksheets.

RUNNING LINTRP

LINTRP was written on a Macintosh in Excel 4.0's macro language. It will run under Excel 4.0 and 5.0 on both Macs and PC's. I have not tested it with later versions of Excel for Windows.

- a. **Open LINTRP:** When the LINTRP macro is initially opened, it will very briefly display a copyright notice and then hide itself. If you wish to look at the inner workings of LINTRP, choose “Unhide” from the “Window” menu. Be sure to hide LINTRP again before running it.
- b. **Open the spreadsheet that contains the data to be interpolated.** Be sure that this spreadsheet is the active (frontmost) window.
- c. **Run LINTRP:** If you are using a Mac, either type command-option-i, or follow the instructions for a PC. On a PC, If you are using Excel 4.0 choose “Run” from the “Macro” menu and select “Lintrp 1.4” from the resulting list. If you are using Excel 5.0 choose “Macro...” from the “Tools” menu and again select Lintrp 1.4 from the resulting list.

- d. **Dialog box:** When LINTRP runs, it will present the following dialog box:



Note: if the dialog box covers up parts of the worksheet you need to see or click on, move the box by clicking on its title bar and dragging.

1. *Starting cell of X data:* Click in the first field in the dialog box. Then either click on the worksheet cell containing the starting X value, or type in its absolute cell reference (e.g., \$A\$2).
2. *Starting cell of Y data:* Click in the second field in the dialog box. Then either click on the worksheet cell containing the starting Y value, or type in its absolute cell reference (e.g., \$B\$2).
3. *Starting cell for output of results:* Click in the third field in the dialog box. Then either click on the worksheet cell where you want the results to begin, or type in its absolute cell reference (e.g., \$D\$2). When the interpolation is carried out, this cell will contain the first X-value (unless the "suppress X-values" option is checked, see below); the cell immediately to its right will contain the first Y-value.
4. *Size of X-increments for interpolating Y-values:* Click in the fourth field in the dialog box. Enter the spacing between X-values you want to use for interpolation. For example, if you wanted to compute elevations (Y-values) every 2 feet across a channel, you'd enter "2" in this box.
5. *Desired starting value of X:* By default, LINTRP uses the first X value as the initial value for interpolation, and simply increments this using the number entered in step 4. If you wish a different starting value, click in the fifth field of the dialog box and enter it. Note that this value of X must lie within the range of X data (i.e., it can't be smaller than the smallest X-value or larger than the largest X-value.)

For example, assume that the first X value is 7.7. It would be awkward to have interpolated points at X= 9.7, 11.7, 13.7 and so on. Instead, it would be better to have values at X=8, 10, 12, etc. To cause this to happen, enter “8” as the desired starting value.

6. *Suppress X-values:* Check this box if you want only the Y-values to be listed in the output. I use this when comparing repeated cross-sections at a site. For the initial cross-section, I leave the box unchecked so that I get columns of both X and Y values. For subsequent cross-sections (which will have the same X-values as the first one) I check this box so that I get only the Y-values.
 7. *Keep set-up values:* Check this box if you want to keep the same values in the dialog box from run to run, i.e. if you want to keep the same interpolation X- increment and starting X-value. Otherwise LINTRP clears all the dialog box data after each run. *If you check this box, be sure to update the starting X and Y data cells, and the cell for output of results each time you run it.* Otherwise you’ll use the old input data and write over you existing results!
 8. *Done or Cancel:* When you are finished entering the necessary information in the dialog box, click the “Done” button to run LINTRP. To abort and start over, click “Cancel”.
 9. *Results:* As LINTRP carries out the interpolation, it will periodically update the worksheet. How often it updates depends on how many values it must interpolate between measured X values. It updates every time it comes to a measured X-value.
- e. **Quitting LINTRP:** When you quit LINTRP, Excel will ask you if you if you want to “save changes in LINTRP 1.4”. Answer NO.

EXAMPLE

Accompanying this macro is a set of test data titled “**testdata.xls**”. You can use this to practice running LINTRP. The X data begins at distance X=7.7 ft. If you follow the instructions above, using a starting point of X=8 ft and an X-increment of 2 feet for interpolation, the resulting dialog box should look like that below. When you run the macro, you results should be identical to those in the accompanying file “**results.xls**”.

Interpolation Set-Up

Select starting cell of X data:

Select starting cell of Y data:

Select starting cell for output of results :

Size of X-increments for interpolating Y-values (absolute value):

Desired starting value of X if different from value in starting cell. (Number must lie within range of X values.)

suppress X values

keep set-up values

DONE

Cancel

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