LINEAR INTERPOLATION

PURPOSE

Perform a linear interpolation of a series of data points.

DESCRIPTION

Interpolation takes a series of (x,y) points and generates estimated values for y's at new x points. Interpolation is used when the function that generated the original (x,y) points is unknown.

Interpolation is related to, but distinct from, fitting a function to a series of points. In particular, an interpolated function goes through all the original points while a fitted function may not.

There are various methods for performing interpolation. Chapter 3 of the Numerical Recipes book (see REFERENCE below) contains a nice discussion of various types of commonly used interpolation schemes (polynomial interpolation, rational function interpolation, cubic spline interpolation). The INTERPOLATION command in DATAPLOT uses a cubic spline algorithm and is normally the preferred type of interpolation. However, the LINEAR INTERPOLATION command can be used to perform linear interpolation (i.e., the given points are connected with a straight lines).

SYNTAX

LET <y2> = LINEAR INTERPOLATION <y1> <x1> <x2> <SUBSET/EXCEPT/FOR qualification>
where <y1> is a variable containing the vertical axis data points;
    <x1> is a variable containing the horizontal axis data points;
    <x2> is a variable containing the horizontal points where the interpolation is to be performed;
    <y2> is a variable (same length as <x2>) where the interpolated values are stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET Y2 = LINEAR INTERPOLATION Y1 X1 X2

NOTE 1

The interpolation points (i.e., <x2>) must be within the range of the original data points (i.e., <x1>). An error message is generated if this is not the case.

NOTE 2

The original data do not have to be in sorted order. DATAPLOT sorts the original data (on <x1>) automatically.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

INTERPOLATION	=	Compute a cubic spline interpolation of a series of points.
BILINEAR INTERPOLATION	=	Compute a bilinear interpolation of a 2D series of points.
BIVARIATE INTERPOLATION	=	Compute a bivariate interpolation from a grid to random points of a 2D series of points.
2D INTERPOLATION	=	Compute a bivariate interpolation from a 2D series of points to a rectangular grid.
FIT	=	Perform a least squares fit.

APPLICATIONS

Mathematics

IMPLEMENTATION DATE

94/6

PROGRAM

    . DATA FROM SANTOS MAYO OF NIST
    . EXAMPLE WHERE CUBIC INTERPOLATION DOESN'T WORK WELL.
    LET X1 = DATA ...
      295.5 290.65 290.2 289.2 288.4 280.5 281.6 280.4 280 278.8 276.5
    LET Y1 = DATA 8.53 8.34 8.33 8.30 8.29 8.06 8.1 8.07 8.07 8.02 7.94
    LET X2 = SEQUENCE 277 1 295
    .
    LET Y2 = INTERPOLATION Y1 X1 X2
    LET Y3 = LINEAR INTERPOLATION Y1 X1 X2
    CHARACTER CIRCLE BLANK BLANK
    CHARACTER SIZE 1.2
    CHARACTER FILL ON
    LINE BLANK SOLID DASH
    LEGEND 1 SOLID LINE - CUBIC SPLINE INTERPOLATION
    LEGEND 2 DASH LINE - LINEAR INTERPOLATION
    PLOT Y1 X1 AND
    PLOT Y2 Y3 VS X2