# Chapter 172

Contour Plots

Introduction

Contour plots are topographical maps drawn from three-dimensional data. One variable is represented on the horizontal axis and a second variable is represented on the vertical axis. The third variable is represented by a color gradient and isolines (lines of constant value). These plots are often useful in data analysis, especially when you are searching for minimums and maximums in a set of trivariate data. An introduction to contour techniques is contained in Milne (1987).
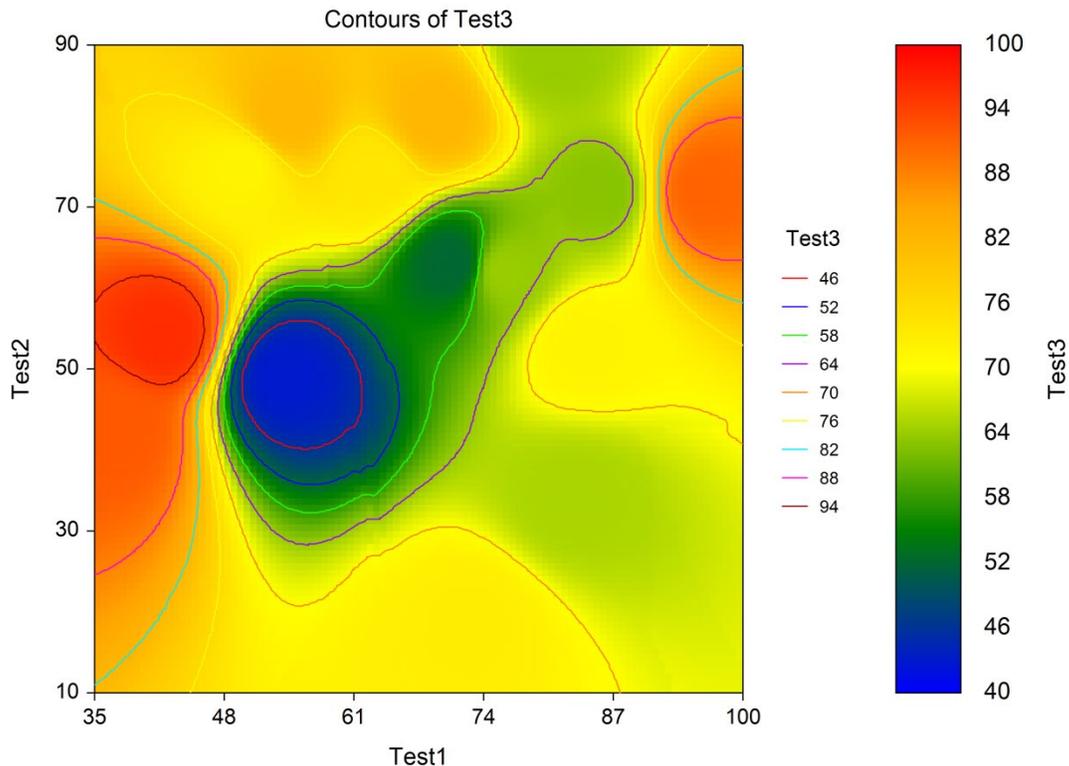
The program allows input of equally or irregularly spaced data.

Data Structure

A contour plot is constructed from three variables. The X and Y variables are shown on the horizontal and vertical axes, respectively. The Z variable is represented by a colored gradient. Note that all three variables must be numeric.

Procedure Options

This section describes the options available in this procedure.

Variables Tab

This panel specifies which variables are used in the contour plot.

Variables

Variable (X, Y, Z)

Each box specifies a numeric variable that will be used to construct the plot. The X variable is displayed along the horizontal axis, the Y variable is displayed along the vertical axis, and the Z variable is displayed using the contour layers.

Variable Names

This option specifies whether the column names or column labels are used on the chart.

Contour Plot

Format

Click the format button to change the plot settings (see Contour Plot Window Options below).

Edit During Run

Checking this option will cause the plot format window to appear when the procedure is run. This allows you to modify the format of the graph with the actual data.

Contour Plot Window Options

This section describes the specific options available on the Contour Plot window, which is displayed when a Contour Plot Format button is clicked. Common options, such as axes, labels, legends, and titles are documented in the Graphics Components chapter.

Contour Plot Tab

Gradient Fill

The following are some examples of different gradients for the same data:
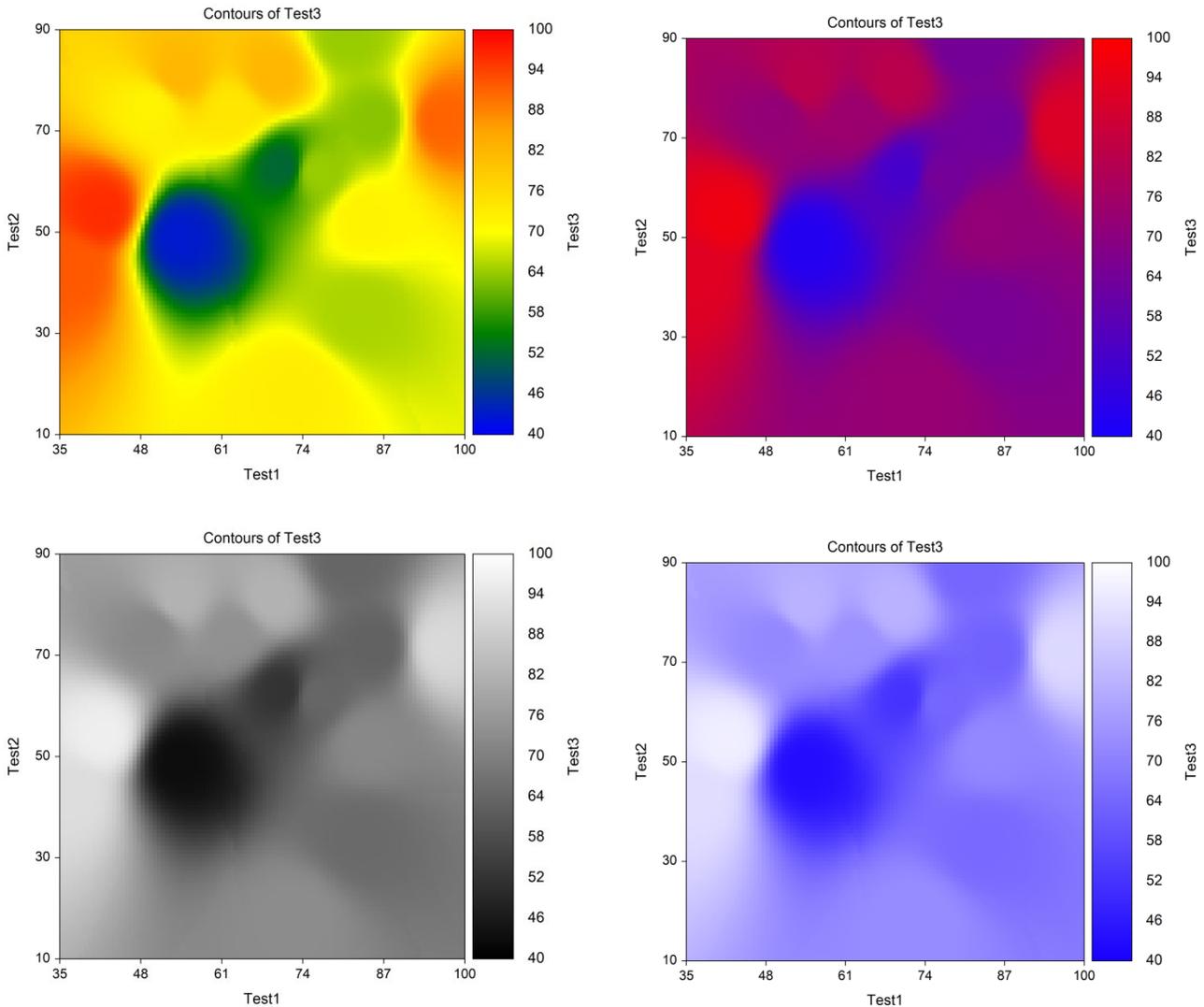
Resolution

This is the number of slices of the gradient fill in the horizontal and vertical direction. When this number is large (say, > 200), the plot may take a short time to generate. For full resolution, this number should be close to the width and height of the interior data area on the Background tab.

Range

These three radio buttons specify the range (min and max) of the gradient. The min of the gradient corresponds to the left-most (and bottom-most) color of the gradient. The max of the gradient corresponds to the right-most (and top-most) color of the gradient.

Automatic

An algorithm selects a suitable minimum and maximum that is at or outside the minimum and maximum of the data.

Data Min and Data Max

The minimum and maximum of the gradient are the minimum and the maximum of Z values. These Z values are the Z values of the full grid (based on the resolution), not the Z values of the original data. This choice gives the maximum contrast on the plot, but the gradient references are usually not "nice" numbers unless input manually.

Custom

The gradient minimum and maximum are input manually. If there are values of the gradient fill outside this range, they will be empty on the plot.

Data Values per Grid Point

The number of nearest-neighbor data values averaged to calculate the value of Z for the grid point. This option controls the smoothness of the plot.

Smoothing Exponent

This smoothing exponent is applied to the relative distance of each data value from the grid point when computing the grid value (Z value). The grid value is computed using a weighted average of the nearest-neighbor data values. The weights are inversely proportional to this exponentiated distance.

Range of Values

Values of 1, 2, or 3 are suggested. A value of 1 gives a larger influence to relatively distant data values. Hence, the contour plot tends to be flatter. A value of 3 results in a plot with more hills and valleys.

Show Data Values

Check to draw each data value on the plot. Only the X and Y coordinates are used--the z coordinate is ignored. When the data was generated by another procedure, such as the Response Surface Regression procedure, these data values are the predicted values from the regression equation, not the original data values from the dataset. Note that the symbol can be added to the legend.
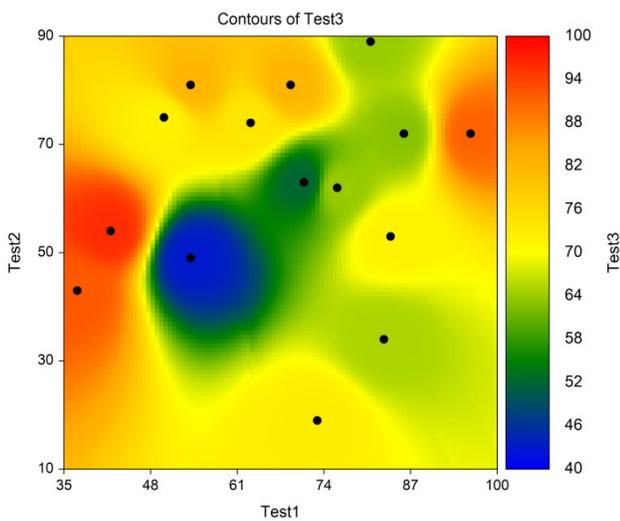
Contour Lines Tab

Lines and Line Labels

These options permit you to see reference lines for the Z variable directly on the plot.
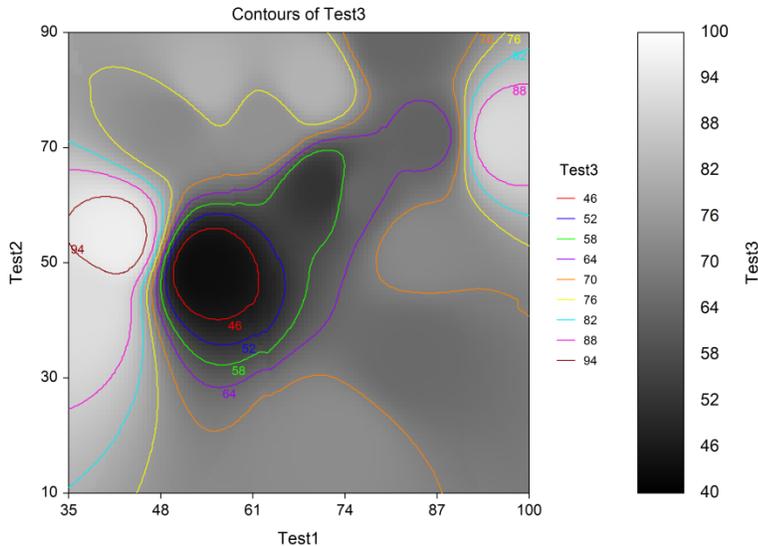
X and Y Resolution

This is the number of slices in the horizontal (X) and vertical (Y) directions. This controls the smoothness of the contour lines. A value between 50 and 200 typically gives good results.

Line Specification

The number and range of the lines may be specified for the lines. Or, a specific list of line values may be entered.

Example 1 – Creating a Contour Plot

This section presents an example of how to generate a contour plot. The data used are from the Tests dataset. We will create contour plot of Test1, Test2, and Test3. Test3 will be contoured.

You may follow along here by making the appropriate entries or load the completed template **Example 1** by clicking on Open Example Template from the File menu of the Contour Plots window.

1   **Open the Tests dataset.**
   - From the File menu of the NCSS Data window, select **Open Example Data**.
   - Click on the file **Tests.NCSS**.
   - Click **Open**.

2   **Open the Contour Plots window.**
   - Using the Graphics menu or the Procedure Navigator, find and select the **Contour Plots** procedure.
   - On the menus, select **File**, then **New Template**. This will fill the procedure with the default template.

3   **Specify the variables.**
   - Select the **Variables tab**.
   - Double-click in the **X Variable** text box. This will bring up the variable selection window.

- Select **Test1** from the list of variables and then click **Ok**. "Test1" will appear in the X Variable box.
- Double-click in the **Y Variable** text box. This will bring up the variable selection window.
- Select **Test2** from the list of variables and then click **Ok**. "Test2" will appear in the Y Variable box.
- Double-click in the **Z Variable** text box. This will bring up the variable selection window.
- Select **Test3** from the list of variables and then click **Ok**. "Test3" will appear in the Z Variable box.

4 Run the procedure.

- From the Run menu, select **Run Procedure**. Alternatively, just click the green Run button.

Contour Plot Output