Image Statistics by Geometric Element

The Image Statistics by Geometric Element process (Image / Statistics / Statistics by Geometric Element or Geometric / Attributes / Image Statistics) computes raster cell statistics from one or more selected images for points, lines, or polygons in a geometric object (vector, CAD, or shape). You can choose to compute standard statistical values such as mean, median, and standard deviation, and also compute a number of Gray Level Co-occurrence Matrix statistics. The statistics can be saved as tables added directly to the geometric object, as tables added to a copy of the object, or as text (CSV) files. Image statistics can be tabulated using:

- all elements of the selected type or only those marked in the process's View window
- individual elements and/or elements grouped by value in a designated attribute field.

Geometric Object

Press the Select pushbutton in the Geometric Object box to select the geometric object to use. The selected object is automatically shown in the separate View window. Use the Elements icon buttons to choose the element type to use for computing the statistics. The setting on the Boundary Cells menu determines how values are handled from cells that are only partially covered by a polygon. The choices are *Include if partially inside*, *Include if center is inside*, *Compute proportionally*, or *Exclude if partially outside*.

Use the Output menu to choose how to save the statistics: *Add table(s) to object*, *Copy object and add table(s)* (leaving the input object unchanged; for vector and CAD only), or *Text file(s)* (to save as CSV-formatted text). The *Use* radiobuttons to the right of this menu set whether to use *All* elements or only those *Marked* in the View.
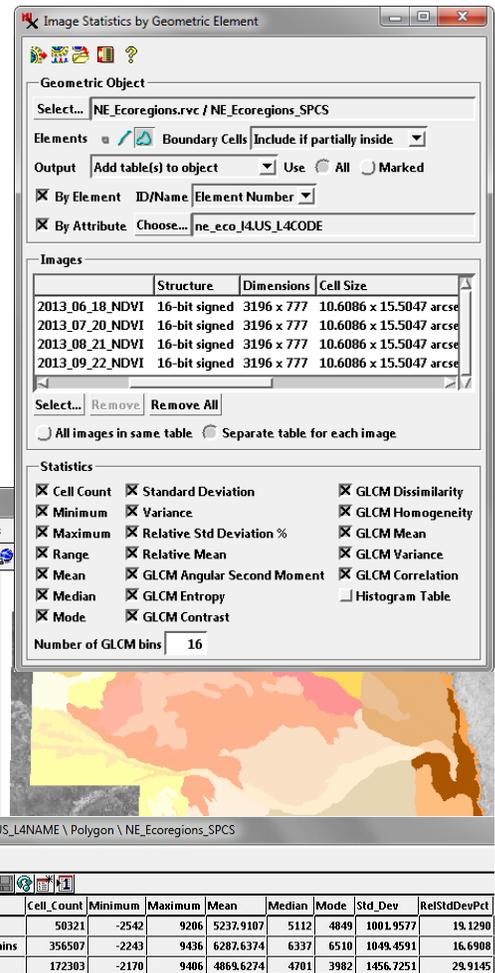
You can choose one or both of the *By Element* and *By Attribute* options. The By Element option compiles statistics independently for each element. With this option you can choose an ID or Name to embed in the statistics table(s) to identify each record. The choices are None, Element Number, [Element]_ID.Current (if the element has an ID table) and Choose; the latter option prompts you to select a database table and field to provide the ID.

The By Attribute option tabulates statistics by grouping elements that have the same value in an attribute field you select. When you choose this option you are automatically prompted to select the table and field to use. You can press the Choose pushbutton to reset this choice if needed. The selected attribute is included as a field in the resulting statistics table.

Images

Press the Select pushbutton in the Images box to choose one or more images from which to compute the statistics. You can choose grayscale, hyperspectral, or color composite images; statistics are automatically computed for each of the color components for color composites. The images are added to the View if the *Display images automatically* option on the Preferences menu is turned on.

The file and object names of the selected images are shown in the list in the Images box. To remove any image, left-click on its list entry to highlight it and press [Remove]. Press the Remove All button to clear the list. When you are analyzing multiple images, use the radio buttons below the list to choose whether to combine or separate the statistics by image (*All images in same table* or *Separate table for each image*).

Statistics

The Statistics box lists the measures available for the selected element type with a checkbox allowing you to select or deselect each. The options include Cell Count and standard statistical measures such as Minimum, Maximum, Mean, and so on. *Relative Std Deviation %* is a dimensionless value computed by dividing the class standard deviation by the class mean and multiplying by 100 to express the value as percentage. The Relative Mean is computed by dividing the class mean by the overall image mean.

A number of Gray Level Co-occurrence Matrix (GLCM) texture measures are available when computing statistics for polygons. These measures first quantize the range of image cell values encompassed by the polygon into bins using the value in the *Number of GLCM bins* field (range 16 to 64). A co-occurrence matrix is computed to record how often specific pairs of bin values occur in immediately neighboring cell positions (horizontally and vertically) within the polygon or polygon class. Each GLCM option derives a different statistical texture measure from that matrix. For details of the individual measures, see the Technical Guide entitled *Raster & Image Processing: Gray Level Co-occurrence Matrix Filters*.

The Histogram Table option for polygons creates a separate table with histogram data: a set of records for each polygon or polygon class with the image cell value, cell count, and area.