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Introduction to Dynamic Exploratory Spatial Data Analysis using DynESDA

Stephen A. Matthews

Basics

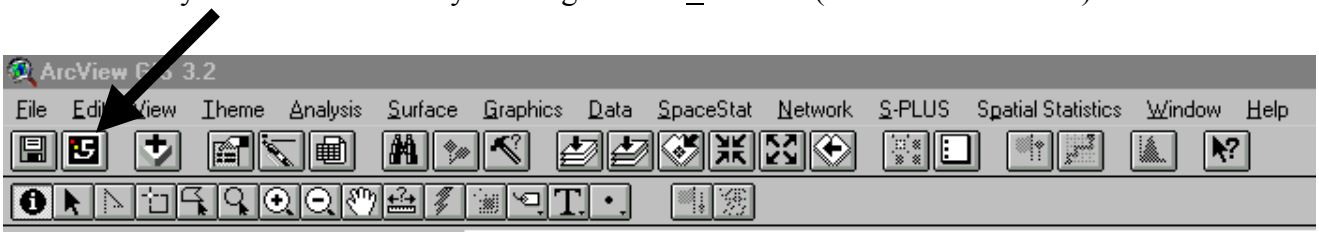
DynESDA is an extension program for Arcview 3.x developed by Anselin and Smirnov (1999): see www.spacestat.com. An excellent recent article describing the functionality of DynESDA is:

> Luc Anselin. 2002. Computing environments for spatial data analysis. Journal of Geographical Systems 2: 201-220 (pages 211-214 focus on DynESDA).

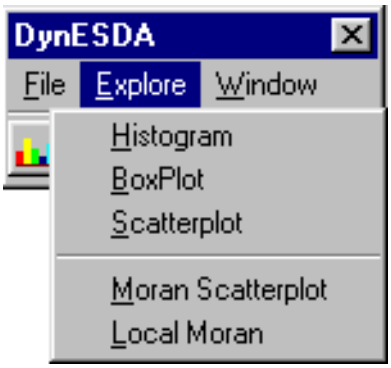
Using DynESDA

To use DynESDA within Arcview 3.x the *DynESDA* extension needs to be loaded. Click on the Project window, check File-Extension and make sure a check mark is in the box against DynESDA.

Invoke the DynESDA extension by clicking on the "S" button (second from the left).



A floating toolbar appears with File, Explore and Window as the menus and five buttons. The buttons refer to options to produce a histogram, a boxplot, a scatterplot, a Moran scatterplot and a local Moran plot (NB: this document focuses on the first three tools, a companion document GIS_RD_will discuss the use of Moran and Local Moran plots).



Select the Histogram option, either by using the menu of the toolbar (Explore-Histogram), or by clicking on the Histogram button. Scroll down the list of variables until you find one you would like to explore (e.g., % poverty). Please note, in most instances the variable selected ought not to be a "count" variable, and instead should be a rate or percent. To select the variable double-click (or click once and then click on OK). A new window will open with a default histogram for the

variable you selected. The histogram can be modified - e.g., changing the number of intervals by means of the Tools-Intervals menu item that appears at the top of the Histogram Window. Type the number of intervals to be used or scroll through the list and click OK. You can also test various intervals by means of the Apply button (where changes are not permanent until you click OK). You can reposition and resize the Histogram Window so that you can see both the histogram and the map View Window.

Select the BoxPlot tool (Explore-BoxPlot or select tool button). Again, scroll down the list of variables and select one. A BoxPlot Window will open. The box plot has a familiar form, with the dark area corresponding to the quartiles around the median (the blue dot in the middle), the thick lines above and below the box are "fences" (which can be set at 1.5 or 3 times the inter-quartile range) and outside the fences are outliers. The definition of the "fences" can be modified using the command Tools-Hinges menu item appearing in the BoxPlot Window.

Select the Scatterplot tool (Explore-Scatterplot or select tool-button). Select the first variable (x-axis) by scrolling down the list of variables and double clicking on it. Repeat for the second variable (y-axis). A scatterplot window will open and it will indicate the value of the regression slope. You can select individual points by clicking on them or groups of points by drawing a box around them (using the cursor to define the area of the box, click once to define the location of one corner of a rectangle and drag the mouse and release at the other corner). You can also switch (toggle) the selection by double-clicking in the graph. These selected points can then be excluded from the analysis using the Tools-Exclude tool. The result may be a different regression slope calculation and line plot (depending upon what data points are excluded). This tool can be used to explore "leverage" points and outliers.

Dynamic Linkages: If you click on the histogram - selecting a column farthest to the right you will see the corresponding areas highlighted on the map. If your windows are all positioned so that they are not overlapping you will also see the corresponding points in the boxplot and the scatterplot. You can link any observation in any view of the data to any other view (window) by clicking on it. Even by selecting on the map to look at neighboring areas.

The easiest way to clear all selected observations is to do it in Arcview (using the selection tool - fourth from the left on the second row of icons - anywhere outside the map).

It is possible to brush the scatterplot (or other graphs) directly. In a scatterplot make a rectangle. Click in one corner and drag to form the rectangle, followed by pressing the Control (CTRL) key. The rectangle will flash for a brief second. Now move the brush window around the plot and observe how the slope of the regression line changes.

Note: *To select multiple data objects at the same time hold the shift-key down while making selections.*

Penn State Resources

DynESDA is installed on all GIA Core PCs and on the PCs in the Computer Lab in 806 Oswald.