

Bridging the Gap Between GIS and Solid Spatial Statistics

Konstantin Krivoruchko, Environmental Systems Research Institute, 380 New York Street, Redlands, CA 92373-8100, kkrivoruchko@esri.com

Over the past few decades GIS and statistical spatial data analysis tools have been successfully applied in the fields of meteorology, environmental monitoring, ecological analysis, and mineral exploration (to name but a few). While these synergistic tools operate on spatial data, as yet they have not been incorporated into a single 'user-friendly' software environment. For this reason statistical methods remain somewhat of a mystery to mainstream GIS practitioners. To widen the use of spatial statistics, it is argued that software packages, such as SAS, SPLUS and GSLIB should incorporate three essential components that are provided by a GIS: a robust spatial database (with associated geographic coordinate systems), spatial models and visualization algorithms. An alternative solution is to incorporate statistical algorithms into GIS software. The *Geostatistical Analyst*, an extension to ESRI's ArcGIS 8.1, is an example of the latter approach. This represents a new level of integration of geostatistical techniques within a GIS framework. The software provides a simple windows-based interface for users that are unfamiliar with spatial statistics.

The Geostatistical Analyst software was released in May, 2001, and has two main components, namely, the Exploratory Spatial Data Analysis toolbox and the Interpolation and Statistical Modelling Wizard. The views in Exploratory Spatial Data Analysis tools are interactive with all of the other tools provided with ArcGIS. The algorithms and functions incorporated into the software make it a suitable processing tool for both the expert and novice users. In its most simplistic application users can select default values to create maps from point samples. As the level of knowledge improves, users are provided with a wide range of processing options to explore the properties of the data and hence create a more accurate map. The Geostatistical Analyst creates geostatistical layer, which naturally interacts with other GIS features and options, such as projection change, clipping, querying, exporting, etc.

The Geostatistical Analyst represents a major step in bridging the gap between GIS and geostatistics. Future software developments will focus on widening the range of statistical tools that are required by the GIS practitioners. This will be successfully achieved through consultation and assessment of the areas of need. It is hoped that such developments will widen the use of statistics in the GIS community and encourage statisticians to use GIS. Detailed information about the Geostatistical Analyst features can be found at <http://www.esri.com/software/arcgis/arcgisxtensions/geostatistical/index.html>.

Many enhancements to the Geostatistical Analyst extension to ArcGIS can be made, including the use of non-Euclidean metrics, conditional simulations, nonstationary models, models for locational errors, and space-time geostatistical models. Although users with strong statistical background are awaiting these additions, it is still unclear how many general GIS users are really interested in advanced geostatistical methods. The same is true in regards to lattice and point pattern analysis methods and tools.