Spatial Thinking, Exploratory Spatial Data Analysis and Design

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Position Statement

Not coming from a design background, I approach the interface between design and GIS from the perspective of a tools and methods developer interested in widening the scope of application of spatial analytical software tools in general, and exploratory spatial data analysis tools in particular. This builds upon some recent experience providing analytical support for a forthcoming text by Emily Talen (2009) on *Urban Design Reclaimed*. In this effort, exploratory data analysis, three dimensional design tools and GIS are combined to provide a basis for *spatially informed urban design*. Specifically, the GeoDa software for spatial data exploration is used together with ArcGIS and SketchUp to develop a series of exercises that bring social concerns related to accessibility, concentration, diversity, etc. to the urban design process.

Paralleling this is a motivation to expand the dissemination of *spatial thinking* in the planning and design professions through the introduction of innovative course materials that are organized around user-friendly software tools for geospatial data exploration. Integrating sound data analysis within a design or planning studio environment presents some interesting challenges to both pedagogy and tool development.

In this context, I see spatial thinking as focused on the twin spatial effects of spatial dependence and spatial heterogeneity (Anselin 1988). Geospatial analytical tools provide the user with interactive ways to identify interesting and significant patterns (such as clusters or spatial outliers), visualize them through maps and other graphics, and explain the patterns through spatial correlation and regression analysis. The challenge is to provide added value (data to knowledge) from the exploration of socio-economic and other data that can inform the design, planning and policy processes, characterized by a normative and interventionist perspective and focused on the built environment. Specific examples of aspects that can inform policy and design

development include the identification of clusters and spatial outliers of parcels in terms of demographic and ethnic composition, income, commuting distances and access to public and private infrastructure. Techniques to accomplish this are well established and by now readily used in the social and natural sciences. I see the main impediment to their adoption in the design and planning process primarily from a lack of familiarity, which can be remedied through education, training and dissemination.

The research challenge is to create effective spatial decision support systems that integrate seamlessly with the design and planning process. This requires particular attention to the interface between socio-economic (income, employment, commuting) and natural phenomena (urban ecology) on the one hand and the built environment on the other. The decision support system forms the computing infrastructure on which simulations, visualizations and scenarios can be played out. I view three ongoing research directions as particularly important in this respect:

- the explicit incorporation of space and design aspects into econometric models of the built environment, through so called spatial hedonic models (Anselin and Lozano-Gracia 2009), which provide the basis for quantifying relationships between building characteristics, context, environment and market value, among others
- the explicit treatment of scale in the analysis of relationships between the built environment and socio-economic and natural variables
- the further extension of exploratory spatial data analysis techniques to the analysis of dynamics over time and across scales as well as origin-destination and other flow patterns as they pertain to changes in the urban environment.

References

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