

Chapter 3.11

Internet–Based Spatial Decision Support Using Open Source Tools

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ABSTRACT

In the last half decade, there has been growing interest in the concept of collaborative geographic information systems (GIS) in support of decision making, especially in the context of various domains of planning. This interest has spawned an already substantial literature in what is now becoming popularly known as public participation GIS (PPGIS) or community GIS. A central and general objective of PPGIS is to encourage the use of GIS technology by broadly based and geographically dispersed nonexpert users. In the context of planning decision support, this involves creating software with map-based functionality that is responsive to the needs of user groups that have limited experience with computers and only a rudimentary knowledge of even simple spatial analysis concepts. This functionality should be de-

signed to enable these individuals to communicate and interact with higher level users and agencies on an equal footing so that all participants can be both better informed of each others perspectives and more involved in decision-making processes that involve land and resource use planning and management. This chapter considers the general issue of PPGIS in the context of use of the Internet and the World Wide Web as a means of achieving broad participation and collaboration in decision making among dispersed participants with a diversity of backgrounds and competencies in using spatial concepts and analyses. The chapter also considers the role that open source software tools can play in crafting accessible and highly customizable solutions using an example for assessing the quality of primary-level education in Peru.

INTRODUCTION

Research into supporting human decision-making processes through the use of computer-based applications is well established in many fields. This research includes the spatial data domain that, although relatively young by comparison, has a history of over 10 years of experimentation, which has produced a large literature. Several threads of research are intertwined within and between specific application areas that use spatial data resources (such as health, education, urban planning, resource management, etc.). These threads have persisted in the literature and have recently diverged into several new areas.

Much of the emphasis in spatial decision-support research continues to focus on developing tools, typically using macrolanguage scripting exclusively or scripting linked to compilable programming and commercial geographic information systems software, such as workstation Arc/Info and desktop ArcGIS. More recently, however, there is an emergent trend in developing spatial decision-support tools on other software platforms (see, for example, Andrienko, Andrienko, & Voss, 2003; Rinner & Malczewski, 2002; Voss, enisovich, Gatalsky, Gavouchidis, Klotz, Roeder, & Voss, 2004), and especially using the Internet as a deployment and communications medium (Dragievi & Balram, 2004; Evans, Kingston, & Carver, 2004; Rivest, Bedard, & Marchand, 2001).

The applications that are bound to mainstream commercial GIS are characterised to varying degrees by a number of limitations. These limitations have been itemized by a number of researchers. They include, among others, relatively cumbersome and potentially difficult to use interfaces (due to the relative difficulty of developing common user interface dialogs and menus with scripting languages, especially in the earlier tools); a preponderance to a single-user, single-decision problem orientation, often using proprietary spatial and tabular data formats, but

with far less dependence on import and export of nonstandard file formats and nonscenario-based and nonshared (stand-alone) spatial analysis than in the past; limited flexibility and options in the support functions, which are required to address specific types of decision problems (Jankowski & Nyerges, 2003); and steep learning curves in the use of the tools for nonexpert users (Feick & Hall, 1999; Uran & Jensen, 2003).

These problems have plagued the practical use of GIS use in decision support to the point where some researchers have recently reevaluated progress in order to facilitate more constructive use of the technology for this purpose (see, for example, Higgs, 2004; Merrick, 2003; Nyerges, Jankowski, & Drew, 2002; Uran & Jansen, 2003;). This critical reevaluation is in part due to the fact that relatively few cases of deployment of spatial decision-support tools have resulted in successful outcomes beyond the academic arena. Certainly, while many tools have been developed, there are few published or well-documented cases that can be heralded as having clear and continued utility in improving public decision-making processes (for example, while it is possible to develop an Internet map-based tool for broad-based public input into where nuclear waste disposal sites should be located (Evans et al., 2004), it would be quite another matter to have such a tool used by a nuclear power authority to guide actual site choices). This dislocation between academic research and its practical uses is complex, and by no means limited to the domain of spatial decision support. However, it is likely that the relative lack of successful use of spatial decision support tools for actual decision making is in part related to a basic mistrust of academic research by some practitioners, as well as a combination of the factors outlined previously.

New research threads in spatial decision support may offer renewed optimism for this area of investigation. In particular, four strands can be identified. These include, first, interest in facilitating the use of GIS technology by nonexpert

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