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GIS for spatial decision making

Veldic Vlado

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Veldic Vlado

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ABSTRACT

GIS for spatial decision making

by
Veldic Vlado

Supervisor: Prof. Dr P. van Helden
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The motivation for this research is based on the recognition that Geographic Information Systems still suffer from certain shortcomings that prevent their utilization as fully-fledged spatial decision support systems. These shortcomings are mostly related to: (1) inappropriate logical foundation, not allowing for any imprecision in information, and (2) low level of intelligence in terms of handling declarative and procedural knowledge. To overcome these shortcomings and to provide a better and more flexible environment for complex spatial problem solving, current GIS will have to be integrated with decision-making tools drawn from other disciplines.

The purpose of this study was to develop a practical approach for the integration of GIS and Knowledge Based Systems (KBS) to support site suitability assessment and environmental impact prediction. This integration is seen as important for spatial decision-making because spatial problems are often unstructured requiring heuristics and other knowledge based techniques.

In an effort to meet the above requirements this study proposes a prototype Knowledge-based GIS (KBGIS) that would be able to anticipate conflicts between development and environment at an early stage of project planning. This prototype KBGIS is based on an evaluation model developed by UNEP/UNCHS (habitat). The objective of this research was to reconfigure this initial model and to convert it into the aforementioned prototype KBGIS.

In essence, the whole research revolved around the idea of building an integrated set of computer-assisted procedures into a system that can be used as a tool to anticipate possible conflicts between development and environment. To fulfil such a task it was necessary to integrate the basic functionality of GIS with elements of a Knowledge Based System. A study of related literature revealed a number of models for the integration of GIS and KBS. The aim of this research was to develop an example of a fully integrated model of GIS and KBS by including elements of KBS techniques as one of the subroutines of a GIS. The idea of the proposed prototype KBGIS was to put the model, data, domain knowledge, as well as the system's knowledge acquisition and reasoning mechanism together in a GIS environment and within one single application with shared communication routines, a common interface and data structure.

The study shows that integrating different information technologies - in this case GIS with KBS is a very useful approach in supporting ill structured spatial problem solving tasks.

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