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GIS for spatial decision making

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ABSTRACT

GIS for spatial decision-making

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ABSTRACT

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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.

TABLE OF CONTENTS

Abstract	i
Table of Contents	ii
List of Figures	iv
CHAPTER 1	
INTRODUCTION	
1.1 Background	1
1.2 Research Objective	3
1.3 Organisation of the Document	4
CHAPTER 2	
GIS AND DECISION SUPPORT	
2.1 Spatial Decision Making and Computerized Support	5
2.1.1 Geographic Information System	6
2.1.2 Spatial Decision Support Systems: Context, Concept and Definitions	8
2.1.3 Geographic Information System as a Spatially Enabled DSS	11
2.1.4 The Rule of GIS as a SDSS Generator	13
2.1.5 GIS Integration (Classification of Systems Integration)	15
2.2 GIS and Knowledge Based Systems	20
2.2.1 What is a Knowledge Based System?	20
2.2.1.1 Components of the Knowledge Based System	21
2.2.1.2 Knowledge Acquisition, Representation and Implementation	23
2.2.2 Knowledge Based Systems in Spatial Problem Solving	26
2.2.3 Coupling KBS with GIS – Knowledge Based GIS	27
2.2.3 Conclusion	30
CHAPTER 3	
THE UNEP/UNCHS MODEL FOR EVALUATING COMPATIBILITY BETWEEN DEVELOPMENT AND ENVIRONMENT	
3.1 Introduction	32
3.2 Purpose of the Model	32
3.3 Conceptual Elements of the Model	33
3.4 Steps in Developing the Model	34
3.4.1 Environmental Zoning of an Area Concerned	35
3.4.2 Identification of Interactions between Development Implications and Environmental Resources/Hazards	37
3.5 Development-Environment Conflicts Evaluation	38



CHAPTER 4

THE KBGIS DEVELOPMENT

4.1	Introduction	41
4.2	Components of the Model	42
4.2.1	GIS Approach to Environmental Zoning and Construction of Environmental Zone Maps	42
4.2.2	Summary of a GIS Data Organisation and Generation of an Environmental Zone Map	43
4.3	Approach to Organisation of the Project Impact Identification Checklist and Development-Environment Interaction Matrix within the Prototype KBGIS Environment	46
4.3.1	Project Impact Identification Checklist	46
4.3.2	Development-Environment Interaction Matrix	48
4.4	The Prototype KBGIS Architecture	49
4.4.1	Integration Approach	49
4.4.2	The System Architecture (Modules and Components of the prototype KBGIS).....	50
4.4.3	The System Modes and Capabilities	51
4.5	The KBGIS Data and Knowledge Acquisition Mode	53
4.5.1	Acquisition of GIS Data.....	54
4.5.2	Acquisition of Knowledge within the Prototype KBGIS Implementation Environment	57
4.5.3	Knowledge Representation within the Prototype KBGIS Environment.....	63
4.6	The KBGIS Consultation Mode	64
4.7	The KBGIS Inference Mechanism: How it works	67
4.8	The KBGIS Knowledge Refinement toolbox	73

CHAPTER 5

SUMMARY AND CONCLUSIONS

5.1	Research Summary	75
5.2	Achievements of the Research	76
5.3	Important Issues Relevant for Environmental Zoning and Construction of an Environmental Zone Map	78
5.4	Directions for Further Research	79
REFERENCES		82

LIST OF FIGURES

Figure 2.1.	Hierarchy of Knowledge	5
Figure 2.2	GIS data gathering and input procedures	8
Figure 2.3	Components (software modules) for a Spatial Decision Support System	11
Figure 2.4	GIS as a SDSS generator	14
Figure 2.5	Loosely Coupled Integration	15
Figure 2.6	Close Coupling Approach	16
Figure 2.7	Full Integration.....	18
Figure 2.8	Structure of a Knowledge Based System	22
Figure 2.9	Process of Knowledge Engineering	23
Figure 2.10	Schematic representation of an interactive, expert-driven knowledge acquisition method implemented in this research.....	24
Figure 3.1	Flow diagram illustrating components and procedure for development-environment compatibility assessment	34
Figure 3.2	An example of a typical development-environment conflict anticipation session	43
Figure 4.1	Flow diagram of typical steps involved in the construction of an Environmental Zone Map	44
Figure 4.2	An illustrative example of the process of GIS data sets derivation and interpretation with the aid of GIS analytical and modelling functions	45
Figure 4.3	An illustrative example of a simple Impact Identification Checklist used in this research for identification of development actions and their implications likely to have significant effects on the environment	47
Figure 4.4	An illustrative Example of the simple Interaction Matrix approach used by the prototype KBGIS for identification of development-environment interactions (potential conflicts) within an area concerned	48
Figure 4.5	Architecture of the prototype KBGIS developed in this research	50
Figure 4.6	The KBGIS Start-up GUI.....	52
Figure 4.7	The KBGIS Knowledge Acquisition GUI and the steps involved in a typical data and knowledge acquisition session supported by the system	53
Figure 4.8	The KBGIS Data Source dialogue window for selection of the Environmental Zone composite layer.....	54
Figure 4.9	The KBGIS interactive dialogue for selection of environmental resource / hazard factors to be used by the system for identification of environmental constraints within a study area.....	55
Figure 4.10	The KBGIS interactive dialogue designed to support viewing and typing in description of unique attribute values for each environmental factor from the EZM attribute table	56
Figure 4.11	The KBGIS form-filling dialogue designed to support construction of Development/Environment Interaction Matrix	58

Figure 4.12	The KBGIS question-like dialogue designed for construction of the project's Impact Identification Checklist.....	60
Figure 4.13	The KBGIS point-and-click dialogue for assessing the likelihood and significance of the project's implications associated with the related screening question.....	61
Figure 4.14	An example of the project Impact Identification Checklist displayed in the main construction dialog for the purpose of being reviewed and re-defined, if required.....	62
Figure 4.15	The KBGIS interactive, point-and-click dialogue for the assessment of the project's development sensitivities	63
Figure 4.16	Illustrative example of the knowledge representation approach implemented within the prototype KBGIS	64
Figure 4.17	The KBGIS consultation mode toolbox developed with the aid of Avenue macro language and embedded into the ArcView's GUI.....	65
Figure 4.18	Analysis and evaluation scenarios that is supported by the prototype KBGIS	66
Figure 4.19	The KBGIS data input controls.....	67
Figure 4.20	An example of interactive dialogue designed to support selection of the intended project	67
Figure 4.21	The screen snapshot illustrating the KBGIS' s ability to extract the Impact Identification Checklist of the selected project from the knowledge base and allow the user the review it.....	68
Figure 4.22	The screen snapshot illustrating the KBGIS ability to extract from its GIS database all environmental constraints found at the selected location	69
Figure 4.23	The KBGIS evaluation tools embedded into the system's GUI.....	69
Figure 4.24	Schematic representation of the reasoning process currently supported by the prototype KBGIS	71
Figure 4.25	An illustrative example of the system's conclusions provided in a language familiar to the user	78
Figure 4.26	An example of a textual file generated by the system for the purpose of storing assumptions underlying its reasoning process	73
Figure 4.27	An example of the system's interactive dialogue designed to support the construction or modification of PII checklists	74