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themes

- 1 **Cooperation among local, regional and national authorities**
- 2 **Information systems for sustainable development**
- 3 **Access, use and maintenance of urban and regional data**
- 4 **Spatial data infrastructure**
- 5 **E-governance**
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- 9 **The third dimension**
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1.1.1 **TWO-LEVEL MODELLING OF REAL ESTATE TAXATION ? THE CASE OF CZECH REPUBLIC**

Real estate taxes recurrently attract attention, because they are a source of potentially increased revenue for local and national government. Most experts agree that it is necessary to switch from using normative values for taxation to a market-value-based taxation of real property with computer-assisted mass valuation, which benefit from use of value maps.

In Czech Republic, efforts have been made to adopt current tax policy goals, but improvements are still needed. The paper aims at supporting the current improvement process towards a market based system. It presents models, which describe aspects of the present Czech property tax system. A proposal for the future system focuses on the value map component. The described change depends on political involvement. This political activity is modelled as well. The hypothesis is that the two-level modelling effort enhances the change process by providing a comprehensive view of options, both of a technical and a political character.

The outcome of the analysis is a proposal to shift the attention from providing a legal base for a countrywide, uniform taxation scheme to the (still complex) issue of allowing for wider access to data on sales prices and immovable property attributes. Wider access to these data will support a broad adoption of the land value map and thereby accelerate the implementation of a market economy in real estate.

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1.1.2 **A TERRITORIAL INFORMATION SYSTEM ON THE METROPOLISATION IN FRENCH MEDITERRANEAN SPACE**

From a project adopted in an European program Interreg, our communication presents an experiment of installation of an observatory of the territories and metropolisation (O.T.M.) in French Mediterranean space. The various stages of its constitution are approached. This contribution also points out the context and the finalities of research and answers two essential questions: An observatory: why? An observatory: how?

The observatory aims to establish a reasoned and projected state of the knowledge on the principal issues of the metropolisation process. It is supplied by documentaries researches. These belong to several knowledge domains (architecture, urban planning, regional planning, economy, sociology, geography?). Consequently, multiple topics have to be integrated. The product of each research is presented on reading cards-index. After validation, the project comprises their publication and the realization of syntheses. Work is then put on line on web site of the observatory.

Parallel to these information retrievals, the search and the treatment of indicators on various scales allow cartographic treatments with a GIS which are also put on line. Gradually a Territorial Information System is set up on the metropolisation and it appears interactions between systems of geodata processing, analysis of the process of metropolisation and exchanges between decision makers, experts, researchers and operators of the territorial development.

Finally, with this documentary and cartographic inventory, it is possible to consider a new interrogation on the possibility of a "culture of the metropolisation" in the public actors and on the emergence of an "intelligent city".

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1.1.3 **HIERARCHICAL ANALYSIS AND AGGREGATION OF TERRITORIAL UNITS FOR MORE DETAILED LEVELS IN THE ?NUTS? CLASSIFICATION**

At the beginning of the 1970s, the Commission set up the ?Nomenclature of Statistical Territorial Units? (NUTS) as a single, coherent system for dividing up the European Union's territory in order to produce regional statistics for the Community. Since in Italy the LAU level 1 has not yet been defined, a committee established by National Statistical Institute (ISTAT) is studying a possible delimitation. This work is set in this background, reporting only one of several diverse hypothesis developed within the committee. A set of common principles for LAU1 have been defined, deriving them from the NUTS Regulation. Consequently, likewise to NUTS, territorial units specific to certain fields of activity have been excluded, while this branch of still running experiments aims to define units of a full general nature. The expected result is the identification of a number of ?settlements systems?, where the underlying law is some kind of general relationship existing between communes. So, it has been adopted a very general model of aggregation, applied to municipalities. The model considers two kinds of constraints for the aggregation: i) a hierarchical ranking of settlements, and ii) the relations between settlements, in the geographical space domain. With these constraints, an aggregative algorithm is defined, whose meaning will result by the specific variables that are used: i) to establish the settlements hierarchy, and ii) to evaluate the spatial distribution of settlements.

Keywords: hierarchy, ranking, graph-tree, local level.

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1.II.1 **TRANSACTIONAL SCENARIO PLANNING ? THE CASE OF MERI-PORI, SW FINLAND**

There is a growing interest in environmental decision-making for aids that combine future studies and multi-criteria decision-making with participatory processes. This paper describes the experience from the application of such a participatory process based on the approach of Transactional Scenario Planning.

Our process is still underway while writing this abstract, but as a preliminary result, the transactional scenario planning proves well suited for identification of reasons and causes behind ongoing conflicts. It also provides a good forum for dispute resolution and creative collective action. In this paper we describe in detail the process of transactional scenario planning.

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1.II.2 **GUIDELINES FOR THE SICILIAN GEOGRAPHIC INFORMATION SYSTEM**

The Regional Geographic Information System (RGIS) is an integrated project that aims to high political and social target: the promotion and realization of e-governance, by online distribution of public services, increase of accessibility, activation of partnerships and network, research of quality, and experimentation of new ways for a more efficient urban and regional planning.

The project for the Regional Geographic Information System (RGIS) is a territorial network that represents a strategic and structural action for all issues of the Regional Operational Programme 2000-2006 (ROP 2000-2006) (<http://www.euroinfocicilia.it>). Its objective is knowledge of the territorial resources, the promotion of regional and sovra-regional ICT network and the development of the local systems and medium rank cities. The Regional GIS is based on a network of 41 local GIS, articulated in a regional node in the regional Dipartimento di Urbanistica, in 9 provincial nodes and in 31 local nodes in the cities with population over to 30.000 inhabitants.

Coordinated start up to the network organization of whole regional GIS nodes requests a strong regional direction and partecipazione of whole 41 nodes.

The complete and effective realization of the GIS network would constitute a sure and concrete step toward the Information Society Institution as a real network of knowledge and diffused accessibility to them, to guarantee an essential tool to the regional development policy for the promotion of the local development, for the exploitation of the territorial resources, for the increase of the so-called "city offer" in terms of facilitation to strategies of development for the regional urban structure.

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1.II.3 **DESCENTRALIZATION AND LOCAL MANAGING REFORMS IN TWO MEDIUM BRAZILIAN CITIES**

This work approaches the way the decentralization process in Brazil, which happened since the 1988's Constitutional Reform, caused changes in the municipal managing organization. For this, an analysis of the managing structures transformation of two medium size cities is shown: Alagoinhas and Barreiras, located in the state of Bahia, at the country's northeast. This work tries to point out some specific parts of the decentralization process from the organization charts evolution, identifying their achieves and challenges when implanting the public policies. It's evidenced, at first, that the sequential managing reforms, in both cities, are not displayed as a rupture, but as a slow adaptation path; second, that those fittings in the local managing structure have a certain synchrony level with the conjunctures propitiated by dispositions from other government levels; third, that the set ups used to organize reveal an option for a sectorial decentralization model and, finally, that in the case of the urban policies section, the tools for decentralization created in other public policies haven't been incorporated.

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2.1.1 THE GENERALISED LAND USE DATABASE FOR ENGLAND

This paper describes the production of new experimental statistics for land use. This Generalised Land Use Database (GLUD) has been provided for all of England as at 2001, and calculated for each local authority district and Census ward. These statistics have been produced by the UK Office of the Deputy Prime Minister (ODPM) on behalf of the UK Office for National Statistics (ONS) Neighbourhood Statistics service. In support of its overall objective of developing sustainable communities, the Office of the Deputy Prime Minister is interested in encouraging and enabling better use of land. To support these policy objectives ODPM has led a range of initiatives aimed at improving information about how the land is currently used, including the National Land Use Database Baseline project. In response to short term demands for information ODPM has developed the Generalised Land Use Database using a simplified nine category classification of land parcels: Domestic Buildings, Domestic Gardens, Non-Domestic Buildings, Greenspace, Water, Road, Rail, Path, and Other. The methodology draws on data derived from Ordnance Survey's MasterMap

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2.1.2

MANAGEMENT AND MONITORING OF THE RELATION BETWEEN TRANSPORT AND LAND USE ? APPLICATION FOR THE CITY OF RIO DE JANEIRO

In the scope of the urban politics directed toward the management of the demand it is of great interest to study how the transport demand can be influenced in its roots, through spatial organization. The integrated planning of the Transport and the Land Use, aiming at the sustainable transport, configures an alternative approach in this aspect.

The present research develops a methodology to analyse the relation between transport and urban land use, aiming to contribute in the process of formulation of public policies and decision making as for the planning and to the operation of the transport systems and their impacts on land use pattern. This methodology is based on the combination of the Geoprocessing techniques and the concepts of Urbanism for Networks, for the identification of the space-time relation?s in the territory and the regulation of these by means of the development of prospectives studies, based in GIS. We look to go deep in the study of the formation of the spatial processes in the city, which supply the conceptual base toward a better understanding of the transport and land use relation.

The method was tested, maps of the factors that represent the attributes of the network and of the territory had been created and combined by means of techniques of geoprocessing (GIS) and evaluation for multiple criteria (MCE). Were constructed fuzzy membership functions, aiming at mapping the degree of membership of these factors for the occurrence of the spatial process of urban segregation, in the city of Rio de Janeiro. Finally, urban areas differentiated by space-time relations, configured for the functioning of the bus transit had been identified how important, in the peak of the morning. Extensive areas with greater potential for the formation of the spatial process of urban segregation had been also identified, in direction of West Zone and part of the North Zone of the city.

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2.1.3 IMPLEMENTATION ISSUES IN THE STORAGE OF SPATIAL DATA AS REGULAR POLYTOPES

The 'Regular Polytope' has shown some promise in providing a rigorous representation of geometric objects in 2D and 3D (Thompson 2005), in a form that is computable using the finite arithmetic available on digital computers. This is in contrast to the current practice where geometric algorithms are based on infinite precision mathematical axioms, which do fail (in exceptional cases) in the finite digital computers.

It has also been shown theoretically to provide two alternative definitions of 'connectivity' (Thompson, van Oosterom and Pullar 2006). A convex polytope is defined as the intersection of any finite number of half spaces. A polytope representation is then defined as the union of a finite set of convex polytopes.

In order to explore practical issues in the Regular Polytope representation, a series of objects have been written in the Java programming language and stored using an Informix database. The class of test data chosen was Cadastral property boundaries, since large volumes of data were available, and this topic presents some unique challenges, in particular, the mix of 3D and 2D data that is involved (Stoter 2004). The Regular Polytope representation provides a particularly elegant solution to this issue.

This paper describes the implementation, and discusses some of the practical considerations that arose as a result. This gives an indication of the requirements of a full implementation, and what further development is needed.

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2.II.1

ANALYSIS OF SPATIAL DISTRIBUTION OF RESIDENTIAL AREAS ACCORDING TO SOCIAL STATUS AND INFRASTRUCTURE PROVISION IN THE RIO DE JANEIRO METROPOLITAN AREA

This paper highlights inequalities in the Rio de Janeiro Metropolis [Brazil] through a documentation of the direct correlation between the spatial distribution of social segments of the population and infrastructure provision, against the background of the natural landscape. By deconstructing the metropolis through spatial units of analysis it is possible to see the extent of urban segregation in the huge gap in social and environmental conditions between different municipalities. When hydrographical systems are used as units of analysis such gap is even more pronounced. The natural landscape, seen in this study through the hydrographical system, is a particularly prominent element in Rio de Janeiro connected to spatial segregation and polarized social and environmental conditions. However, we can see contradictions beyond such polarization and that, high and low-income neighbourhoods are brought together within each hydrographical basin and that they therefore share, to a greater or lesser extent, environmental degradation and amenities. Through such an approach, the aim of this study is (a) to develop a spatial analysis leading to a more comprehensive understanding of the urban development process and its correlation not just to political-administrative borders but also to ecological systems; (b) to identify the level of influence of infrastructure provision development and socio-economical and residential segregation in the Rio de Janeiro Metropolitan Area; and (c) to evaluate urban development dynamics in the period between 1991 and 2000. The spatial analysis presented here encompasses two steps: (a) development of a spatial analysis tool that combines social and infrastructure indicators, and (b) discussion of the application of such tool to map the spatial distribution of these variables and their spatial correlations.

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2.II.2 INFORMATION AS A SUPPORT TO DECISION-MAKING PROCESSES IN URBAN MOBILITY SYSTEMS

Information is an indispensable tool for management, in particular when we are discussing complex systems with high intensity of interaction and diversity of agents. Scientific treatment of Information Systems is a relatively young discipline, where definitions are still rather unstable. We consider information as corresponding to relevant sets of organized data that serve as general input for decision-making and contribute to better management decision through improved knowledge of the functioning of the system being served (i.e. the Urban Mobility System - UMS).

To support decision in the management of the UMS, information should be organized in relation with the decision-making structure. This means that all stakeholders should be considered, in the interactions developed in the following type of decisions:

? Strategic decisions: related with long term, complex and with a less clear structure of decision, usually taken by senior management. Information used is often ill defined, required in a non-recurrent basis, in a good part originated in sources external to the system, gathered in informal way (e.g. newspapers, radio, informal meetings and social events, etc) but highly summarized through the interpretation of the recipient;

? Tactical (or management control) decisions: related with medium and short term, often concerning comparisons with standards. Information is internally focused, short term, historical, usually predefined and required on routine basis;

? Operational decisions: usually supported in well defined rules. At this decision level information is internally focused, predefined and rather precise. Frequency of decision is very high, so it is common to have a good part of it supported by automated means.

Having this in mind, the present work, currently being developed, tries to identify the main requirements for the design of a Management Information System (MIS), to serve as a tool for a Transport Authority (TA) in the management of an Urban Mobility System (UMS). Its conclusion will allow the configuration of a proper MIS, which we expect to considerably help the effective management of the UMS, by bringing up the consistent use of information to all management levels.

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2.II.3

CROSS-SECTORAL APPROACH TO SUPPORT SPATIAL PLANNING

Decisions on land use are often made in isolation by each sector of economy. Cross-sectoral approach is efficient way for design of the harmonious decisions. Key step towards implementation of cross-sectoral approach is the development of intersectoral model. This paper presents a case study of intersectoral model for evaluation of 'hot spots' of rapid forest cover change detected on satellite imagery. We demonstrate approach based on scenario analysis and the use of fuzzy multiple criteria decision making techniques. It points out that the minimum average weighted deviation method is perspective approach for decision of problem of evaluation of growth trend of 'hot spots'.

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3.1.1 CONNECTING THE DUTCH GEO INFORMATION NETWORK ? LIBERTY UNITED

Geo information that can contribute to addressing the spatial challenges in a densely populated country as the Netherlands is amply available. However, accessibility of this geo data is often limited to the data set owner and perhaps a few established relations. Increased and improved access can be realized by the (further) development of a national geo-information infrastructure (or SDI), as is stimulated by the government co-financing grant through the program ?Space for Geo-information?. Within this program the project ? GeoPortal Network: Liberty United? is developing a collaborative network that allows easier and combined access to the wealth of geo data available.

Within the network a framework specifies the minimum ?set of rules? regarding issues like meta-data, open standards, use conditions and pricing mechanisms, to allow a user transparent and easy access to geo information through the network. Regardless of the users entry-point, the user should be ?be able to find and be allowed to use? the geo information he needs.

The network is composed of several ?colorful? geoportals that target at existing application domains, like the ?Red Portal? for the built environment and the ?Brown Portal? for subsurface data. The portals and the network connecting them build on the framework, and are open for other portals or services to join if they are willing to meet the minimum requirements of the framework. The architecture used includes three layers: a data layer, a services layer and an application layer. This allows a mix and match of any combination of information from the available data sets, portals or services the user requests.

Scientific research will aid the project in identifying the factors of success and failure of the geoportals and its connecting network. The project will also develop an improved access model for geo-information, making (legal) use conditions and the (financial) pricing mechanisms more transparent.

An active communication strategy will contribute to raising awareness of the project and preventing the reinvention of the wheel within the Dutch geo information world.

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3.II.1 ACCESS OF SPATIAL DATA USING MICROSOFT SQL SERVER 2000

The work investigates the problem of spatial data management, which need to be stored in non-spatial relational database, containing urban data. Such situation might occur when the amount of spatial data is not prevalent but large enough, so that queries on spatial data should be optimized. Information systems in the field of urbanistics are an example: they contain a lot of both spatial and thematic information. In some cases the use of off-the-shelf solutions like geospatial servers may be not commercially reasonable due to their high price, surplus or inconsistent functionality. Standard relational database management system (DBMS) with spatial support may be exactly what the developer need.

DBMS Microsoft SQL Server is one of the most common commercial server DBMS?s on the market. Unfortunately it has no spatial data types and does not provide spatial indexing. So in order to use it in urban applications it should be extended with such spatial support. In this paper we present the results of performance evaluation of window queries using two implementations of spatial indexing scheme (namely, Z-indexing and XZ-indexing). To evaluate the performance, the numerical experiment was made. It was done for different database sizes, object sizes and query windows. Its results may for a priori estimation of spatial indexing performance in similar systems.

In implementation of Z-indexing and XZ-indexing the proposed heuristic algorithm of quadrant splitting was used. It was shown, that the approximation error in case of this algorithm is smaller then in case of standard algorithm.

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3.II.2

FEASIBILITY STUDY FOR THE PROPER MANAGEMENT OF A SPATIAL AND TOPOLOGICAL GEOGRAPHICAL DATABASE BASED ON ORACLE SPATIAL AND POSTGIS TECHNOLOGY USING COMMERCIALY AVAILABLE APPLICATIONS

The project involved the development of a prototype server based on a Linux operating system (RedHat Server 3.0), and on Oracle Enterprise 10g (v 10.2.0.1.0) and PostgreSQL - PostGIS - GEOS as database server.

The aim of the project was to investigate the features offered by Oracle and PostGis for the management/interrogation/change of geo-referenced spatial and topological data, tune the server, and analyze the performance of queries that require a great deal of calculation.

A study was carried out to assess the feasibility and effectiveness of Oracle and PostGress solutions in the creation of a spatial and topological database for the management, distribution and validation of geographical data. The prototype tests the existence, type and functionality of software solutions that permit the structuring of a database capable of allowing concurrent access to data and remote changes to the same. An essential part of the study concerns DB connectivity for various client applications and the further examination of the issues that arise when attempts are made to elaborate data using different applications simultaneously.

The aim was to assess whether this particular configuration is sufficiently mature and reliable to be used in the centralized management of geographic information in an urban environment.

There are numerous products available that meet to share the contents of one or more servers over Internet; they are similar in function but very different in architecture. For example, there is an object (MAPX) created by MapInfo that allows us to publish spatial geographic layers on the Net. ESRI also has products (ARCIMS) that facilitate the publication of specific workspaces. In both cases we would be tied to the producer, as there is no possibility of accessing third party data.

In order to give the UGN community the opportunity to share geo-cartographic data, we have had to choose products which allow the distributed publication of such data. We gave preference to products which fully support OGC standards and WMS/WFS technology.

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3.III.1 GIS DESIGN AND IMPLEMENTATION METHODS ? THE MECOSIG IMPROVEMENT AND UPDATING PROJECT

The use of methods concerning the design and development of spatial databases and the design, development and implementation of the entire GIS in an organization, started to appear at the end of 80's. At the beginning elements of the existing IS/MIS design methods were used, but soon new ideas and formalisms in the area of spatial databases design and new methods for GIS design and implementation started to emerge. One of those methods including a specific formalism for geographic database design was the MECOSIG (MEthode de COncption de Syst

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3.III.2 **TOWARDS A METHOD FOR AUTOMATED TASK-DRIVEN GENERALIZATION OF BASE MAPS**

Currently, generalization of topographic base maps is driven by the existing supply of topographic data. To provide an optimal topographic setting for thematic information layers, the topographic information displayed on the base map should satisfy the user's information needs. Therefore, we propose an approach towards a method on automated generalization of topographic base maps for thematic mapping at various scales that is driven by the tasks that various user groups carry out to satisfy a specific information need. This method is based on principles of user-centred design and task analysis. This paper describes how these principles are applied on the way to automated task-driven generalization of base maps for Dutch physical plans.

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3.III.3 **CULTURAL HERITAGE AND MULTIDIMENSIONAL REPRESENTATIONS OF BUILDINGS ? A SEMIOTIC APPROACH TO GI-ONTOLOGIES**

Cultural heritage means something to most of us and historical buildings play a role in many peoples daily life. As part of historical or architectural research those buildings represent in themselves former ways of living that has to be documented, analysed and communicated. Furthermore those buildings can be represented in various ways due to a variety of purposes in society. Dealing with city management in general the complex of information concerning historical buildings is for instance present when handling building permissions or city renewal processes, facilitating tourism as well as branding the city or cultural environments in a broader sense. In the geo-information community as well as in the built environment metadata and meta-information as means of communicating content and usability of datasets and information setups has been a key matter for several years. The approach in this paper is the belief that a more abstract level for reflection and understanding of the various modelling processes is needed. Addressing this matter a semiotic modelling tool will be introduced as a formal ontological schema capable of framing the various representational levels concerning complex multidimensional geo-phenomena present in a city management GI-infrastructure. The semiotics of Charles Sanders Peirce (1839-1914) is of increasing interest as means of understanding the fabric and dynamics of representation as well as the processes of communication in general. So it is argued, that the semiotic principle of constantly considering the relations between the three basic elements ? the representation, the object of the representation and the way the object is represented ? establishes an abstract cognitive framework for handling the analysis of the various communicative aspects related to the complex questions of data quality and metadata, meta-information or even meta-understandings.

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3.IV.1 **ENHANCED URBAN POPULATION DISTRIBUTION MODELS USING GEOSPATIAL DATA INTEGRATION AND ITS BENEFITS IN SERVICE ACCESSIBILITY ESTIMATION**

This paper examines the influence that alternative models of population distribution can exert over GIS-based analyses. Specifically, two population models are tested, the de facto 'standard' method of even-distribution within a census tract, and a dasymetric-based model. The latter is constructed by geospatial integration of raster map data with a mailing information database, the methodology of which is explained. An evaluation is performed in the context of an accessibility study, comparing a number of basic services using the 2-step Floating Catchment Analysis technique. This is conducted in both an urban and a predominantly rural region. A number of outcomes are described and discussed. These include a general tendency for the dasymetric model to report lower accessibility scores, but with potentially important variations in this effect being evident both between and within each study region, and on a service-by-service basis. It is concluded that greater awareness of this issue is important given the potential of such analyses to inform the planning of urban and rural service provision and the spatial allocation of central resources.

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3.IV.2 **INTEGRATING SEMANTICS INTO THE INTEROPERABLE 3D GIS CITYSERVER3D**

In this paper, the authors present a practical approach to design and implement an interoperable three-dimensional geographic information system. Besides the described system concept combining visualization and GIS-driven requirements the concept uses up-to-date software engineering techniques to realize a sustainable and extensible 3-tier software system.

The first part describes the general architecture and the specific patterns used to overcome the software engineering hurdles and attaining the goal of geometric interoperability. These include the use of a common functional model to cleanly separate interfaces, data sources and processing and the use of facades and orchestration mechanisms for the establishment of communication between systems.

The second part concentrates on managing the semantic lifecycle of GIS data in the described system. Since it is to be used in various domains and by heterogeneous user groups, an ontology driven approach was developed. Hereby, semantics are managed by using and extending several OGC-standards. FeatureTypes are used as an essential component for the ontology modeling. By combining FeatureTypes and ontologies and by a slight extension of the Simple Feature specification, this approach allows the assignment of features, which possess ontology-dependent attribute definitions, to different domain ontologies.

Following the summary an outlook on further developments like an extension of OGC web services by ontology-driven queries is given.

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3.IV.3 GEOVISUALIZATION WITH SWEDISH STATISTICS (SCB) MULTIVARIATE DATA

Sweden's statistical databases are maintained by Statistics Sweden (SCB) and can be accessed free of charge via the Web. We provide an easy-to-use, exploratory visualization application, called "GeoWizard" that lets users of these databases explore data, construct hypotheses, discover, refine, test knowledge and evaluate results. GeoWizard provides four types of visual representations, implemented in dynamically linked views, parallel coordinates, choropleth map, scatter plot matrix and 2D scatter plot. Our target user group is not restricted to experts, but we want a broader group of analysts to feel comfortable with our human interaction tools. Tailor-made and web enabled applications based on layered component thinking are the foundation for our research. We present a development platform approach that, instead of Java, uses Microsoft's .NET framework, which can integrate a wide range of problem-solving components, both computationally and visually. The approach facilitates .NET hierarchical layout management for implementation of dynamic and resizable views in a single coherent GUI window and a data model optimized for efficiency and interactivity in handling large multivariate data sets. We describe a parallel coordinate browser (PCB) that serves as the control panel for selecting attributes to be explored and provides easier identification of multivariate relationships across spatial domains in the choropleth map and the scatter plot. The PCB integrates range sliders for both dynamic queries and condi

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3.IV.4 **EVALUATING QUALITY OF WEB-MAPPING TOOLS
IN PROVIDING ACCESS AND
USE OF GEOGRAPHICAL DATA**

Internet is the best way to give visibility to efforts to know and deal with phenomena that occurs in the geographical space. Usability has to be carefully addressed by software design, particularly when maps are presented through Internet. The evaluation hereby presented, done in April 2005, compared web-mapping tools provided by four Brazilian state governments. This evaluation considered two main aspects: usability and functionalities related to accessing spatial data. The sites that were evaluated are the following: GeoLivre ? basic geographical information of Rio Grande do Sul State; Interactive Map of Santa Catarina State; Ecological and Economic Zoning of Paran

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3.V.1 **STUDIES ON THE ETL OF THE SPATIAL DATA WAREHOUSE**

In the course of constructing the data warehouse, the process of extracting, transforming, cleaning and loading data (ETL) is the most complicated assignment of the whole work, which covers 60% to 80% workload of the construction of the whole data warehouse project. Therefore the ETL work of the spatial data warehouse is more complicated due to the demand of solving special problems such as transforming and integrating the spatial data. This paper first introduces the definitions of the data warehouse and the spatial data warehouse, and then discusses the main contents of the ETL in the construction of the data warehouse. Then according to the characteristics of the spatial data warehouse, it discusses the main problems that the ETL needs to solve in the construction of the spatial data warehouse, such as the integration of the spatial data, the integration of the spatial and semantic data, integration of multi-scale spatial data, the division of the spatial data, etc. And then it brings forward the basic frame of the ETL of the spatial data warehouse. With the practical case of Constructing Guangzhou Agricultural Economic Data Warehouse as an Example, it discusses how to apply the above technology in performing the ETL work of the spatial data warehouse, which includes: heterogeneous multi-sources data extract & transform interfaces, the concept hierarchy of data, the management and control mechanism based on metadata, intelligent data cleaning, the integration of heterogeneous agricultural economy data, the cleaning, transforming and integration of the spatial data based on ArcGISTM, the integration of the spatial and semantic data based on geocoding, etc. In the end, this paper evaluates the ETL work of the Guangzhou Agricultural Economic Data Warehouse.

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4.1 GEO-COMMUNICATION AND WEB-BASED SPATIAL DATA INFRASTRUCTURE

The purpose of geo-communication is to bridge the gap between reality and data sources on one side and decisions on the other side. This is achieved through several types of activities, where web-services and spatial data infrastructure play an important role. The introduction of web-services as index-portals based on geo-information has changed the conditions for both content and form of geo-communication. A high number of players and interactions as well as a very high number of all kinds of information and combinations of these characterize geo-communication carried out through web-services.

This paper discusses the relations between the different components of SDI and geo-communication as well as the impacts thereof. Discussed is also a model for the organization of the passive components of the infrastructure; i.e. legislation, collaboration, standards, models, specifications, web-services and finally the information. Awareness of the complexity is necessary, and structure is needed to make it possible for the geo-information community to pull together in the same direction.

Modern web-based geo-communication and its infrastructure looks very complex, and it will get even more complex! Therefore there is a strong need for theories and models that can describe this complex web in the SDI and geo-communication consisting of active components, passive components, users and information in order to make it possible to handle the complexity and to give the necessary framework.

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4.2 BUILDING A HARMONIZED BASE MODEL FOR GEO-INFORMATION IN THE NETHERLANDS

In the Netherlands a base model for Geo-Information (NEN3610) has recently been published. This base model is designed as a starting point for spatial data providers in the Netherlands to create sector models. In a sector model a data providers models its own data according to the rules described in the base model. Because all sectors now share a base, interoperability between the sectors is greatly enhanced. This paper describes some design issues behind the model and describes the construction of the first sector-model TOP10NL.

The key features of the base model are: It is an object-oriented model and is fully described in the Unified Modelling Language (UML); it is based on international standards (the ISO/TC 211 model); it describes nationwide unique identifiers; it defines a mechanism to track changes of objects through time; a GML exchange model for the data can be automatically derived from the model; and the model is meant to be extended by sectors to fit the needs of that sector.

We discuss two mechanisms for extending the base model to create a sector model: Extension by subclass and extension by pattern. The pros and cons of the different mechanisms are discussed.

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4.3 THE PREMISES OF 'CITY KNOWLEDGE' ? A MIDDLE-OUT APPROACH TOWARD SUSTAINABLE MUNICIPAL DATA MANAGEMENT

This paper introduces the basic premises that underlie the 'City Knowledge approach' for the gradual and sustainable accrual of urban information in support of urban maintenance, management and planning decisions and actions. The City Knowledge approach is founded on the premise that urban change falls almost entirely under municipal jurisdiction, and specifically under the purview of individual municipal departments. This paper therefore focuses in particular on municipal departments, proposing a strategy termed 'middle-out' that combines the benefits of top-down and bottom-up initiatives, while largely avoiding their respective pitfalls. Instead of proposing a top-down solution to municipal data management, the paper suggests a distributed scheme whereby each department would be in charge of the upkeep of its own urban data, leveraging the power of Geographic Information Systems (GIS) as the platform for intra- and inter-departmental sharing of information. The novelty in this approach lies in its pragmatic, yet systematic pursuit of exhaustive, fine-grained, department-level datasets for each physical structure and dynamic activity in the urban realm, and in the identification of the implementation tools available to municipal governments, as well as of the technical and administrative mechanisms for capturing permanent as well as ephemeral change when it is directly or indirectly caused by official municipal acts.

The City Knowledge concepts introduced in this paper are reinforced and illustrated by a case study about the authors' recent research efforts to help the London Borough of Merton meet its ambitious carbon reduction goals.

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5.1 THE CITIZEN AS DATA SUPPLIER IN E-GOVERNMENT

This paper reports on an ongoing study of how to mobilise and utilize the citizen as data supplier in e-government. The role of the citizen is seen in the context of public participation, and a number of possible application areas for online tools where the citizen can serve the public administration with data are described. Existing applications where citizens act as observers of flora and fauna are described and the limitations of these systems are pointed out. A system architecture for a prototype that is part of the project is sketched and finally the ideas of public participation and citizens as data suppliers are seen in the context of the forthcoming reform of the Danish public administration.

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5.2 THE ROLE OF GEOGRAPHY MARK-UP LANGUAGE IN DEVELOPING ENVIRONMENTAL SIMULATION SERVICES FOR E-GOVERNANCE

There is increasing concern about the environment in which the citizens of Europe lead their lives. As a consequence the demand for high quality environmental information has never been greater and the number and variety of consumers of this information has never been higher. In order to support this information-led society there is a need to develop information services. It is believed that such services can, for example, strengthen participation in an urban planning process that will, through greater consensus, lead to more sustainable urban development. European aspirations for an information society and knowledge economy will only be realised if improvements in information and communication technologies can be harnessed to support this goal. The research presented in the paper was conducted as part of the Intelcities Project that created an integrated suite of municipal information services for citizens and businesses supported by a core infrastructure for the purpose of placing cities at the heart of the information society by 2010. This paper describes the development of environmental simulation services as part of a virtual planning platform. The platform brought together multiple geospatial applications in an interoperable framework. It provided an opportunity to identify and explain, through demonstration, the role of Geography Mark-up Language (GML) in the delivery of environmental simulation services over a distributed system and its? extension to other e-planning services. It was found that substantial and rapid improvements were possible if cities shared their technologies and experience and that the main challenge was the ability of cities to establish a culture that was better able to respond to changes to working practices and relationships with citizens, business and other cities.

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GIS-BASED URBAN CONSTRUCTION ARCHIVE MANAGEMENT SYSTEM

The here presented an application system is part of reserach and developing project named ?Digital City Enginereing? in P.R.China. The aims of developing the application system are to improve filing, managing and utilizing for the document, graph concerning urban construction. There are the Urban Construction Archives (UCA) in 668 cities and 1848 counties, in overall P.R. China. UCA, which belong to Building and Planning Department in local government, takes charge of filing for the building-documents and building-drawings. The urban construction archive are historical records about city planning, construction and management, and important part of the urban management information, which usually are employed as important references to make a decision for the future and present of an urban development. Besides having the essential features of general textual files, images, video and audio records, the urban construction archive possesses both distinct characteristics of location and time, and its position existed and time existed must be recorded in its files.

The generation component GIS platform is adopted to develop the Urban Construction Archive Management System (UCAMS) for displaying, querying and managing the spatial data effectively. The GIS-based system integrates closely the existed management information system (MIS) of urban construction archive and a routine business management workflow unit of urban construction archive; and also, used an embedded large-scale spatial database engine to implementation huge amount of spatial data, attribute data and other archive data. Web GIS technology is taken in UCAMS to publish and search the urban construction archive information on Internet.

UCAMS takes the geographic location as inquire model which change the conventional manual and textual search models and extracts the synthetic information from geographic area, different media and type of archives which provide a new method for management and application of many urban construction archives. The GIS-based system should improve the service qualities of e-Government and extend the service fields of e-Government.

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6.1.1 **THE VOID BETWEEN RISK PREVENTION AND CRISIS RESPONSE**

In this paper we present the results of a study in the Netherlands, in which we have studied the information needs and the use of geo-information in risk prevention and crisis response. The central question in this study was: What are end users' needs for the further development of geo-information and geo-information science for risk prevention and emergency response?

We conclude that there is a great need for better information services for both risk prevention as crisis response. This conclusion can be derived from the numerous initiatives that have been taken on the local and regional level. During our study, we have seen that the two phases mentioned above have their own specifics and more importantly, the types of users, information needs and priorities for further development of geo-information services differ.

For example, the crisis response sector stress the urgency for real time data, while the risk prevention sector is more interested in how the information systems and models that have recently been developed, are actually used and can be used in the decision making process.

It is a very interesting observation that land use planners are increasingly recognizing the need of studying disasters to be able to improve quality of their planning and especially to ensure preventive evacuation in threat of disaster. The emergency sector is also considering more than even before the risks criteria and vulnerable objects used by the land use planners. Appropriate system architectures can link the numerous local initiatives and can enable organizations in both crisis response as risk prevention to use each others data, which opens new ways for a better information exchange and coordination between crisis response and risk prevention.

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6.1.2 REAL-TIME INFORMATION SYSTEM FOR CRISIS MANAGEMENT IN REUNION ISLAND

Reunion Island, with 760,000 people and 2512 km

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6.1.3 **WHAT DID GIS PROGRAMS LEARN FROM KATRINA?**

Hurricane Katrina struck the U.S. Gulf Coast on August 29th, 2005 and forever changed the perception of a nation supposedly prepared to handle natural disasters under the Homeland Security Administration (HS) programs.

How realistic are our emergency preparedness plans? Do towns and cities/regions even have one? How realistic is the role GIS and the role of those managing GIS systems when disaster occur? Does GIS perform well under this type of stress? Hurricanes Katrina and Rita demonstrated the numerous problems with both technology and political handling or mishandling of natural disasters. Both hurricanes presented a ?reality check? for most cities in the world to evaluate again and again their disaster preparedness plans. Both hurricanes also demonstrated that under stress, agencies and politicians responsible for disaster management can learn ? quickly ? how to better such first response systems.

Lessons learned and best approaches will be discussed in the presentation.

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6.II.1 NATURAL RISK ASSESSMENT AND GIS APPLICATION FOR LOCAL COMMUNITIES

According to Piedmont Region (NW Italy) legislation about urban planning and land management at local scale, urban plans approval by regional authorities requires the assessment of natural risk levels. The local directive provides guide lines for conducting the evaluation of risk and the criteria for risk classification. A quantitative method for assessing natural risk levels at local scale, by combining quantitative techniques with GIS technology and by using data produced for urban plans and risk assessment is proposed. Risk assessment is considered as a part of risk management process, where information about natural threatens for local community are collected and risk is quantified. According to the definition where risk is the product between hazard and damage/consequence, a methodology aimed at identifying and quantifying the last two terms was devised. Risk assessment procedure is structured in Hazard analysis, Consequence analysis, Risk calculation and Risk evaluation. The study area was the municipal territory of Vaie (Susa Valley, Turin Province, Piedmont Region). Hazard analysis led to the identification of natural dangers related to floods, alluvial-fan activity, shallow landslides and Deep Seated Gravitational Slope Deformations. Hazard levels calculation was based on the combination of weighted parameters maps. Consequence analysis was conducted by associating to each element at risk indicated by Vaie urban plan a relative values, taking into account different aspects: social value, physical value, economic value, environmental value. A geographic information system was developed and connected to a relational database where information about urban plan and population were stored. The results are displayed in form of raster maps, where, for each cell risk is numerically quantified. Risk values are then converted in risk classes according to 7/LAP risk classification. Based on risk levels, Vaie risk zoning was proposed.

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6.II.2 EVALUATION OF THE SPATIAL MULTIDIMENSIONAL APPROACH FOR THE ANALYSIS OF NATURAL DISASTER DATA

In the context of management of natural disasters it is necessary for the public and the private sector to be aware of the status of all the information at different levels and to build pertinent indicators for the decision making process. The indicators can be built by combining different types of data: descriptive data, numerical data and geographical data. In order to have an overview of the system the exploration of the indicators through various levels would be interesting:

- visualisation through geographical levels: national, provincial, departmental, communal and cadastral;
- visualisation through temporal levels: analyzed periods;
- visualisation through thematic levels: prevention themes, hazard themes, exposure themes.

In order to navigate through all this information, a flexible structure must be implemented to store all the pre-calculated indicators and to make it easily accessible for reporting (graphics, charts, maps, tables).

Dimensional modelling can help in the decision making process by exploiting urban data and risk data.

This paper gives an overview of the evaluation of the pertinence of dimensional modelling to help deciders to get better insight on the data relative to natural disasters in France.

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6.II.3 AN AIR QUALITY FORECASTING SYSTEM FOR URBAN AND REGIONAL AREAS ? OPANA V4

During the last years, an important increased interest has been found in the use and applications of urban and regional air quality forecasting system. In this contribution we present an updated and state-of-the-art version of an urban and regional air quality forecasting system which has evolved from the old version during 90?s and beginning of XXI century. The system has entered in operation recently in the city of Las Palmas de Gran Canaria (Canary Islands, Spain) and it operates over Internet managed by our research group. The system is denominated OPANA V4 (OPerational Atmospheric Numerical pollution model for urban and regional Areas). The system was initially developed in 1995 and it was operating with different version in different cities such as Madrid City, Madrid Community, Asturias, Andalusia, Canary Islands Community, Bilbao City (Spain), Leicester (UK), etc. (San Jos

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6.III.1 SEAMLESS DIFFUSION OF HETEROGENEOUS RISK INFORMATION WITHIN A SPECIFIC REGION

Our objective is to diffuse risk information seamlessly within a region of possible risk. In order to publish risk information regarding various objectives, specific aspects are to be stressed: 1) information should be represented in a unique form, whether or not it comes from various organizations and has different characteristics. (Some of the organizations could be, for example, municipalities, the police, non-government organizations (NGOs), and volunteer organizations); 2) information should be updated and modified when necessary.

In addition, risk information from various other organizations and social groups may be diffused prior to or after a risk event. It is necessary to identify and design a frame for the information in order to improve efficiency and ensure relevancy. All kinds of information need to be synthesized using metadata so that the information is easily accessible to both organizations and community members. We establish ?Web Map Server? and ?Web Feature Service?, and share our risk information system. ?Web Map Server? is an open-source development environment for constructing spatially enabled Internet web applications. A variety of maps can be diffused using the Web Map Server. Extended Markup Language (XML) is used for the metadata as well as the risk data themselves, and Common Alert Protocol (CAP) is used for risk information. The CAP OASIS Standard has been designed to allow a consistent warning message to be communicated simultaneously over different systems. The Web Feature Server is based on the Web Services used to distribute information over the Internet. We constructed a prototype system for the seamless diffusion of risk information using CAP and a Web Feature Service based on a Web Map Server. Use of metadata would allow this information system to be extended to other regions in the future with a few modifications.

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6.III.2 **ASSESSMENT OF GEO-INFORMATION UTILISATION AT THE TSUNAMI AFFECTED AREAS IN ACEH AND NIAS, INDONESIA**

On December 26, 2004, up to 30 m high tsunami waves wiped coastline of Aceh and Nias. According to National Development Planning Agency of Republic Indonesia (2005), the death toll has reached 128.515 in 15 municipalities in Aceh and 130 in Nias.

It has been thirteen months after the catastrophe. Unfortunately, the progress of emergency relief process in Aceh and Nias is not as good as it was expected. Many measures have to be taken and one of them is related to the use of geo-information. This paper will assess the disaster management in Indonesia from geo-information point of view. Having identified current obstacles and challenges disaster management sectors faces, this paper suggests an improved utilization of geo-information at post-disaster area.

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6.III.3 A GEOGRAPHICAL INFORMATION SYSTEM FOR VOLCANIC HAZARD MODELLING

A major application field of GIS technology concerns the study of natural hazards. In this paper, we focus specifically on volcanic eruptions. For the development of land use and emergency plans, volcanic hazard maps represent a fundamental resource. Such maps specify the geographical areas that may be affected by a dangerous volcanic event, such as lava flows. However, volcanic hazard maps are very complex to generate. Moreover, since commonly based on subjective interpretation of historical data, their reliability is difficult to estimate.

In order to provide a more rigorous and systematic approach to the development of volcanic hazard maps, simulations of the phenomenon can be very helpful. For that purpose, we propose an approach for the construction of the hazard map, specifically for the Mount Etna (Sicily, Italy), based on the integration of simulation techniques with data mining and spatial data management. The Mount Etna is a challenging case study since it is the most active volcano in Europe. Nevertheless the only hazard map that has been realized so far for Mount Etna goes back to twenty years ago (Chester et al, 2002) and is based on incomplete knowledge of past eruptions and only qualitative analysis.

For the development of a more accurate hazard map of Mount Etna, we propose an approach based on three key ideas: a) to provide an accurate and comprehensive spatial data base containing topographical and geological data including data about past eruptions; a) to develop a simulation model of lava flows to determine the extent of lava flows originated from emission points; c) to apply clustering techniques to group past emission points and thus outline eruption zones, that is the zones in which higher is the probability of eruption. The idea is then to combine the above components as follows: first the eruption zones are determined based on historical data; then lava flow simulations are generated from sample emission points located in eruption zones, so that the areas which might be covered by lava flows are outlined. In this paper we focus in particular on the techniques developed for the simulation of the lava flow and, since the work is still in progress, some preliminary results and the open issues related to the clustering of emission points.

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6.IV.1 USING SDI AND MOBILE GIS FOR IMPROVING URBAN EMERGENCY MANAGEMENT

Emergency management, with its urgent and time-sensitive nature, is a challenging task in urban areas. It requires rapid and reliable response operations for reducing undesirable impacts of incident on wider society. Proper response operations require reliable and up-to-date information on current emergency situation, existing sources and facilities, while more than 80% of this information has spatial characteristic or location.

The time sensitive nature of emergency situations brings the necessity of collection and usage of spatial information within the minimum waste of time, as an important factor, into front. This will be achieved if in the context of a collaborative effort, each of the parties involved in emergency management, takes responsibilities for collecting some parts of spatial information required for emergency management and sharing them to be accessible for wider emergency management community. In this regard, Spatial Data Infrastructure (SDI) is an appropriate framework to facilitate such collaboration in spatial data collection and sharing. Mansourian (2005) showed the improvement of emergency management by developing an SDI conceptual Model and web-based GIS to facilitate spatial information management.

Based on SDI framework for emergency management, field data collection and real time updating of Emergency Operation Center (EOC) on current emergency situation can be highly improved using Mobile GIS. Mobile GIS can also improve in-field decision-making for emergency workers. Meanwhile, in order to use Mobile GIS for emergency management, it is necessary to expand the developed SDI conceptual model to support Mobile GIS applications.

This paper aims to address the role of Mobile GIS and SDI as an integrated framework for facilitating urban emergency management by improving field data collection and in-field decision-making. This is based on a research project which is ongoing in Iran.

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6.IV.2 A GIS-BASED RISK ASSESSMENT FOR URBAN PLANNING STUDIES ? THE ?ZMIR CASE

The widespread use of Information technologies (IT) became a vital element to many disciplines in recent years; for example city planning, social sciences, engineering etc. Particularly GIS based studies for urban planning has started to gain more importance as a powerful tool to evaluate alternative planning scenarios. Planning is directly related to both physical space and social space. Therefore, one of the most critical purposes of planning is to create environmentally sensitive quality urban environment. In this context, creating safe urban environments protected from natural disasters such as earthquake, flood is very critical issue; because during the last decade a number of disasters (national or manmade) occurred in the world. A North American Tournedos?, a Japan?s Tsunami?s and earthquakes happened all over the world, make people think about what kind of system should be established to prevent countries and people form these kinds of disaster. Specifically in Turkey, there had terrible earthquake experiences on 17th August 1999 and 12th December 1999 in the recent history.

GIS offer powerful tools to make spatial analysis such as risk analysis of earthquake, simulating effects of possible flood or selecting best locations for shelters. In this study, some parts in Metropolitan Municipality of ?zmir were selected to demonstrate how GIS can effectively be used for risk assessment. ?zmir is the third biggest city in Turkey and has three million populations. It has high density settlements in the city center and also has dynamic fault lines. Because of this, this study has an important role to be seen a possible terrible earthquake results. The results of these analyses are represented as a 3D model created using high resolution satellite imagery. ArcGIS 9 and its spatial analyst, network and 3D modules were used as software. Additionally, IKONOS satellite image, belonging to 2004, was used for analysis.

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OBJECT-ORIENTED ANALYSIS OF HIGH RESOLUTION IMAGERY FOR URBAN DATA MANAGEMENT

Every research dealing with the analysis and management of land as well as the observation and modelling of spatial data presupposes the existence of a reliable and up-to-date geographic database. Remote sensing has made possible the monitoring of earth in a continuous and periodical base. Currently, the remotely sensed data are available in very high resolutions enabling land uses mapping of urban areas. To exploit these data, new analysis tools have to be developed to extract thematic information in small scales.

The basic problem during thematic cartography of the urban environment is the heterogeneity of land covers. The complexity of urban features and the similar reflectance of different land objects (streets-buildings) restrain the recognition of urban land uses. Especially in high resolution images the spectral variability and the noise within land use classes is increased and leads to less accurate and unreliable results.

In this paper a new object oriented classification approach is analysed based on fuzzy logic. In opposition to traditional pixel-based methods, object-oriented approach deals with objects that consist of pixels with similar spectral and shape characteristics. Based on this attribute the method takes into account not only spectral information but also shape, form and texture of the objects. Moreover a mathematical approach of fuzzy logic is a powerful tool to handle class mixture for each object. During the implementation, the introduction of LIDAR data as context information is tested for the further improvement of classification results.

The analysis of the results of this project demonstrates that the classification of urban scenes can be improved considerably firstly by implementing a fuzzy approach of object-oriented classification and secondly by integrating multispectral and geometric data.

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7.1.2

USING AIRBORNE LASER SCANNING DATA IN URBAN DATA MANAGEMENT ? SET UP OF A FLEXIBLE INFORMATION SYSTEM WITH OPEN SOURCE COMPONENTS

In recent years airborne laser scanning has evolved into the state-of-the-art technology for topographic data acquisition. Applications for urban areas are recently growing to a greater extent (e.g. building extraction). Airborne laser scanning produces large datasets of point measurements, which demand for new strategies in data management. LISA (LIDAR Surface Analyses) is a concept for combining existing Open Source software for an efficient data management and analysis. The core components are the spatial database PostgreSQL/PostGIS, the geographical information system GRASS GIS and the statistical software R. Interfaces between the system components exist and therefore time-intensive data transfers are avoided. The open structure allows for developing workflows from simple applications to complex analysis. LISA is operationally used at the alpS - Centre for Natural Hazard Management. A large potential is given, for scientific applications as well as for operational tasks of public authorities.

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DATA WAREHOUSE AND SPATIAL DATA MINING AS A SUPPORT TO URBAN LAND USE MAPPING USING DIGITAL IMAGE CLASSIFICATION ? A STUDY ON S

Data warehouse and data mining technologies have been widely used to support business decisions. Both technologies are combined to support urban analysis and to verify data quality. This paper presents a study on data warehouse and spatial data mining techniques applied to support urban land use mapping through digital image processing. The remote sensing data used to classify the urban area is a CBERS-2 image (China Brazil Earth Resources Satellite) and the 2000 Brazilian Census data. The area of study is the Sao Paulo Municipality. The methodology used to obtain the urban land use classes was a supervised classification using the maximum likelihood algorithm. The urban border was identified as an area that needed ancillary data to be classified. The Brazilian 2000 Census data was analysed aiming to understand the contribution of this data to the digital image processing analysis supported by knowledge (rules) mined through Census data sets, with a proposal on how to extract information from Census data and how to relate it to land use image classification. The data set was mined by an implementation of the C4.5 r8, one of the most traditional classification algorithm, using the Weka software. The information achieved with the data mining techniques, was used to improve the digital image processing at the urban fringe. The results show that the areas classified as urban based on census data improved the classification in the urban border. The classification was precise where the areas had already some urban characteristics. The results were checked with the ground truth to evaluate the quality of the classification. The combined inferences resulted in a good improvement in the digital image classification with the contribution of Census data.

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7.II.1

OBJECT-BASED BUILDING DETECTION BASED ON AIRBORNE LASER SCANNING DATA WITHIN GRASS GIS ENVIRONMENT

The paper gives insight into the workflow of a building detection algorithm analysing airborne laser scanning data based on open source software. The procedure is set up in the GRASS GIS environment. Buildings are exclusively extracted from airborne laser scanning data and its derivatives without using any additional data source (e.g. high resolution images). This shows the potential but also the limitations of this kind of data. The implemented object-based approach uses remote sensing and GIS methods. Buildings are landscape objects with a well defined border. The object-based approach works on sharp outlines of objects which is an advantage in the case of building detection.

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7.II.2 ASSESSMENT OF URBAN LOCATION FACTORS FROM REMOTE SENSING

Highly-dynamic, explosively and unmanageably growing mega cities arise throughout the world. This rapid alteration within the urban environment often results in a lack of reasonable information for city planning, risk management or site selection. In urban areas conventional techniques for data collection through field work or census are too time-consuming and cost-intensive. Remote sensing of urban areas with a high spatial resolution has the potential to deliver up-to-date area-wide information about the urban morphology and to infer indirectly additional socio-economic parameters. This paper presents the workflow, from the original IKONOS imagery to a land cover classification and to a structuring of homogeneous zones within the city, based on similar urban morphology. Results show a 3-D perspective of alignments, structures and densities of urban areas. Supported by field work data the allocation of homogeneous zones serves for an area-wide computation of the population density distribution as an example for the inference of a socio-economic parameter. GIS-Layer of the built-up areas as well as census data are the basis for an accuracy assessment of the classification result and the population density. The collation of diverse location factors derived from remote sensing eventually leads to an assessment of a location at the test-site

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7.II.3 UTILISATION OF A LAND USE MAP DERIVED FROM HIGH RESOLUTION SATELLITE IMAGES IN A VAST AREA PLAN ? THE ECOLOGICAL NETWORK

GMES-GUS project was born with the aim of showing the utility of Earth Observation interpretation derived products to the public administrators and all the people dealing with spatial planning.

Service and product typologies deriving from this project are oriented, in particular, to urban transformation monitoring land use changes to evaluate market needs and requests in this field.

The Province of Treviso has joined the project to test the potentials of the services supplied by industries in order to produce a final product for a vaster area (the whole Province's territory) than that one of the experimental phase.

By this first experience, the administration has decided to produce maps for all the administrated territory.

The use of these maps was concentrated on vast area spatial planning and, in particular, for the Province's ecological network in the Province's Vast Area Plan (PTCP).

This use has allowed to derive some considerations about the critical and the positive aspects of this product typology.

This paper concentrate on product description and the methodology applied for the realisation of the maps, describing some specific uses.

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THE IMPACT OF A MAIN ROAD (IP4) IN THE DEVELOPMENT OF URBAN SOIL USE IN THE MUNICIPALITY OF VILA REAL, PORTUGAL

The detection of changes in land use resorting to images of earth observation is an important tool for planning and administrating natural resources and urban areas.

Since the release of the first satellite for earth observation, in the decade of the 70s, several methods to produce land use cartography based on satellite images have been developed. In the beginning this production was done based on the visual analysis in everything similar to the photo interpretation of aerial images. Later on, researchers devoted themselves to the development of methods based on the automatic analysis of images. For many years, the maps of land use which derived from the automatic classification of images had smaller and quite inferior precision to those produced on the basis of visual interpretation of images. Consequently, the first operational programs were based on visual analysis.

In the 90s the first operational programs of cartography production, this time based in automatic methods, began to appear. However, most of those methodologies still need an exhaustive manual post-edition to arrive at a good precision.

This paper aims at estimating the quality of a classifier based in neural networks (NN) to quantify the development of urban areas on the basis of SPOT 5 images, induced by the structuring effect of the main communication route that crosses the whole Northern Region of Portugal (IP4).

The method is tested for an area of 1090 ha, located in the urban centre of Vila Real, and it is based on an aerial picture of 1985, which was previously photo interpreted. The results will be compared with those obtained through the delimitation of an urban area derived from the digital cartography updated in 2004. This method has proved to be extremely reliable and quick when compared with other classifiers available in several programs of automatic classification.

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8.1.1 SIMULATING URBAN AND REGIONAL SCENARIOS IN EUROPE ? STUDY CASES IN ALGARVE PROVINCE, PORTUGAL AND DRESDEN-PRAGUE TRANSPORT CORRIDOR, GERMANY-CZECH REPUBLIC

Among other causes the analysis of urban areas and their development has particular relevance because of their growing exposure to natural hazards, particularly floods and forest fires. Inappropriate regional and urban planning can exacerbate the negative effects of natural hazards. On the other hand, good land management and planning practices, including appropriate land use and development control in natural hazard-prone areas, represent suitable non-structural solutions to minimise exposure and damage. This paper aims to provide a coherent basis for the spatial planning and management of landscapes in Europe.

The MOLAND Model for urban and regional scenario simulation (Barredo et al., 2004; White et al., 1999) is used to evaluate spatial planning for sustainable urban and regional development and measures for natural risks reduction. We describe the application of the MOLAND Model on the two case studies, the Algarve Province in Portugal and the Dresden ? Prague transport corridor in Germany and in the Czech Republic.

Urban simulations offer a useful approach to understanding the consequences of current spatial planning policies. The scenarios are considered to generate data of meaningful representations of the region?s characteristics whilst still allowing the model to process data in response to the wide variety of possible policy packages specified by the user. The new tool will enhance support to European policies of sustainable development and the derivation of current strategies regarding the adaptation to extreme weather events.

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8.1.2 GENERATING AND MAPPING POPULATION DENSITY SURFACES FOR URBAN AGGLOMERATIONS USING GIS AND DASYMETRIC TECHNIQUES

Population mapping, in general, has two purposes: firstly, to cartographically portray the extent and density of population across an area of interest, and secondly, to derive a quantitative estimation of population density for use in subsequent spatial analytical modeling tasks. A cartographic portrayal of population traditionally has the form of a choropleth map. This kind of mapping is very simple, but despite its simplicity, choropleth maps have limited utility for detailed spatial analysis of population data, especially where human populations are concentrated in relatively small numbers of villages, towns and cities.

One potential solution to these problems is a surface based demographic data representation, in which data is modeled as a continuous surface that is not depending on partitioning into arbitrary enumeration units. It can be done by transformation of the administrative units into smaller and more relevant map units through the process known as a dasymetric mapping. The dasymetric technique maps a quantitative variable according to boundaries derived from the character of the data distribution.

This paper demonstrates the use of satellite derived ancillary land cover data (CORINE Land Cover Database) to map population densities within urban agglomerations in Poland using dasymetric mapping. The first issue addressed was 'how is population distributed among CORINE Land Cover classes in Poland?'. Special attention was made to estimate the coefficients for the population ratio in land cover classes. The three dasymetric methods presented, revealed the variation in population density more realistically, in particular, among built-up areas and the others. There are: a binary method, a fixed percentage method, and an areal weighting correlation method. The methods were tested for several urban agglomerations, which have a mix of land cover classes - from undeveloped (forest and agriculture) to heavily urbanise. This paper presents the results of dasymetric mapping population density in Warsaw Metropolitan Area.

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8.1.3 **A DIVIDED CITY ? SOCIAL GEOGRAPHY OF SALVADOR METROPOLITAN REGION**

This paper presents the methodology applied and the results of a project research done on social and territorial impacts at Salvador metropolitan area caused by changes in Brazilian economy and demographic evolution. The main goal is to understand Salvador social geography and in order to do this a database composed by a vast spatial and non spatial data set was designed and assembled. At first non spatial data was processed to classify and present the social structure of the Metropolitan area. Then, this social structure was analyzed in its geographical distribution and how it is related to the metropolitan urban space. This project is a part of a research network named Metropolis, Unequal Socio Spatial Distribution and Urban Governance, a federal government initiative that intends to broaden knowledge about how Brazilian main metropolitan areas have been developed. The social geography of Salvador was mapped using a huge set of spatial and non-spatial data. The non-spatial data was related to economically active population's variables such as: income, occupation, activity area and educational degree. The spatial data includes census areas, transport system, cadastral data, and others data from local and regional planning offices, beside these images ? aerial photographs and remote sensing images ? are used also, for different uses; for instance, characterize urban occupation in diverse time periods.

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8.II.1 EVALUATING THE FUTURE IMPACTS OF URBAN SPRAWL BY CELLULAR AUTOMATA SPATIAL DYNAMICS MODELING AND LANDSCAPE FRAGMENTATION ANALYSIS

This paper describes a spatial analysis methodology (Veduta - Visualizing and Evaluating the Development of Urban and Transitional Areas) that has been developed at the Land Management and Natural Hazards (LMNH) Unit of the European Commission's Joint Research Centre (JRC), for visualizing and evaluating the spatial impacts of urban sprawl on 'functional urban regions' in Europe. Urban sprawl occurs when the rate of land conversion and consumption for urban land uses exceeds the rate of population growth for a given area over a specified period. The methodology for assessing urban sprawl is based on analysis of changes in the spatial structure of urban and transitional (i.e. urban / rural) landscapes, that have adverse social, economic, and environmental impacts. The paper describes the main technical aspects of the methodology, and illustrates its application to selected study areas from the JRC's Moland database. In particular, the methodology has been used to assess three social impacts of urban sprawl (i.e. quality of amenities; access to green areas; housing density), two economic impacts (i.e. commuting distances; access to services), and three environmental impacts (i.e. degree of soil sealing; biodiversity potential; habitat disturbance). The use of 'cellular automata' land use modelling for assessment of likely future impacts urban sprawl is also described.

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8.II.2 THE USE OF GIS AND ROUGH SET IN URBAN PLANNING

The distinction among urban, peri-urban and rural areas inside a territory represents a classical example of uncertainty in land classification. The transition among the three classes is not completely clear and can be described by the Sorites Paradox, taking into account residential buildings and settlements. Peri-urban fringe can be considered as a transition zone between urban and rural areas, as an area with its own intrinsic organic rules, as a built area without formal organisation or as an abandoned rural area contiguous to urban centres. In any case, concepts as density of buildings, services and infrastructures or the degree of rural, residential and industrial activities, will lead to uncertainty in defining classes, due to the uncertainty in combining some properties. One of the methods which can be employed is the rough set theory, which represents a different mathematical approach to uncertainty capturing the indiscernibility. The definition of a set is connected to information knowledge and perception about phenomena. Several phenomena can be classified only in the context of information available about them. Two different phenomena can be indiscernible in some contexts and classified in the same way (Pawlak 1983). Rough set approach to data analysis hinges on the basis of two basic concepts: the lower approximation, which considers all the elements that doubtlessly belong to the class and the upper approximation, which includes all the elements that possibly belong to the class. Furthermore, the rough set theory takes into account only properties which are independent. This approach has been tested in the case of study of the Province of Potenza, in Southern Italy. This area is particularly suitable to the application of this theory, because it includes 100 municipalities with different number of inhabitants, quantity of services and distance from the main road infrastructures.

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8.II.3 ENVIRONMENTAL AND URBAN DYNAMIC INDICATORS

The paper presents a set of indicators, calculated in the spatial dimension, suitable to measure the sustainability of the city of Rome.

The reference framework being the MURBANDY-MOLAND project (AA.VV., 2002), the focus of this work is both on the availability and accessibility of 'basic urban services' (e.g. schools, hospitals, green areas, public transport), and on the physical urban structure dynamics (sprawl and integration)

To be useful for planning activities, the indicators have been calculated on the basis of three different zonings within the city:

- ? a regular grid (250m x 250m) for the 'availability' indicators;
- ? a regular grid (1000m x 1000m) for the 'accessibility' indicators;
- ? a anular-sectoral subdivision for the urban dynamics indicators.

Different data sources have been integrated: earth observation data (ETM 2001, land cover 1992), vector coverage (road network, census units, public transport network) and statistical data. It has been necessary to develop diverse methodology for the same indicator type, when applied at different themes.

Two different problems have been met: first, the irrelevance of some problems in the city of Rome (e.g. the derelict land, and, second, the need to improve the dataset, because of the scarce availability of data and/or their level of homogeneity were not always satisfying. Nevertheless the result - revealing the differences within the urban area - seems to be a good informative basis to better the understanding of the 'city environment?', and therefore a useful tool in the decision making process to drive the urban change.

Keywords: sustainable development, spatial indicators, zoning system, global and local scale.

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GENERATION OF COST SURFACE FOR GAS PIPELINE ROUTE FINDING

This paper outlines a strategy for gas pipeline route design from a geometric perspective in a geospatial information system (GIS) framework. We generated a cost surface from the factors using different overlay functions including index overlay, fuzzy product, fuzzy sum and fuzzy gamma models. For integrating the factors, they have been weighted using a combination of data driven and knowledge driven methods. We calculated the value of weights for factors on an existing pipeline route (Bidboland-Farah in Isfahan Province at the central part of Iran). The weights were multiplied to the corresponding factor layers and then the factors have been combined. The results verified the superiority of fuzzy gamma model for the overlay operation. The achieved value of gamma and weighted parameters have been applied in Maron-Ahvaz gas pipeline route located in Khuzestian Province in South-West of Iran and a pipeline route has been designed that is 31% cheaper than that of the existing pipeline route. The result shows, the calculated gamma value and weighted parameters are very useful for gas pipeline design.

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8.III.1 **INFORMATION SYSTEM CONTROL FOR LONG TERM FUEL SHORTAGES**

A conceptual idea is proposed for an information system that rations fuel in the event of transport fuel energy shortages. Fuel crises have occurred in many countries in recent history and it is anticipated that fuel energy shortages will become more common in the future. A Vehicle Fuel Rationing (VFR) system has been conceived that improves upon current management strategies for fuel rationing. A VFR system is an information management system that matches fuel rations exactly to the available supply using real-time data of oil supply and consumption. Users would purchase fuel rations with a fuel card similar to existing fuel cards, however, the card would contain a chip that is constantly updated with the user's fuel ration quantity. Such a system would be used when market forces are no longer able to control fuel demand. The conceived VFR system should put a stop to irrational behaviour, such as 'panic-buying' and reduce the negative economic impact of a fuel shortage. VFR systems, in conjunction with world cooperation, have the ability to provide an alternative to market forces control of a vital resource, thus reducing the instability of oil prices. This paper explains how the proposed VFR system could function within cities or countries and also puts forward ideas for inter-country cooperation in managing world oil reserves as a shared resource.

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8.III.2 USING LAND VALUE IN REALIZATION OF URBAN DEVELOPMENT PLANS IN A GIS FRAMEWORK

Urban development plans (UDPs) are among the most important tools for optimum management of existing complex cities. Therefore, it is necessary to optimize or solve these problems in production or realization of UDPs for increasing the efficiency. This paper outlines the role of land value through implementation and optimization of real estate appraisal as an influencing parameter in optimization of UDPs production process. Considering previous research, the joint use of artificial neural network (ANN) and geospatial information system (GIS) seems to be a useful approach for UDPs production process. The implemented methodology in ANN process was Kohonen Self Organizing Feature Map (KSOFM). For implementation of the above-mentioned approach, maps of some parts of Tehran at a scale of 1:2000 have been acquired and spatial parameters consisting of geometric and accessibility factors extracted using GIS and fed in KSOFM. Then, the outcomes of the network were classified and similar land parcels identified. It was clearly distinctive that KSOFM is useful for land classification. In the next step, the produced map is used for selection of best places to build a primary school, as a case study, on the basis of the standard criteria. The field work carried out for market value determination is preceded with value estimation of the selected parcels using multi regression analysis (MRA) method. It has been concluded that the proposed parcels are not suitable due to lack of sufficient financial resources of the Department of Primary Education. The research successfully showed the importance of taking land value into account at early stages of UDPs production process.

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8.III.3 FUZZY-ASSISTED IN A GIS-BASED DYNAMIC URBAN TRAFFIC CONGESTION MODEL

Most of our traditional tools for formal modelling, reasoning, and measuring of congestion are crisp, deterministic, and subjective in character. But urban traffic network real situations are very often uncertain or vague in a number of ways. So for congestion modeling in outdoor situations we have two problems: 1-real situation are very often not crisp and deterministic, and they cannot be described precisely, 2-the complete description of a real congestion measurement system often would require much more detailed data than traffic experts could ever recognize simultaneously, process, and understand. In these situations, traffic experts' decisions are based on vague or imprecise concepts, which can often be expressed linguistically.

This paper reports on a GIS-based decision supporting system for dynamic congestion modeling in a real urban traffic network. The proposed method uses a discrete time dynamic network assignment procedure that predicts network flow at detailed temporal resolutions. So by considering and modeling speed and inter-vehicle distance of each road section in a particular period of time we have designed and implemented a fuzzy model for measuring levels of congestion for different type of urban roads in a GIS environment. Tests of measured congestion for a moderate complicated network are conducted and their results show the efficiency of the algorithm and support our analyses with respect to conventional volume to capacity (V/C) ratio method.

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8.IV.1 **HOW WIND POWER LANDSCAPES CHANGE ? AN ATTEMPT TO QUANTIFY VISUAL IMPACT ON LAND USE AND RESIDENTS IN NORTHERN JUTLAND, DENMARK**

Following 25 years of continuous development, Danish wind energy landscapes are going to face changes. Ceased on-shore construction, unresolved re-powering and stalled regional planning characterize the situation overshadowed by off-shore development. One of the factors inhibiting development appears to be planning uncertainty regarding the future impact on landscapes. Visual impact has seldom been an issue so far, but growing turbine size and less local involvement may change this. This paper presents a deterministic approach of quantifying perceived visual impact on landscapes and population, taking into account that there is no clear threshold for perceived visual impact. A raster-based geographical information system (GIS) has been used to build a regional landscape model for Northern Jutland County, which is used to assess visibility of turbines in the period of 1990 to 2010. Multiple viewsheds are computed for a variety of thresholds of visual impact, and since overlaid with population and land use data. The results indicate that the construction of new turbines replacing 40% of the old turbine stock and raising the installed capacity by 20% will not add to the comparative impact in general. However, the pattern of visibility will become askew, and the present homogenous distribution of visibility will disappear. This skewness, together with changing ownership and receding local involvement, could eventually lead to lower popular acceptance of wind power.

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8.IV.2 **COMPARING LOGISTIC REGRESSION METHODS FOR MICRO-SIMULATION URBAN LAND USE CHANGE MODELLING**

Urban simulation model can represent a valuable approach to understanding urban phenomena and, to some degree, to reflecting the consequences of previous and current planning policies. Simulation of urban growth, however, requires sophisticated tools to embrace the complexity of urban systems. In this paper, we present logistic regression techniques, integrated with the dynamic approach of the micro-simulation cellular automata (CA) and a geographic information system (GIS), for predicting patterns of urban land use change. Through logistic regression, estimations of spatial land use transition probabilities are calculated. These probabilities are embedded in CA rules, driving cellular automata to simulate spatial urban land use dynamics within a GIS environment. The key focus of this paper is the exploration and comparison of the possible application of two statistical logistic regression methods ? the binary and multinomial logistic models ? and a determination of their success in replicating a given pattern of land use change. The work is based upon a case study for the Lat Phrao district, Bangkok, Thailand. Different simulation results for the case study site were generated. The two methods give a high level of similarity for their simulation results, mainly because of the influence of similar independent variables ? proximity to road types and neighbourhood effects.

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8.IV.3 URBAN PLANNING IN BART?N RIVER, TURKEY

Bart?n, which is located in the western Black Sea region in Turkey, has important landscape features with its 3000 year-old history. The most important feature of Bart?n is Bart?n River, which flows in the historical city center and which is the topic of this paper. Bart?n River, which flows into the Black Sea, is also important due to its length of 12 km and the natural, historical urban and archaeological sites around it which are protected by the law of Registered Immobile Cultural and Natural Heritages.

Bart?n River has been an important river for years because of its natural and cultural features and touristic and recreational opportunities. It is capable of transporting goods from the Black Sea through the city with ships (500 tones). Thus, it provides recreational trip with rowboats and motor-driven sea vehicles and sportive fishing opportunities to the society besides commercial transportation with freighters.

Bart?n River, which is a main factor of the establishment of the historical city characteristics of Bart?n, is faced with the problem of unplanned urbanization caused by population increase and misuse of land such as disordered industrilization unconscious agricultural activities, developing highways and decreasing flora and fauna. Therefore, it needs conservative strategies.

In this paper, to contribute to the precautions to be taken to ease the solutions of the present and future environmental problems, the natural and the cultural landscape values of the Bart?n River and its vicinity will be evaluated using Geographical Information Systems (GIS). According to the data acquired as a result of this research, proposed land use planning for the Bart?n city will be developed, based on the Bart?n city and its vicinity?s urban planning concept.

Keywords: Bart?n River, urban planning, river landscape, land use planning

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8.IV.3 **GIS APPLICATION IN MONITORING IMPACTS OF DECENTRALIZATION ON URBAN LAND USE ? SWANSEA (UK)**

Retail decentralization is an international phenomenon. However, each city is unique and therefore the causes of retail decentralization differ with different geographical localities. Globally retail decentralization can be attributed to growth of suburban population, rise of car ownership, congestion in the central area, cheap and sufficient space available in the suburbs for the large sites, and commercial priorities of property developers

Retail changes due to decentralization and revitalization in Britain have been a particular area of interest. Retail changes due to decentralization and revitalization in Britain have been a particular area of interest.

Adopting a focus on temporal and spatial dimensions, this research aims to explore the impacts on retail functions by using GIS to monitor the changes in a city centre experiencing severe pressure from decentralization. The research was conducted in the Swansea City Centre in South Wales, UK between 1st June and 5th July 2003

Thematic land use data extracted from road plans, manipulated and analysed in a GIS environment has revealed that the Swansea city centre retail functions have been impacted upon by both decentralization and regeneration processes.

Key words: Retail decentralization, GIS, retail revolution.

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8.V.1 **3D URBAN GEOLOGICAL MODELING AND ITS APPLICATION IN CBD BEIJING**

3D urban geological modeling is an important research issue with the studying of the digital city in China. In view of the deficiencies of present modeling methods, a new method to model 3D urban geological body including faults based on generalized tri-prism (GTP) model is presented. Four geological knowledge inference rules about urban 3D urban geological modeling are put forward. The method mainly includes three steps: a) Process and organize the borehole data; b) Generate Delaunay TIN (D-TIN) of the geological upper surface according to borehole's collar data; c) Extend each triangle of the D-TINs down into GTP along borehole line referring to the four geological knowledge inference rules. In order to improve the flexibility and the interactivity of 3D visualization, a 3D interactive environment is provided. The application for 3D geosciences modeling and 3D visualization including 3D interactive visualization, aided design and spatial inquiry etc are introduced. A real-3D geosciences modeling system, GeoMo3D, is developed with VC ++, OpenGL and SQL sever. An actual 3D geological model of an exploring district of CBD, downtown Beijing, is shown as a case.

Keywords:

3D urban geological modeling; generalized tri-prism (GTP) model; geological knowledge inference rules; 3D interactive visualization; aided design

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