ISDE

ABSTRACTS

The 3rd International Symposium on Digital Earth
Brno, Czech Republic, September 21-25, 2003

Digital Earth

Information Resources for Global Sustainability

Edited by Milan KONECNY
Co-editors: Lucie FRIEDMANNOVA, Miroslav KOLAR, Pavla STEPANKOVA

Knowledge
Networks
Technology
Economy
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orgGSDIri Global Spatial Data Infrastructure

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FAO Food and Agriculture Organization of the United Nations

PANGEA WORLD

FGDC Federal Geographic Data Committee

Institute of Computer Science Masaryk University

VÚGTK

CAGI Czech Association for Geoinformation

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PROGRAMME

Ladies and Gentlemen, Colleagues and Participants of the 3rd International Symposium on Digital Earth, Dear Friends,

Our Symposium takes place at very important time, between World Summit on Sustainable Development in Johannesburg and World Summit on the Information Society which will be held on 10-12 December 2003 in Geneva, Switzerland.

As a cartographer with a geographic education and knowledge, I believe that our world needs global spatial data, information and knowledge support for solution of global problems. Several global spatial data oriented initiatives were started after the Rio Earth Summit in 1992. The Global Map project supported by the Japanese Government was the first. The Global Spatial Data Infrastructure the second one, and Digital Earth initiative the third. These initiatives are complementary. In several regions the spatial data infrastructures are working well when integrated with information infrastructures and other Information Society development.

One of the main tasks of the coming 3rd Symposium on Digital Earth reflected in our Proceedings is to strenghten the link between development of geographic (spatial) information that is specific, full of knowledge and wisdom, and other aspects of the emerging Information/Knowledge-Based Society.

Almost five years have passed since Al Gore defined the idea of a Digital Earth. It emerged from the successful realization of the National Spatial Data Infrastructure in the USA, Canada, Australia and New Zealand, and the United Kingdom: initiated

by specialists in digital cartography, GIS and remote sensing. Geographic information elaborated and processed by various methods and in different ways has been the principle ingredient designing the step-by-step realization of the SDI's, NSDI's and Digital Earth ideas.

However, Al Gore's proposal went beyond technology deployment. Today we have many technological tools but only a small proportion of the world's population is able to use them in their everyday lives. There are still barriers for many people without special education, training and knowledge to use modern technologies. But is our World only about technologies? No, it is not. We have many other problems, dreams, and ambitions. We also have ideas on how to solve many of the situations of the contemporary World. Support of such ideas was one of the aims of the World Summit on Sustainable Development in Johannesburg.

Sustainable Development is no longer limited to economy and ecology and their relations but it also includes cultural heritage, education, technology, and the social and ethical aspects of societies. Only a combination of all the above mentioned aspects can lead to solutions acceptable by most of humankind.

We need to communicate, we need to exchange our opinions, knowledge and best practices. Because our symposium will be held in Europe, let me give you an example from this region. In 1996, the European Commission established the Information Society Forum. The Forum's final report was published in 2000: The European Way Towards Information Society. Its purpose was not to give direction to people in other regions but to share European knowledge and offer possible solutions coming from the multicultural, multilingual and multieconomical space of Europe's emerging Information Society.

Other activities are going on in the developing countries. For example in China they are dynamically realizing the idea of Digital Cities, in India several progressive events in Geographic Information like the Digital Map symposia are being organized. In Malaysia an excellent National Spatial Data Infrastructure NALIS, is being realized, and in Africa and Latin and South America there are new strong efforts to create continental spatial data infrastructures.

The Brno event has the ambition to reinforce these trends and to embed them in the wide range of Information Society development processes. The 3rd International Symposium on Digital Earth wants to continue in this direction. Relations between problems of sustainable development and information society are not observed and investigated enough. The solutions are still not sufficiently visible in everyday lives of people. For us in Europe, Digital Earth is closely associated with the "eEurope" initiative of the European Union. There are new problems coming from the complicated political situation in the World. There are fundamental problems with the use of data, information and knowledge from the legislative, security and technical points of view. We need to offer solutions for the "digital divide" issues not only in the developing but very often also in the "developed countries". We need a theory and a philosophy of the contemporary World so much influenced by information technologies to get better

quality of life of people and at the same time to establish a sustainable environment.

The 3rd International Symposium on Digital Earth is organized by Masaryk University in Brno, Czech Republic in close co-operation with the newly established International Society on Digital Earth. The program consists of several segments. The core is traditionally GI oriented. Among conference topics you will find problems of the Earth observation and processing technologies for Digital Earth, the meaning of sustainability and policy of its formulation, delivery, monitoring and evaluation. Other important parts of the symposium are the Global Society Dialogue as well as e-government, e-governance and e-parliament as accompanying factors of a networked knowledge society. Topics about global sustainability versus homeland security should also be very interesting. There are topics linked with delivery of services to citizens and digital cities, communities and localities. Finally, we are paying attention to the global and regional spatial data and information projects, best practices of the SDI design and usage, development of the Digital Earth idea and coming European Union projects, such as INSPIRE.

Several international organizations serve as patrons for the symposium, such as the International Cartographic Association, CODATA, ISO, and the Open GIS Consortium. In addition, several ministries of the Czech government are included in the organization of the symposium: Ministry of Foreign Affairs, Ministry of Informatics, Ministry of Environment and Ministry of Interior. Also U.N. organizations such as FAO, UNEP, and UNESCO have been invited and all activities of the U.N. connected with sustainable development, Information Society and global spatial data projects (GM and GSDI) are included. At the European level Directoriate Generale such as Information Society and Environment, and Joint Research Center in Ispra are part of the preparation process of the symposium and its program.

I hope that published Abstracts of Papers and Proceedings of our Symposium will be good add to the the discussion about necessary conditions, processes and barriers of creation of the Global Sustainable Information Society.

Milan KONECNY
President of Organizing Committee of the 3rd International Symposium on Digital Earth;
President of the International Cartographic Association,
Member of the Steering Committee and Plenary of the Information Society Forum EC
and Global Society Dialogue of the EC;
Academician of the International European-Asian Academy

SUNDAY
September 21, 2003

Opening Ceremony

Opening Speaches

Vladimir MLYNAR
Minister of Informatics of the Czech Republic

Libor AMBROZEK
Ministr of Environmentof the Czech Republic

Pavel VOSALIK
Deputy-Minister of Foreign Affairs of the Czech Republic

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Ammatzia PELED
ISPRS

Myra BAMBACUS
NASA

NASA's Perspective on Geogspatial Interopersbility

Peter JOHNSTON
EU

A European way to a sustainable knowledge society

A European way to a sustainable knowledge society

Peter JOHNSTON
European Commission

The transition to a competitive and dynamic knowledge-based economy is now the central theme of Europe's economic and social policies to 2010. This objective is now integrated with the goal of sustainable development, both in Europe and at the world-level.

Information and communication technologies are the key enablers of change. A "Digital Europe" and a "Digital Earth" must be sustainable – in terms of economic growth, social inclusion and environmental resource use.

This contribution to the 3rd "Digital Earth" conference highlights some of the policies and measures we are taking in Europe to realise this goal.

Introduction

Much of the value of scientific Conferences is that they bring people together : They make new links and build new bridges between people and scientific research. This is particularly important in the development of a knowledge-based economy and of sustainable development, where a holistic view of societal change is essential. I therefore welcome the initiative by the organisers of this "Digital Earth" conference to widen the scope of discussions beyond the topics of digital cartography and remote monitoring, to include a wider range issues.

This Conference is also part of a longer process of international debate – not just as part of the series of "Digital Earth conferences", but in the broader perspective of social and economic changes and of the forthcoming World Summit on the Information Society. "Digital" technologies have a crucial role in sustaining growth, in fighting poverty and exclusion and in increasing the efficiency with which we use natural resources. I will therefore say a few words about the emerging issues.

It is also important that this Conference is hosted here in the Czech Republic – one of the countries which will become part of an enlarged European Union in 2004. Not only will the enlarged Union bring together over 450 million people into a single framework of security and prosperity, but the new Constitution proposed by the Convention on the future of Europe will strengthen the focus on sustainable development, underpinned by technology development and innovation. I will highlight some of the key aspects of this.

Finally, I will say a few words about current European policies and programmes, and about how they relate to your discussions in the next days.

1. The economic and social framework for a "Digital Earth"

To put your discussions into context, some longer-term trends have been apparent and stable through the 1980s and 1990s, and can reliably be expected to continue for another decade or more :

- GDP- and productivity growth continue to be driven by research, technology

development and innovation, and in principle, they could sustain non-inflationary growth of about 2-3% per year in OECD countries – sufficient to maintain high-levels of employment;
- The "digital" information and communication technologies play a key role in this ; both as a fast growing proportion of GDP, with the sector having grown from 4% of GDP in 1990 to about 7% in 2002, and likely to grow to 10% in 2012 ; and as a contributor to GDP and productivity growth across the rest of the economy;
- This enables, and is enabled by, a continuing shift to networked-employment in knowledge-based services, and for a better educated and more skilled workforce;
- Increasing specialisation in business activities necessitates increasingly complex networks of collaboration – for which communication networks, networking and knowledge-management technologies are vital ; the next generation of the Internet, with broadband multi-media capabilities will be the key infrastructure for development for a complex and interdependent knowledge society;
- Constraints to growth come increasingly from pressure on resources (traffic congestion, and the ability of the environment to absorb pollution and greenhouse gas emissions) requiring more intelligent and efficient resource use;
- Demographic change to a stable, longer-living, but older population – with a higher proportion of active people over 60 - requires not only an extension of working life to sustain actuarially-balanced pensions schemes, but a greater valuation of knowledge and experience in work, with life-long learning, and more flexibility in the time and place of work.

These persistent long-term trends underlie Europe's continued commitment to becoming a competitive, dynamic and sustainable knowledge society beyond 2010.

2. Key Technology Development Perspectives

The nature and pace of future technology developments is often much more predictable than the use that society will made of new technologies.

Computing power has doubled each 18 months since 1980, and is likely to continue to do so beyond 2010. IBM recently presented the following "targets" for future capabilities: **In computing**:10 times the processing power per $ in 2008; **In memory**:10 times as much storage per $ in 2009; 1000 times as much data available on the Internet by 2006, and 1 million times as much by 2010; and **in communications capacity**: 100 times faster connections in the Internet backbone and local access by 2008. In this perspective, only a few % of the potential of the "Internet" is yet realised in terms of the number of users; the number of connected devices; speed and bandwidth; the amount of content, and the number of applications.

Beyond the "Internet" itself,
- There could be a further 20-fold increase in the efficiency with which the radio spectrum is used (by data compression and "smart antennae"). Radio-based multimedia communications (images, diagrams, photos and short videos) could be as pervasive in Europe in 2010 as GSM voice telephony is today.
- Light-weight, thin, energy-efficient displays could be integrated into a much wider range of equipment: 3D and synthetic imaging could be a mainstream design tool in architecture, fashion, health-care and manufacturing and a major contributor to environmental monitoring.

- Micro-sensors could be pervasive in environmental monitoring, health-diagnostics, cars, kitchens and workplaces; electronically networked “labels” could protect against fraud, protect creativity and IPR, and enable food traceability.

The value to society is not just in mastering the supply of technology itself, but in how effectively and widely it is used. Key new challenges will therefore be in managing knowledge, complexity and security. The emerging “soft sciences” of knowledge management; the simulation of evolving complex systems and of risk assessment will therefore become crucial.

It is therefore particularly important that we, in Europe, continue to develop a coherent regulatory and RTD framework – not just for “electronic communications services”, but also for work, business and governments : with a focus on sustainable development, security and international trade: It must facilitate the provision of appropriate technologies and infrastructures for everyone, and stimulates the effective and coherent use of them in government, business and private life.

3. The International debate on sustainable development and the Information Society

There is no greater or more pressing challenge than that of sustainable development : Managing the transition –over the next 20 – 30 years – to a more prosperous and equitable world society of up to 8 billion people, living in harmony with our environment.

The international agenda for Sustainable Development has emerged in a series of major conferences in the 90s, starting with the Conference on Environment and Development in Rio in 1992. In the last three years, progress has accelerated with five important achievements:

The **United Nations Millennium Declaration** was adopted in September 2000. It reinforces commitments to the values of freedom, equality, solidarity, tolerance, respect for nature and shared responsibility, and was accompanied by the **Millennium Development Goals**: halving extreme poverty and hunger; universal primary education; empowerment and equality of women; environmental sustainability; and a global partnership for development;

The **Brussels Declaration** in May 2001 reaffirmed the critical role played by the official development assistance for the Least Developed Countries, and the speedy implementation of debt relief for the poorest countries;

The **Doha Ministerial Declaration** in November 2001 at the WTO Ministerial Conference recognized the need for a new multi-lateral trade framework for further economic development and alleviation of poverty. It recognized that the least developed countries must be helped to secure beneficial and meaningful integration into the global economy.

The fourth, the **Monterrey Consensus**, in March 2002 recognized the need for a holistic approach to financing sustainable, gender-sensitive, people-centered development in an increasingly interdependent world economy;

The fifth, the **Johannesburg Summit Declaration** and **Implementation Plan** of September 2002 recognized that poverty eradication, changing unsustainable consumption and production patterns, and protecting and managing the natural resource base are essential requirements for economic and social development.

All these conferences have created a new framework for action. Their Declarations provide specific goals and timeframes. **The World Summit on the Information Society (WSIS) in Geneva in December will be the sixth step in this process.**

I hope this "Digital Earth" conference can make an important contribution to the preparations for this World Summit.

4. Current European initiatives

In an increasingly global economy, the prosperity and cohesion of European society will depend on our ability to gain competitive advantage from high-levels of educational attainment and knowledge, and from our diversity, creativity and productivity. This will require that we continue to work with other regions in the mastery and use of "knowledge" and "collaboration" technologies (KCTs) – the next generation digital technologies, beyond the current "information" and "communication" technologies (ICTs).

This must increasingly be done in the context of sustainable development. This EU Treaty objective, ratified in 1999, has been translated into specific policy goals in the EU sustainable development strategy, adopted in 2001.

This sustainable development strategy has been integrated with the Lisbon strategy for a competitive and dynamic knowledge-based society, and the Commission is committed to prior assessment of the social, economic and environmental impacts of all major policy and programme initiatives. The Union has also adopted a framework to strengthen Corporate social responsibility, within a single market for financial services.

The EU research and technology development has been re-oriented to focus primarily on these twin themes of the knowledge society and sustainable development. It has been further embedded within a research policy for a coherent European Research Area, and for a progressive increase in investment in RTD and innovation to near 3% of GDP by 2010, as an integral part of the transition to a knowledge society.

The European Commission, working with the other European Institutions, has the opportunity, and responsibility, to steer developments and investment into areas of maximum benefit through instruments such as the Framework Programme for RTD; the eEurope Action Plans and support for the Open Method of Co-ordination; the guidelines for use of the European social and regional development funds; support for trans-European network developments, and framework directives on spectrum use and infrastructure regulation.

5. Enlarging and re-focusing the European Union

The enlargement of the Union and the nomination of the new Commission in 2004, the adoption of a new Constitutional Treaty for the Union, the preparation of proposals for the new financial perspectives and policy priorities beyond 2006, and the align-

ment of the 7th Framework programme for Research and Technology development with these perspectives and priorities, provides a historic new opportunity for Europe to lead the world in implementation of a coherent set of policies and programmes.

In the Draft constitution proposed by the convention on the Future of Europe, "Sustainable development" remains a headline objective of the Union. It is now the focus of the proposed Article 3 which takes up the commitments in the previous Article 2 of the "Amsterdam Treaty". However, it interprets sustainable development more explicitly as balanced economic growth, in a highly competitive social market economy, with full employment and social progress, and a high level of protection and improvement of the quality of the environment.

For the first time, these goals are associated with a commitment to promote scientific and technological advance; respect cultural and linguistic diversity; and safeguard and enhance Europe's cultural heritage. The explicit link to "cultural diversity and heritage" is the first time that the "cultural dimension" of sustainable development has been recognised in EU treaties.

The commitments are further extended, in Article 4, to the international dimension: sustainable development of the earth; with free and fair trade; and measures to eradicate poverty.

These Articles represent a significant further strengthening of previous Treaty commitments to sustainable development, incorporating the subsequent agreements at Lisbon and Göteborg to a competitive, dynamic and sustainable knowledge society and the UN Millennium Goals. This explicit link to scientific and technological advance emphasises the shift to sustainable development through technology development and innovation, rather than through restrictive regulation.

6. Challenges for a "digital Earth"

The **transition to a "digital Earth" – to a networked knowledge society** cannot be only driven by our fascination with technology for its own sake or for short-term competitive advantage. Technology is a **"tool for development"**, not a "reward for development". Digital technologies have the potential to empower billions of people and enhance human dignity. They can offer new access to education for and by the people even in the most remote regions; bring improved health care; help eradicate poverty, empower women and build sustainable communities. They can enable self-expression, new knowledge creation and cultural diversity, and continued and sustainable economic growth. They must be harnessed to the goal of globally sustainable development.

The reduction of the **'digital divide'** is therefore rightly a world priority. This requires appropriate **technology development**, and **education** in use of technologies, as well as effective use of technologies for education and capacity building. These technologies must fit a wide range of skills, native languages, local traditions and indigenous knowledge.

Digital technologies can also play a crucial role in protecting and managing our environment. They can help monitor natural resources; natural disasters; climate change, fresh water depletion, desert extension and forest depletion, and many others.

A **systemic approach** for **monitoring** and **early warning** must be supported by the international community and urgently implemented. The accumulation of very large amounts of data; their effective use and archiving for the far future, requires a global structure and management facilities.

I hope this Conference on the Digital Earth will take the next steps towards better integration and implementation of the joint initiatives of the European Commission and the European Space Agency, the Global Monitoring for Environment and Security system (GMES) as well as those of the UN Environmental Program and International Telecommunication Union, the private sector, such as the Global e-Sustainability Initiative.

The availability and use of data about the Earth's co-evolution with humanity is an essential foundation for effective policies for sustainable development. I congratulate the organizers again on their initiatives, and I wish you all a fruitful conference.

MONDAY
September 22, 2003

Enabling Interoperable Spatial Data Infrastructures for Sustainable Development

Preetha PULUSANI
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Policy makers need fast and easy access to different types of information in order to make sound decisions. Spatial data is often crucial. Until now a variety of barriers have made it virtually impossible to provide policy makers with an integrated geospatial view of the challenges and options before them. These barriers include disparate data sources, proprietary data formats, and limited information about the location, availability and quality of data. Spatial Data Infrastructures based on open interoperability standards, such as GML and open web services, are about to change this. This paper explains Intergraph's commitment to this vision coming true. Geospatial in a new era means an evolution from knowledge creation to information access to true knowledge sharing.

Open Interoperability: From Conception to Realisation

Bart HOOGENRAAD
Vice President
Global Marketing
Intergraph Mapping and Geospatial Solutions

As is frequently noted, GIS has been moving more and more to the mainstream; to facilitate integration into to core IT systems open standards are essential. Further to this, with Spatial Data Infrastructure projects high on Local, Regional and National government agendas, open technology is positioned as the key enabler. Intergraph has been committed to open standards since the beginning, as a founder member of the OpenGIS consortium and only vendor at Strategic Member Level. This paper will discuss ongoing customer projects leveraging open technology, outline the benefits to the individual organization and wider economy and close with the vision for the future.

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Monday, September 22, 2003 ***stream I.***

topic 1

DATA, INFORMATION, KNOWLEDGE, TECHNOLOGIES AND TECHNIQUES

The Simulation Technology for River Basins Sustainable Management

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The digital simulation technology of a river basin consists of following components:
The objects for simulation are processes and non-linear effects (thresholds, floods, fans, jams) in basins.
Fast raster-vector reforming for mapping goes together with numerical multi-dimensional modeling.
Movie computer maps corresponds monitoring, forecasting, and urgent warning.
Information flows are 'feed' for evaluation of water/mass flows through basins.
Resulted is the Acting Tabletop Portrait Double of the interested basin.

River Basins are the most widespread elements of the earth surface. The living near a river in plains and in mountains is under a hazard for natural and human provoked accidents and disasters. The enduring fear of Floods and Debris-Flows orders for technology for monitoring, warning and mitigation for disasters. The monitoring orders for simulation modelling. Many flood proof methods exist, but they were resulted as no effective to prevent or to warn many recent disasters. The one of these no-effective methods and low resolution is to divide a single basin to sub-basins as units of modeling. The recent method for 2D grid based evaluation of water/mass flows by a simulation is more reliable tool for a basin management, because of the 2D model perceives natural/human pressure with a higher sensibility to external/ internal impacts in a basin due to high spatial resolution.

The simulation technology deals with nonstop process for transformation of external natural and human drivers into continual water/mass/energy flows through a basin. This is the process for computer monitoring. The 1D and 2D former, current, and future records provide tasks for the validation, monitoring, and forecasting accordingly. A basin is written in form of multi-dimensional numerical grid. Any installation of the validated River Basin Simulation Model (RBSM) is the reliable computer tool, in view to provide a detection, warning, mitigation, and evaluation for long time effects of human activity for the Sustainable Management.

The general River Basins Simulation Model (RBSM) relocates itself from the periphery to center of GIS by property to reform spatial-temporal flows of external information to new movie information about the governing processes as follows: water discharge and water resources dynamics, snow-line dynamics, floods spread, pollution spread, debris-flows tracking, and reservoirs reliability. With the corresponding acting mapping, this is a convenient and flexible tool for scenario simulation on behalf of river basin management, and is to afford computer monitoring for a basin for the purpose of prediction and warning for accidents and disasters. The RBSM and its particular versions reforms meteorological and human pressure/im

pacts to self-perceiving of floods and debris-flows events, to hazardous events for dams, and for other accidents.

The task for Management of Information Flows is the obligatory part of Sustainable Management through a necessity of the followings:

Input of 1D and 2D records – is for the calibration, real-time data inflow – is for the purpose of monitoring, and permanent prognostic records – is for the purpose of forecasting.

Output for new information by acting mapping with simultaneous fast raster-vector reforming, reflects detection and tracking of accidents, and generation of warnings.

Basin Management requires for Active Data Base in result of multiply scenarios, for purposes of decision support.

The Information flows through a simulation system should sway monetary flows to prevent multiply larger losses.

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Research on the MDA-based GIS Interoperability

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Currently, Geographic Information Systems (GISs) have become a significant area of application of computing technology. But the GIS software industry that exists today is fragmented. Different GIS applications may have different terminology and approach, which greatly hampers the cooperation among them. Also it brings great difficult when updating the legacy systems.

To solve GIS interoperability problems, many standards for exchanging structured information (such as XML/GML) and geo-information (such as ISO TC211 and OpenGIS Simple Features, Web Map Servers, GML, etc.) are available. In spite of these, one important aspect is missing— a series of standard and common-accepted models for GIS Applications. It is a must to build some models for a GIS application when it is too difficult to comprehend the system in its entirety.

The OMG's Model Driven Architecture (MDA) essentially assures the development of high-level Unified Model Language (UML) models that describe corporate applications and middleware. It focuses on the application models, which often will last for decades. We can use these models to generate multiple implementations. As long as they are derived from the same model sets, the GIS applications will have the same comprehension of the same geographical information and process, which will greatly facilitate the interoperability among them. Meanwhile, as long as the user demand and the system operation logic are not changed, the update of the legacy applications based on the established models will be much easier.

This paper describes our research on the spatial information sharing and the GIS interoperability from an MDA-point of view, following the idea introduced above. First we analyze the GIS interoperability difficulties, and then we argue that a common model is needed for the cooperative GIS applications to follow from the design. Based on the careful analysis of MDA, we give a conclusion that MDA will help to promote the GIS interoperability.

Next, we discuss how to establish and provide the common-models, methods, tools and frameworks for different GIS applications and present some principles and general procedures. Finally, a case study, a sub-project of National Project "Digital Beijing", is introduced in detail to demonstrate and validate the usability and viability of this proposed concept.

Spatial variables modelling for high quality DTM production

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The importance of high quality digital terrain model (DTM) availability is constantly on the increase. “Classical” DTM production methods use only especially acquired data and therefore cannot exploit the advantages of all available data sources. One of the main possible benefits of using the existing data is higher accuracy and more economical processing. In this paper a method of weighted sum of different data sources with geomorphological enhancement is described. Data sources used in the proposed DTM production method should be of similar and – even more importantly – well-known quality. Therefore, methods used to classify different data-sets regarding to environmental variables (karstness, roughness, curvature, height, characteristic regions of terrain, percentage of forests, hydrological network, urbanisation and transport network) are described in greater detail. No matter how much effort is invested into DTM production the final result is outdated at the very moment it is finished. It is crucial to propose a method for its updating, because different events (e.g. underground activities, landslides, earthquakes, volcano eruptions, quarries production, highway constructions) constantly change the Earth’s surface. In this paper remote sensing is described as one of the possible sources to model and monitor environmental changes and enhance the DTM quality.

Keywords: GIS, modelling, digital terrain model, environment, remote sensing, accuracy

A Lane-Specific, Temporal GIS-T Data Model for Mobile Object in Dynamic Road Network

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A traffic system includes fixed facilities, flow entities, and control system. With the dramatic development of mobile positioning and related technologies, it is possible to collect real-time data for handling dynamic traffic conditions and mobile objects. In order to apply such data to location-based service, a well-organized data management approach must be developed. In terms of the management of traffic data, different models are employed in GIS-T and Mobile Object Database (MOD) from perspectives of road network and mobile objects respectively. However, it is necessary to integrate these models into a united model when developing a complex and operational system for location-based applications, such as navigation. Therefore, the research will make efforts to develop such a model. Firstly, the research purpose is educed through queries raised in several examples. With respect to navigable application and dynamic traffic conditions, lane-specific and temporal information should be able to be handled in the proposed model. Secondly, a critical literature review on current data models of GIS-T and MOD is given. Then, the third and forth parts propose the static and dynamic representation of traffic features respectively. An UML class diagram illustrating the proposed data model is presented in the forth part. After presenting the representation functions of the model, implementation issues are discussed in the fifth part including data access operators, data source, and database. The last part concludes the paper.

Topology in spatial DBMSs

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Introduction

Spatial data, which is used in GISs, are mostly part of a complete work- and information-process. Therefore in many organisations there is a growing need for a central DBMS: a system in which spatial data and attribute data are maintained in one integrated environment. Many DBMSs are capable of maintaining spatial data in 2D, since mainstream DBMSs (Oracle (Oracle, 2001), IBM DB2 (IBM, 2000), Informix (Informix, 20f00), Ingres (Ingres, 1994)) have implemented spatial data types in 2D more or less similar to the OpenGIS Consortium (OGC, 1998) Simple Features Specification for SQL (OGC, 1999). The implementations consist of an SQL extension that supports storage, retrieval, query and update of simple spatial features (points, lines and polygons).

According to the OpenGIS specifications, the spatial object is represented by two structures, i.e. *geometrical (i.e. simple feature specifications)* and *topological (i.e. complex feature specifications).* While the geometric structure provides direct access to the coordinates of individual objects, the topological structure encapsulates information about their spatial relationships. Current implementations are based on the geometrical model, while the topological model not yet has been implemented in DBMSs. Topological relationships between spatial objects can be found by means of spatial functions that are available in DBMSs. Recently, Laserscan Radius (Laserscan, 2003) has implemented a topological model on top of the geometrical model in Oracle Spatial 9i.

With the implementations of the geometrical model it is possible to store and query spatial features in a DBMS, but the relationships between neighbouring spatial objects cannot be stored and can only be queried with a geometrical query. This causes redundancy: shared edges and shared nodes are stored twice. Moreover the performance of spatial queries could be improved when topology would be supported.In our Department we carried out a research to study the possibilities of storing and using topology in a DBMS. For experiments we use Oracle Spatial 9i. Although Oracle Spatial 9i is not OGC compliant on all levels, our experiments show generic aspects and solutions for supporting topology in DBMS. In our research we focus on the topological structure of a planar partition.

Dataset

For our experiments we use a data set of cadastral parcels, provided by the Netherlands' Kadaster. This data set is modelled topologically, i.e. the geometry of the parcels is not stored, but can be inferred from the cadastral boundaries that are stored. The most important tables are 'boundary' (cadastral boundaries) and 'parcel' (parcel identifiers). There is no need for the geometric data type 'polygon', because the area features (parcels) are stored topologically in the 'parcel' and 'boundary' table using the so-called 'CHAIN method'. The edges in the boundary table contain references

to other edges according to the winged edge structure (Baumgart, 1975), which are used to form the complete boundary chains (parcels). The edges also contain a reference to the left and right parcel.

This approach allows calculations on correctness of topology after adjustment of the surveyed new boundaries to the cadastral data. Furthermore, it opens the possibility to relate attributes to the boundaries between parcels, e.g. date of survey, names of persons locating the boundary, etc. If each parcel would be represented in the DBMS by a closed polygon, it would be complicated to represent the basic object of cadastral surveying: one boundary between two neighbour parcels. Closed polygon representation would lead to double (or triple or even more) storage of all co-ordinates (except the territorial boundary), which complicates the data management in a substantial way. Closed polygon representation can result in the introduction of gaps and overlaps between parcels, which is not related to reality (Oosterom and Lemmen, 2001). A parcel has exactly one reference to one of the surrounding boundaries and one reference to a boundary of each enclave.

Topology in the DBMS

A disadvantage of storing the parcels in a topological model in the DBMS is that the DBMS is not aware of the geometry of the parcels. Because there is no geometry attribute in the parcel table, it is for example not possible to calculate the area of a parcel. By extending the DBMS with a function that materializes the geometry from the boundaries it is possible to store the data topologically whilst it is still possible to perform operations on the geometry.

Self implemented function

We implemented this by creating a function ‘return_polygon’ which realizes the geometry of a polygon. This function can be used in an sql-statement, e.g. in a query to compute the area of a parcel:

```
select sdo_geom.sdo_area(return_polygon(object_id), 1) from parcel;
```

The function is implemented in two ways. The first solution uses the information on the relationship between edges (winged edge structure). The second solution is based on the left-right information of edges, which also is stored. In the paper we will describe both implementations, together with our experiences, including spatial analysing, and the advantages and disadvantages of both approaches. Also performance issues on the implementations are addressed.

Realising geometry based on winged-edge structure

All parcels contain a reference to one of the surrounding boundaries. The realisation of the parcel–polygon starts with this edge. Than in the boundary table the next edge of the chain can be found because the boundary table also contains which edges are connected to the particular edge. This is repeated until the first edge is met again. The set of found edges are used to realise the geometry of the polygon. The parcel also contains a reference to one boundary of each enclave. The realisation of possibly enclaves is started with this boundary. And then the enclaves of parcels are realised in the same way.

Realising geometry based on left-right information

When the left-right information is used to materialize the geometry of a parcel, all boundaries that have the given parcel to the left or to the right are selected. By repeatedly joining boundaries that end in the same endpoint, we end up with the boundary of the complete parcel. Enclaves are realised in the same way.

Topology software

As was mentioned before, recently Laserscan Radius (Laserscan, 2003) has implemented a topological model on top of the geometrical model in Oracle Spatial 9i. Experiments with Laserscan software were part of our research. In the paper we will describe how Laserscan implemented topology in the DBMS. We will also elaborate on our experiments with Laserscan Radius and compare them to our own experiments. We will end the paper with a discussion in which we will draw a conclusion on the state-of-the-art of topology in DBMSs based on our experiments. We also give recommendations on what still has to be developed to make full and generic support of topology in DBMSs possible.

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Formal Specification with RAISE for a GIS Based Decision Support System*

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It is necessary to integrate different sources of data for decision support systems. DTM(digital topography map) from the bureau of mapping, land use map from the land bureau, road map from the transportation bureau, pollution data from the environment agency, climate data from weather stations, population data from the census database, forest data from the forest department of government, farm data from the agriculture department of government, etc. It is also necessary to integrate analysis tools and models for efficient use of the data. Some of these data sources are rigorous GIS types. Some of them are indirectly related to GIS. They are associated with addresses that can convert to geography coordinates. All of these data must be integrated into a standard data format for integrating them for the further analysis to support decisions. To give a rigorous specification for the complex requirements of the system, the formal method of RAISE (Rigorous Approach to Industrial Software Engineering) is applied. The specification of data fusion is given with some discussion in this paper.

Integration Role of the General Geographic Database

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The General Geographic Database (GGDB) of Poland has been elaborated as an official spatial database corresponding with details to the map at scale 1 : 250 000. It has been developed on the basis of several sources and related to the official map series of the country. The database consists actually of three levels of detail, i.e. adequate to the mentioned scale and to 1 : 500 000 and 1 : 1 000 000. Last two are linked to the first one and constitute its generalised versions.

The database represents a digital record of the spatial objects and phenomena but also aims at integrating other national registers containing the spatial reference. Several such registers have been analysed and linked to the General Geographic Database. The identifiers used at those registers has been attached to the geographic features stored at the Database. Hence the rich characteristics of spatial objects are potentially available to the users of the GGDB.. The methods of integrating those registers will be presented in the paper.

The GGDB is the first step to the practical implementation of the National Spatial Data Infrastructure. The experience gained during creation of the General Geographic Database will be utilised in the process of integration at the larger scales of the databases.

Online Querying of Heterogeneous Distributed Spatial Data on a Grid

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With the emergence of spatial data interchange and map serving standards, and proliferation of standards-based internet-accessible map servers, online integration of distributed spatial data becomes a reality. Map servers based on the WMS and WFS specifications, growing acceptance of XML-based open standards for spatial data representation, exchange, rendering, metadata and service capability descriptions (GML, SVG, etc.) and advances in data grids utilizing WSDL/SOAP protocols, make it possible to seamlessly query multiple heterogeneous spatial data servers in a standard platform- and vendor-neutral manner. The emerging Open Grid Services Architecture, OGSA [Foster et al. 2001, 2002] combines Grid systems architecture with Web services technologies, to enable seamless standards-based data federation and computation. The goal of this paper is to explore OGSA applications to integration of spatial data sources, outline spatial mediation Web services, and describe our first implementation of a grid-based spatial data integration system within the Geosciences Network (GEON, www.geongrid.org) project.

The *motivating example* for this paper is provided by a common analytical situation when a geologist needs to select areas with geologic formations of a given age, within a region covered by multiple geologic maps. Each state in the region of Rocky Mountains maintains its own geologic map, or a collection of maps. The state geologic maps are available in different formats and served in different projections. Data schemas are also different: on some maps geologic age is referenced by a single attribute called *Period*, while on others it is called *Geo_Unit_A*, *Time_Unit*, *Age*, or is referenced by a series of attributes (*Era, System, Series, Period*). Beyond the schema differences, the actual terms used as values for column(s) referencing "geologic age", may reflect different levels of detail in geologic age descriptions. For example, some states may use term "Quarternary" while others would refer to its subdivisions ("Holocene", "Pleistocene"). In addition, the values may represent data developer's lack of confidence about geologic age of a particular feature (evidenced by the occurrence of values such as "Jurassic?", "Jurassic??", and even "??") or transitional/mixed zones (called, for example, "Jurassic/Triassic"). In such circumstances, a common GIS query such as "Select polygons where Period = 'Jurassic'" will return incomplete results from one set of maps, empty results from other maps, and may fail in the third group, where the term "Period" is not present in the schema.

To process such queries, the data integration system being developed at SDSC, follows the common *wrapper-mediator* architecture [Wiederhold 1992], where queries and results exchanged between system components represent virtual XML documents [Baru 1999]. In such a system, query execution against heterogeneous sources is orchestrated by a *mediator*, which is responsible for parsing user query, formulat-

ing sub-queries against individual *XML-wrapped* sources registered to the mediator, and assembling query results. In our OGSA-compliant system, all data sources and services, including the mediator, are exposed as *grid services*. Every data source or processing service exposes a standard interface to the mediator, built around WSDL source descriptions, and system elements communicate using SOAP messages. The system is comprised of the three main tiers:

1. The Data Tier

Spatial data are served by a variety of distributed heterogeneous servers that include Oracle Spatial, DB2, ArcIMS and WMS servers. All data sources are wrapped in WSDL/SOAP wrappers. In case of ArcIMS sources, for example, the wrappers convert mediator-generated grid service calls into ArcXML requests understood by the server. The server output, a virtual XML document possibly referencing a map image or a compressed feature set, is returned to the mediator wrapped in SOAP response.

2. The Middle Tier

The middle tier of the system plans and orchestrates execution of user queries against multiple sources. Since the sources may exhibit various aspects of heterogeneity (system, structural, syntactic, semantic), the mediator layer is equipped with a range of data conversion services including: type conversion, coordinate conversion, format conversion and concept resolution. The spatial nature of data and results necessitates a special results assembly service responsible for merging different result fragments into a presentable composite map. The following middle tier components, exposed as grid services, are critical:

Mediator: Mediator plans and orchestrates query execution. In our prototype integration system, we deployed a customized version of XMediator from Enosys Markets [Papakonstantinou and Vassalos 2001], which uses X-Query to define integrated views over distributed spatial data sources.

Registration Service: This service automates the process of source registration at the mediator. Source schemas and capabilities (functions supported by the source) are exported to the mediator using procedures described in [Gupta et al., 2002] for Oracle sources. For ArcIMS sources, the mediator has access to ArcCatalog-generated XML files with schema descriptions, in addition to a collection of WSDL-wrapped ArcXML requests.

Ontology Service: This service handles semantic discrepancies across source schemas. It resolves concept heterogeneities, by mapping geologic concepts used in each state, to a *global ontology* describing geologic time. It disambiguates user query in the following steps: (A) *Concept Expansion:* extracting all sub-concepts of the queried term, from the global ontology, and (B) *Concept Resolution:* querying each data source to return a set of unique values for each of the query terms, and mapping them to the global ontology terms extracted at step A. Using such mapping, the *Concept Resolution* service rewrites the query for each source, replacing the initial WHERE clause with a new one derived from the mappings.

Result Assembly Service: This grid service generates map composites on demand, as one or several image files or feature coordinate streams that can be returned to the client. Its operation depends on the size and format of the result fragments supplied by the sources, as well as on client capabilities. Our architecture supports several mechanisms for assembling query result as a composite map. Map images may be generated at data sources or at the mediator level. To produce a composite result, they may be merged at the mediator or simply overlapped at the client. Further, if enabled by data sources and the clients, map integration may rely on combining vector data returned by each source, either at the mediator or at the client. The primary map assembly scenarios are:

· Scenario 1: client-side overlay of map images from individual sources. Web services for each map server implement GetCapabilities and GetMap requests of the WMS specification (for ArcIMS: GET_SERVICE_INFO and GET_IMAGE requests respectively). Queries are processed at each map server individually; each server generates a GIF or PNG file with transparent background and within the common map envelope computed by the mediator. The mapping client then accepts a stack of overlapping map images and displays them below locally-stored state boundary data rendered as vector shapes in VML or SVG. As a variation of this scenario, the map assembly service may merge individual image fragments into a composite image, using the assembly's *Image Fusion service*. In our tests, this solution appears to scale well with the increase in number of data sources and simultaneous requests.

· Scenario 2: generation of results image by a mediator-level service that integrates coordinate information from ArcIMS sources. Web services for each data server implement the ArcIMS's GET_FEATURES request, and query results are returned from each server as ArcXML documents with geometry of selected polygons. The map assembly service then generates a single multi-part polygon from all features returned. This "result" polygon is added as an acetate layer to a "blank" ArcIMS service which then generates a single image file with query results. As a variation of this scenario, the geometry information retrieved from individual sources as XML documents may be passed on to the client for vector rendering (in VML or SVG). While providing for better client-side interactivity, this approach is less scalable and heavily dependent on client capabilities.

· Scenario 3: the results map is dynamically generated at the mediator as a complete ArcIMS image service. The map assembly service dynamically generates a mediator-level ArcIMS image service using fragments of data and images retrieved from individual sources (using GridFTP, in particular). Web services for each data server implement ArcIMS's GET_EXTRACT request (or a similar functionality in conjunction with a WFS server or Web-enabled DBMS), to convert individual query results into shapefiles or compressed GML documents for shipping to the mediator. This scenario provides for more flexible map assembly and implies a more comprehensive construction of a map assembly service, which includes: *File Transfer Service, Uncompress Service, Image Assembly Service, Image Fusion Service, Query Service, Data Conversion Service,* and *Command Module*. The latter represents a collection of map assembly templates which bind together the processing components into a map assembly workflow.

3. The Web Mapping Client

The query and mapping client used in the system is based on AxioMap (Application of XML for Interactive Online Mapping [Zaslavsky 2000]). The client is capable of rendering both vector and raster data generated by mediator's results assembly service. In particular, it can render one or more images served by one or several ArcIMS or WMS servers, as well as XML-formatted vector data (in SVG or VML). The client supports map presentation of query results in each of the map assembly scenarios described in the paper.

Our working system prototype demonstrates that an open, extensible and scalable system for querying a federation of heterogeneous distributed spatial data sources is feasible, aided by the emerging standards in grid computing, Web services, and spatial data interchange.

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FAO Spatial Information Management and Applications

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The Food and Agriculture Organization (FAO) of the United Nations has a wide range of activities involving the use of Earth observation data and spatial data and information management in its mandate activities in agriculture, forestry, fisheries and food security at international, regional and national levels.

The paper describes some of these activities with emphasis on environmental monitoring for food security, landcover mapping at various scales and spatial information management and information access development using various internet technologies, based on ISO and OpenGIS standards. Particular systems described are GeoNetwork, ARTEMIS, AFRICOVER, ASIACOVER, GTOS, FIVIMS/Poverty Mapping and the Global Land Cover Network (GLCN) inititative.

Location of Pollution Source by Means of Numerical Optimization

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In cases of environmental problems like pollution dissemination we often would to locate the source of the problem as fast as possible to diminish the impact of such catastrophic scenario. But very often the dissemination cannot be described as a function of time because of uncertainty and softness of the system, so we have the only possibility to measure pollution values on some places. The model can be regarded as unknown function of two variables – geographical co-ordinates and we would to search for the maximum value of the pollution. There exist many methods to find the maximum value of such phenomenon. Some elementary method is to make a grid over the investigated area and measure the value in every point of intersection of the grid, but this method is slow. More effective is to apply some of numerical optimisation methods. In the cases we have no information about unknown function such methods are based on Nelder-Mead optimization method and self-organization algorithms. The aim of this article is to show the variants of these algorithms passed to environmental applications, taking care of the constraints and impossibility to measure values on some locations.

Reliability and Redundancy in Complex Digital System

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The electronics for aerospace missions, for example in the AMS experiment for the search of the universe antimatter, must be designed with techniques of fault tolerance that can improve the system reliability. The choice of the system architecture depends on the compromise between a sufficient reliability and a not excessive redundancy that would increase too much the weight. In this report quantitative methods for evaluating fault-tolerant systems are described. The concepts of failure rate and reliability function are introduced for series and parallel systems. Moreover the redundancy is described with examples, where it can take one of several forms: hardware redundancy, software redundancy, information redundancy and time redundancy. Furthermore all the redundancy techniques are compared and finally a sample design, which contains most of the redundancy concepts, is illustrated from oppong harison steward.

Path Direction Using the Number of Junctions

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This paper proposes a new type of path directions using the number of junctions in location based service. It is based on the fact that at a detailed level of spatial abstraction, people often use the number of junctions or crossroads to locate places in urban navigations. The proposed approach provides an alternative to mileage, time and petrol cost in path description. In particular the approach can be combined with these existing methods at different levels of spatial abstraction, i.e. mileage and time cost for approximate locating, while the number of junctions for precise locating. As the approach is based on existing street network, it is a straightforward task to implement it into GIS for location-based service. A case study illustrates the application of our implementation based on ArcView GIS.

Keywords: shortest path, location based service (LBS), path, street network.

Digital Landscape Model: an integrated tool for area management

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The digital landscape models (DLM) were completed for selected training areas. The DLM simulates an integrated data base consisting of multiatribute data layer "natural background", digital elevation model and "human impacts" data multiatribute layer (for some DLMs the layer "development limits" was created, too). The methods of landscape synthesis, 2D, 3D and 4D modelling procedures were applied using DLM and own, shared, and commercial expert knowledge module packages (EROSION 3D, AGNPS). In the area of scientific methodology, the course of analytic data integration procedure has been formalised for manual, semiautomatic and preliminary autoautomatic spatial data processing. A new experience has been achieved in the soil erosion and land slide risk assessment. The regional geographic knowledge has been improved by results of area evaluation for landscape management purposes. The practical applications of DLM are derived from the various DLM integrated data processing with regard to erosional risk, land slide risk, utilising preferences given by natural potential calculations using own data procedures, and external modelules as well. The DLM is presented to geoinformatics as a completely new data base type. It is an one- (or less-)layer logically integrated data base composed of multiatribute spatial units, while traditional GIS databses are represented by set of mechanically overlaid analytic data layer comparable by scale, map projection and data format together only. The data logically integrated in the DLM are linked as it is in the real world. The DLM serves the area of the parascience by the new data base tool able to be extended any time by any additional thematic (analytic) information, which will be and must be integrated with the previous thematic data. Newly comming spatial data can be integrated operatively with regard to users requirements and can be taken from the DLM for other processing as a fully logically integrated one with other information stored in DLM.

This way, the DLM is a very practical tool not only for geosciences, but for practical landscape management in the information society era as well.

topic 7

EUROPEAN SPATIAL DATA PROJECTS

INSPIRE: Technical aspects and links with global interoperability initiatives

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In the European Union, governments collect huge amounts of information relating to the environment, particularly at regional and local level. However, this information is fragmented: it contains gaps and duplications and we very often have to "to walk across fields" in order to use it in a broader context.

These obstacles prevent our governments from dealing efficiently with the increasingly complex and interconnected issues that affect our quality of life today. Many of our policies need to be underpinned by information on spaces and places in order to assess the need for action, to inform policy-making and to evaluate impact.

After various attempts to address these problems, the European Commission has recently launched a new initiative INSPIRE aimed at setting off a major effort to deal gradually with the problems of scattered spatial information in Europe.

The INSPIRE initiative recognises that there are many reasons for the above problems, and proposes creating a European spatial data infrastructure to deal with them. This infrastructure will allow users to co-ordinate their needs with data providers, so that they will then be able to easily find, access and combine existing data from various sources (e.g. various regions in Europe, different levels of government, different government departments).

Obviously the European spatial data infrastructure will provide access to spatial data in Europe not only to address local or regional problems but also to support the establishment of monitoring systems at global level. For this reason, the INSPIRE development is looking and try to coordinate with other initiatives dealing with spatial data in a global dimension such as GSDI, Global Mapping and Digital Earth. This paper addresses the technical aspects to be considered in coordinating with these projects.

Spatial Data Infrastructure in Europe: State of Play

Daniel RASE

A Networ knowledge Society Geographic Information Network in Europe

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The aims and context of the GINIE project will be briefly introduced. A particular attention will be given to results and recommendations, which were formulated on the basis of the GINIE workshop and follow-up comparison analysis focused on GI Capacity Building in the EU Accession Period.

Survey Results of the Impact Study of INSPIRE-key data sets

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INSPIRE (Infrastructure for SPatial InFormation in Europe) is an initiative currently being prepared by the European Commission to support tye availability of spatial information for the formulation, implementation and evaluation of Union policies. It intends to set the framework for the creation of a harmonised spatial information infrastructure. INSPIRE will initially focus on environmental policy needs, but being a cross-sectoral initiative, will gradually be extended to other sectors (e.g. agriculture, transport …) as other interested Commission services participate.

A survey was distributed during INSPIRE expert group meeting held in Athens (Greece, 30 and 31 October 2002). The main intention of this survey was to analyse the impact of INSPIRE key-data sets by producers and users in Europe. This paper presents the main results of this survey.

Governmental Spatial Data Supporting National Development

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Czech Office for Surveying, Mapping and Cadastre (ÈÚZK), principal provider of the base cadastral and geographic data to most of the public and private sector organisations as well to the individual citizens in the county. All the spatial as well as descriptive data are now continuously converted into a digital form. In 2001 the Information System of Cadastral of Real Estate (ISKN) was launched providing services on Internet. Fundamental Base of Geographic Data (ZABAGED) based on digitised topographic map 1: 10 000 will be completed this year Amendment to the existing Law No. 200/1994 on Surveying and Mapping reflecting the important changes in map production spatial data application due to the latest achievements in the field of information and communication technologies is ready.

Towards a European Spatial Data Infrastructure - the role of EuroGeographics

LAGRANGE Jean-Philippe

Monday, September 22, 2003 ***stream II.***

topic 8

DIGITAL EARTH

Towards Digital Earth - Its' ideal, situations and future: Asian version takes off

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With the dawn of post-industrial society in the true sense, our society is rapidly turning into an information-based society. Advances in science and technology propel digitization at great speed, enabling us to capture a wide variety of information, create a processing model of phenomena, and to simulate various models ranging from microcosmic human body structures to macrocosmic climate change on a global scale. As a result, our recognition of the real world has been vastly changed. Much of what used to be abstracted as infinitely large or infinitely small is no longer considered as such.

Our current status of environmental issues on a global scale clearly indicates that we can no longer consider the capacity of the natural system that provides foundation to human activities, such as water, atmosphere, soil, to be infinite, nor can we ignore the scope of human activities or their speed of expansion as negligible. We have entered an era of "spacecraft earth". A new norm that regulates a relationship between humankind and nature is urgently called for. This new norm should fundamentally be based on a search for "adequate scale", in other words, "recognizing that the most appropriate set quantity or set formula worked out for a subsystem under a certain framework may not be most appropriate under a different framework. Defining the framework is of top priority, and for that, we should always consciously maintain an overall perspective, always zooming in on various aspects while zooming right back to the wide overview of the whole picture. In this paper, we have tried to look at the concepts and technologies of the Digital Earth that would enable this approach.

Digital Earth is a virtual representation of the planet, encompassing all its systems, and life forms, including human societies. It is designed as a multi-dimensional, multi-scale, multi-temporal, and multi-layer information facility. The Digital Earth vision incorporates a computerized Earth, as its interface, whereby a corresponding virtual body of knowledge, or global encyclopaedia of the real Earth and its digital representation for understanding the oneness of the Earth and its relevant phenomena. Digital Earth has corresponding theoretical, technological, science, engineering, and application systems, all fully integrated enabling the support of national and international cooperation initiatives for sustainable development, and also focusing on economic construction and social welfare. An overview of the scope and breadth

of these innovative activities in Japan, such as the project “Digital Asia Network” is showcased in this paper.

The first step towards realization of the Digital Earth, is the formation of “International Society for Digital Earth – Japan (ISDE-Japan)” participated in by government, industry and academia. ISDE-Japan will be established as a non-political, non-governmental and not-for-profit international organization, principally to promote the exchange of information, science, technology innovation, education and international collaboration in conjunction with the distributed network of ISDE regional and national secretariats. The Society will also promote international cooperation on the Digital Earth vision, and to insure that Digital Earth technology play key roles in economic and social sustainable development, environmental protection, disaster mitigation, conservation of natural resources and to improve humankind’s standard of living.

Through seamless visualization of information ranging from the global to the local level and an easily understandable overall representation of global issues, we can expect a formation of “knowledge of the global community” based upon shared sympathy of the majority of the global population. The potential of the Digital Earth as a media to nurture a tactile sense of being part of one connected planet and one humankind is enormous. We have strong expectations that building such world will further enrich us and realize concepts such as “global citizenship” and “global society.”

The Earth Knowledge Base and Global Information Society

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Today a lot of countries have applied a strategy of information-oriented society and data development. Varying in details and ways of realization, these politics are integrated by their chief aim – to build a global information society. Here the crucial role belongs to the Electronic (Digital) Earth. Certain analysis of the problem have been done by the vice-president of ICA Milan Konechny in his report on the 20th ICA International Cartographic Conference (Beijing, 2001).

We mention three points of view on the problem of the Electronic (Digital Earth) elaborated world over:

- Digital Earth (USA) – a topographic (three-dimensional) and thematic representation of the Planet in the raster and vector forms with the application of high resolution satellite images;
- Digital Earth (China) – National Informational Infrastructure, National Spatial Data and Earth Systems Studies Infrastructure, digital mapping;
- Electronic Earth (Russia) – a universal information model of the structure and development (lithosphere, hydrosphere, atmosphere and biosphere) of our Planet created on the basis of the enacted Electronic maps System, and integrated analysis of geographic, survey, cartographic, geologic, geophysical and other explorations of the Earth .

The matter of the Electronic Earth, Electronic Russia is an integration of geoinformational technologies in the Earth Knowledge Base (EKB), which designed for the economic, social and scientific progress.

In the heart of the EKB is the Electronic Maps System accumulating the knowledge about lithosphere, hydrosphere, atmosphere and biosphere. The Electronic Maps System is the aggregate of electronic topographic and thematic maps, city plans, digital models of terrain, satellite images and semantics integrated under the common idea and requirements to the geodetic base, content, legend, as well as classifications and encoding, digital description and data formats. In Russia the Electronic Maps System, passed in 1999, is used for task solutions in the fields of the state administration and national safety.

The EKB is based on the following principles:

- System approach as the conceptual basis for creation and implementation of cartographic models, as the methodology of research and projecting the System, and as the scientific method of development of effective computer-aided multimedia technologies;
- Principle of mathematical and cartographic modeling as a way to visualize terrain features and objects;
- Principle of controllability of digital cartographic data;

- Principle of utmost complete acquisition, one-time exhaustive analytic/synthetic spatial data processing and its use by many customers.

For implementation the main statements of the EKB the following tasks are solving:

- Investigation and generalization of the international experience in Earth mapping and application of geospatial data;
- Development of cartographic thinking, revelation and exploration of objective regularities and features of Earth mapping, formulation of principles of the EKB on this base;
- Investigation and elaboration of the concepts, intellectual methods and technologies of acquisition, integration, analysis, processing, modeling, displaying of electronic maps, 3D images (3D cadastres), dynamic cartographic models, virtual maps;
- Development of basic categories and notions, international and national standards in the area of the EKB;
- Creation of the International Earth Knowledge Management System, Global Base of Metadata and Banks of Geospatial Data, telecommunication networks;
- Development and implementation of high-skilled cartographic expert systems and GIS of various intent;
- Increasing professional skill level of the personnel in the area of GIS and intellectual technologies at all educational levels;
- Revelation of contradictions in the area of the EKB, determination of directions of its evolution, elaboration of the criteria and methods for evaluation of the effectiveness of the new technologies;
- Development and implementation of the international cooperation programs in the area of the EKB strategies including participation of governmental and private cartographic enterprises.

The Earth Knowledge Base must be created according to the UN recommendation on sustainable development. It provides further growth of geoinformation technologies market and functional organization of the global information society.

Introduction to Digital Earth Prototype System

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Digital Earth is based on geographic coordinate, and is an information system with a tremendous amount of multiple resolution and multiple scale data and shown in multiple dimensions. By acquiring the large amount of data of the earth, and utilizing the computer technique, imagery and graphic technique, network technique, and virtual reality technique and so on to visualize the real earth and its relevant phenomena in digital way. The advent of the Digital Earth provides us a brand-new view to see our world.

Digital Earth has been received great attention all over the world. The United States, the European Union and Japan has conducted a large amount of work on digital earth. China has paid great attention to Digital Earth, and held the First International Symposium on Digital Earth in China. In recent years, systematic research works have been done in the fields of digital province (district), digital city etc.

The building of Digital Earth prototype system has provided a test-base for the research and development on digital earth strategy. The Chinese Academy of Sciences during the period of implementing knowledge innovation program has built a digital earth prototype system (V1.0). This system introduces the concept of digital earth, key technologies as well as its applications in crop growth monitoring, disaster monitoring, digital archaeology, environment management, and digital city etc., and demonstrates the huge developing potentials and its attractive prosperous.

3D Geobrowsers: Gateway to Digital Earth

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From the inception of the Digital Earth vision, the concept projected a future where a child would stand before a virtual representation of the planet and query information about human and natural events and histories. Breakthroughs in browser interface technology have provided a suite of state-of-the-art systems and prototypes which are rapidly entering the market place. Innovators of these 3D Geobrowsers have been cooperating in documenting the functional user requirements of these systems in a community spirit to upgrade the generic performance and enhance the systems data access and exchange designs. Under the support of the International Society for Digital Earth, the documented results of this effort are reported, as it can be seen that successful application of the 3D Geobrowsers will serve as the primary gateway to the connected world of a Digital Earth.

A SIG-based Architecture of Digital Earth System

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Digital Earth is huge information system over high speed Internet, in which the fundamental Geospatial information is reorganized and integrated with other information resources in a four dimensional time-spatial coordination frame. Recently 'Grid' is presented as a new methodology to simplify the complexity of huge system, which models the whole system with a handful of grids and interaction between grids. Based on the grid methodology, the paper proposes a SIG-Based(Spatical Information Grid) architecture of digital earth system in four levels: data grid, information grid, service grid and decision-making grid. In the data grid level, multisource, heterogeneous, distributed and huge Geospatial data will be organized transparently to seamlessly to the higher level, and the problems such as storage, query, transfer and management of Geospatial data will be considered. The semantic complexity of Geospatial information is accounted for in information grid level, while providing seamless Geospatial information services is the aim of service grid. And modeling and large-scale simulation of complicated systems will be the work of decision-making grid level.

Key words: Grid, Spatial Information Grid, Digital Earth, Time-spatial coordination frame.

Health Applications for Digital Earth

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The construction of Digital Earth provides for an increasing automated and networked planet for the use and exchange of digital information. Recent world health incidences have demonstrated the increasing risk of rapidly transmitted contagious diseases and the need to better track and communicate the behavior of these diseases to all people of the planet. The challenge for health officials has been in adopting new technologies, such as geographic information systems while still attending to their primary mission of disease prevention and control. Universal access to the Digital Earth architecture and the increased reliance on extended tools for modeling, communication, and education can be expected to accelerate the application of health issues within the growing DE community. A framework for understanding the challenges of bringing Digital Earth to the health community is presented, accompanied with recommendations for advancing the benefits of these technologies without overburdening an increasingly stressed work force of health care givers.

On Geospatial Data Infrastructure of China

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After giving the definition of digital earth (DE), Digital China and Cybersity, the requirement of spatial data infrastructure to GIS software is discussed. In this paper an outline of geo-spatial data infrastructure in China is given. The main consideration is the design and implementation of 1:50,000 spatial databases of China. As an initial solution for this purpose, GeoStar, a software developed by our university is presented. By means of GeoStar, multi-scale images, graphics and DEMs integrated very large seamless database can be created, and the 3D visualization with multi-resolution is also available. At last, the application of GeoStar for a few pilot projects of SDI in China is illustrated and several concluding remarks are stressed.

Key Words Digital Earth, SDI, GIS Software, GeoStar

From Digital Earth to Digital Human Body - Concept, Framework, Connotation of Digital Human Body (Human Body System Digital Science)

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Digital human body is a high synthesis of present medicine science and technology, information science, computation science and computer technology. In this paper, concept, framework and connotation of digital human body are put forward. At the same time, with main and collateral channel coordination therapy 243 mental patients are given clinical diagnosis and treatment, and the better effect of digital expression is gained.

From the point of discipline ,"digital human body"is known as "human body system digital science", too. So in the research of digital human body science and technology, not only great care is needed for part, but also control for whole is needed. In virtue of human-body-observation technology, the author studied and constructed the digital human body in a complicated huge system standpoint. The basic concept of digital human body is that to take the human body system as the prototype, human body coordinate as reference system, and human body system science, information science and computer science as theory foundation to build and integrate a serial of different levels of prototypes, mathematical models, physical models, mechanical models, information models and computer models. On the basis of high-new human body observation system and network technology, the establishment of multiple resolution, vast data and multiple kinds of data fusion, multiple dimensional presentation with multiple media and simulation, virtual technology and space, digital, network, intelligent and visualization technology systems. Digital human body is informationization and digitalization virtual human body. In general, digital human body is a technology system that is managed with computer network after information is digitized in order to find out the information process of human body system. A special attention should be paid to the information relationship and interaction of human body system.

The digital human body research and foundation is divided into four parts: basic theory research, technology support, science engineering and china-style digital human body construction. The core part and aim is a kind of vast four-dimensional and high-resolution human body information description. It is made up of two parts: one is the fast increased network human body information system with a four-dimension human body graphical interface that can be used to browse data in kinds of resolutions; the other is mechanism that can integrate and display all kinds of information. Main research content of basic theory is based on the basis of human body system science, information science and computation science and so on. The author takes the human body system as a prototype, discusses the inter-relation and interaction

among the kinds of human body systems, and finally builds occurrence and evolutionary human body models, mathematical models, physical models, mechanical models, information models and computer models of the human body system phenomena. The main research content of digital human body technology supporting system contains data collection, store, transmission, processing, display technologies. In addition, it also contains human body space data infrastructure foundation, data storing management, and simulation & emulation, virtual reality display etc. Digital human body science engineering is supported by these basic theory research and technology supporting system. The operational, distributed and open network information system will be built through software development and hardware integration in order to serve medicine study and clinic application service.

On the basis of study on digital human body study thought, basic concept, study objects, study task and effect and significance, the authors try to construct the framework of digital human body theory and application system. The main contents includes basic theory and prototype, technology support, system engineering integration and digital human body application.

Key words: Digital human Body, Concept, Framework, Connotation

Building Digital Earth with Grid Computing Technology - The Preliminary Results

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Digital Earth will be a multi-resolution, *four*-dimensional virtual representation of our planet that enables a person to explore and interact with the vast amounts of natural and cultural information gathered about the Earth. It needs Interactive 3-D visualisation, display and navigation through immersed and non-immersed environments; it also needs high-performance computation to create derived information and model simulations on demand, storage and real-time access to very large, multi-resolution datasets, fusion of satellite imagery and other geo-referenced data sources of diverse content, satellite and terrestrial broadband networks for high data rate transmission, interaction, and collaboration, standards and metadata for interoperability among and access to differing geo-spatial databases are inevitable. Digital Earth concept becomes an international cooperative program instead of merely one country's initiative.

So far, Grid technique is the best solution for Digital Earth. Digital Earth can only be done through the interaction of people, heterogeneous computing resources, information systems, and instruments, all of which are geographically and organizationally dispersed. Earth observation includes information acquisition, processing and applications. Information acquisition provides a vast amount of spatial data for building the fabric resource infrastructure. Information processing means that spatial information processing middleware is used with distributed large, secure grid computing resources for real time processing of all kinds of spatial data.

With the help of GIS, we are currently working on the development of core-middleware for Earth observation data processing and applications. The further results will be available soon.

Key words: Digital Earth; Grid; Virtual Organization; Spatial Information Grid; Telegeoprocessing

Introduction of Digital Asia Network

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Digital Asia is an initiative to provide people and communities with easy access to geo-spatial information over the Internet through open sharing of GIS and Remote Sensing Data among all the countries of Asia. Digital Asia will form the Digital Asia Network (DAN) to bring together all participating people and agencies, and to provide a place where they can obtain useful information for developing their applications and demonstration systems. As a three-year activity, DAN would support participants' efforts to link these Web-based GIS systems to demonstrate the usefulness of data availability and data sharing for society.

The main objectives of Digital Asia are (1) to develop a mechanism for data sharing, so that partners can participate easily, (2) to provide guidelines for developing applications and demonstration systems, (3) to help any agencies, through sharing of technical knowledge and training, who would like to open their data, (4) to stimulate development of demonstration systems which will be the basis of a future operational system, and (5) to share experience and "lessons learned" through development of demonstration systems

To promote this Digital Asia Network concept, NASDA agreed to support a DAN preparation meeting in cooperation with the DAN secretariat at the Asian Institute of Technology (AIT), and the preparation of a three-year implementation plan for DAN.

This paper describes the overview of Digital Asia Network and the three year implementation plan.

Construction of the Digital China

Qian WANG, Yanying XU, Jianjun LUO, Weijian LI, Jixian ZHANG

Digital Beijing Strategies and practise

Chong Jun YANG, Jing Dong ZHANG, Xin BAI, Shao Fu LIN, Ning LIU

Study on Urban Planning Simulation System of Olympic Green of Beijing, China

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The development of virtual reality technology provides an entirely new tool for urban planning. The research works on urban planning simulation system of Olympic Green of Beijing will promote the applications using virtual reality tech for urban planning, and also give a chance for practice. These research works will accumulate fundamental data and technique resources for Digital Beijing.

Take Olympic Green of Beijing as a test site, this paper present an Urban Simulation System which is combined with virtual reality tech, remote sensing tech and GIS system. In the research works, we developed a system with some functions such as interactive queries, different projects real-time compare, real-time 3-D model modifying and GIS data integrated management. In this paper, we have discussed some key techniques using in the system, such as Dynamic Multi-Resolution Terrain Model, Dynamic Multi-Hierarchical Texture Inlay, interactive browse, space analysis and management of GIS system on the virtual scene.

Key Words: Virtual Reality, Urban Simulation System, Real-time, Interactive

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topic 5

DELIVERING SERVICES TO CITIZENS: FROM WEB TO MOBILE

ICTs for the underserved communities: What role GIS has to play?

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Information and Communication Technology (ICT) is being seen by many countries as a tool which can drastically change the lives of the underserved communities in rural areas and poorer sections of the urban areas. These communities have been traditionally not been addressed by the computer hardware, software manufactures and e-services providers within and outside the government. But it is now being increasingly realised that ICT can help bring social, economic and political equity to these communities and a low cost and democratic manner, and there are many organisations emerging which are looking at addressing the needs of this sector.

GIS and related spatial technologies can play an important role in providing citizen services, developing newer social and economic opportunities to these underserved sections of the society. This paper delves into the issue of how could GIS take advantage of the overall ICT phenomenon starting to sweep to the globe.

WirelessInfo – mobile applications according INSPIRE pronciples

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The INSPIRE initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an inter-operable way for a variety of uses. The objective was to offer new possibilities of implementation of mobile communications into every day live in rural regions. In many applications for the mobile data access, it is necessary to access parallel to more data sources. This data sources are usually distributed among more organisations and they are located among more data servers. It plays a very important role in the case of direct field measuring. Currently this situation is solved by replication of the same data in different institutions.. This paper describes hi the principles of INSIPRE was implemented by WirelessInfo project for mobile domain, to be possible offer an operative data access anywhere and anytime is necessary to establish a more operative solution. The solution is built on the utilisation of OGC standards Web Map Service (WMS) and Web feature services (WFS).

“The INSPIRE initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an inter-operable way for a variety of uses. The target users of INSPIRE include policy-makers, planners and managers at European, national and local level and the citizens and their organisations. Possible services are the visualisation of information layers, overlay of information from different sources, spatial and temporal analysis, etc.

The spatial information infrastructure addresses both technical and non-technical issues, ranging from technical standards and protocols, organisational issues, data policy issues including data access policy and the creation and maintenance of geographical information for a wide range of themes.

The INSPIRE initiative intends to improve the current situation by triggering the creation of a European Spatial Data Infrastructure for the access and use of spatial information built on the basis of the following principles:

- Data should be collected once and maintained at the level where this can be done most effectively
- It must be possible to combine seamlessly spatial information from different sources across Europe and share it between many users and applications
- It must be possible for information collected at one level to be shared between all the different levels, e.g. detailed for detailed investigations, general for strategic purposes
- Geographic information needed for good governance at all levels should be

abundant and widely available under conditions that do not restrain its extensive use
- It must be easy to discover which geographic information is available, fits the needs for a particular use and under what conditions it can be acquired and used
- Geographic data must become easy to understand and interpret because it can be visualised within the appropriate context and selected in a user-friendly way."

The WirelessInfo project was a part of Key Action IV.5 Mobile and personal communications and systems, including satellite-related systems and services. The WirelessInfo project was trials project, so the intention was to introduce newest results of research and technological development into new applications areas. There were demonstrated new technologies and new practical solutions for agriculture, forestry, water management, land management, rural development, and environment protection practices**.** The whole project was oriented on the connection of GIS systems (including GPS technologies, remote sensing, photogrammetry, 3D modelling) with wireless communication based on utilisation of 2G and 2.5G networks (GSM, GPRS, HSDCS). The main objective was exploitation of wireless communication for the both side data transport (server - terrain, terrain - server) has to short down a time between data collection and data processing. The main communication platform was Mobile Internet. Such solution offers multimodal data access (computer - computer, computer - human, human – computer, computer – machine, machine computer). The technological trials was:
- To design and implement Mobile Internet GIS system for agriculture, forestry, water management, land management, rural development, and environment protection
- To design and implement solution for remote wireless data management for agriculture, forestry, water management, land management, rural development, and environment protection
- To design and implement the wireless access to distributed data (Web Mapping Services) sources for agriculture, forestry, water management, land management, rural development, and environment protection
- To design and implemented Mobile Web Analytical Services (remote sensing, statistic, 3D modelling) for agriculture, forestry, water management, land management, rural development, and environment protection
- To design a special wireless field terminals for the purpose for agriculture, forestry, water management, land management, rural development, and environment protection

The Mobile Internet GIS solution is new solution, which offer mobile Internet data access and data updating. The system allowed access data trough GPRS (GSM, HSCSD) data communication with different client terminal. There are possibility utilise notebook or special field computers based on PC technologies, but also handheld. The new line of MDA is promised technology, which could be base for new generation of information and navigation solutions. The system supported location based services, based on GPS assisted technology or on network information. The system could be modifying for mass market, but also offer large possibilities for professional and industrial applications.

The system could be implemented in agriculture, forestry, rural development, envi-

ronment protection etc, but also in tourism, city planning and management, emergency services, etc.

According to intentions of the WirelessInfo project is its technological background based on OGC standards. This approach ensures base conditions for interoperability of used geodata services. Till this date OGC published several standards for sharing geodata over WWW. To the most developed and also adopted by wide community belongs WMS.

The WMS is a Web Map Service (specifically an OGC Web Map Service). A WMS is capable of producing maps drawn into a standard image format (PNG, JPEG, etc) based on a standard set of input parameters. The resulting map can contain "transparent" pixels where there is no information and thus several independently drawn maps can be laid on top of each other to produce an overall map. This is possible even when the maps come from different Web Map Servers.

WMS is based on transfer of georeferenced maps i.e. images or eventually drawings, which are generated on request. In some cases exist demand on transfer not maps but geofeatures.

The Web Feature Service Implementation Specification describes feature database operations (e.g., points, lines, and polygons) making it possible for client and server applications to interoperate across the web. The request is typically generated on the client and posted to a WFS server. The WFS server reads and executes the request, returning the result in Geography Markup Language (GML) encoding. The GML document, used in conjunction with an XML Schema, can then be parsed by any client application for further use.

The Web Analytical Services give possibility provided analysis of spatial data trough Internet and mobile Internet. This solution improves information access for the decision makers in forestry, agriculture rural development, environment protection, etc. High quality information is the basis for effective management.. Because of this, the system is constructed as an mobile Internet solution, which offer not only possibility of data access, but also data updating and analysis through Internet. The Internet client server architecture manages large amount of different data, primary data, derived data, fertilisation data, etc. It is necessary to provide the description, classification, sorting and validation of this data too.

The basic solution is based on MapServer Open Source development environment for building up spatially enabled Internet applications. Important part of it is a system for remote data processing in the central database and for mobile data editing. Mapserver is a powerful Internet tool to handle a big amount of data. Internal application server offers new possibilities of on-line data analysis through Internet. Grass is used as a internal application server.

A New Architecture of Mobile Spatial Information Service System

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This paper discusses the development trend of mobile communication technologies and spatial information science, and introduces the main components of MSISS (Mobile Spacial Information Services System). Based on the analysis of key problems and technologies in designing a MSISS system, an open, scalable and function-reusable architecture of MSISS is presented.

Keywords: Mobile Spacial Information Service System, Location-Based Service, Architecture, GPS, GIS

Research on the LBS (location based services) in E-business

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Location - location - location, from the ancient times ,we well understood the significance of location. Location is a common denominator in our lives. In business, location are matters more, and so on, all are related to the location. With the development of the computer and network, we are entering the e-business age, the backgrounds of the business are changing, the rapid development of the Open information frameworks and open information frameworks .the way of the business are changing on the internet, information can be send cheaply and easily from anywhere. It seemed that the role of the location is decreased , but in fact .in the new information Age, Location is still a fundamental element in business, it play an important role in E-business, what has changed in the E-business is the way that data about location can move quickly and efficiently through business processes, the fundamental role of the location in business is not decreased ,but is enhanced .Because most e-business process must require some level of the information of the location are completed, The information of location based services (LBS) must be an integral part of the underlying E-business process. At the same time, with the development of the wireless communication, spatial information grid (SIG) and web services, the location based services can be easily acquired and integrated with the mainstream information technology than before and this make the location based e-business become feasibly and will be a revolution to the development of the tradition GIS and application of the location based services.

In this paper, the author try to provider the reader with an understanding of importance of location and (LBS) location based services in E-business and how tightly integrated LBS enhanced E-business processes, whole paper include 7parts as follows:

1The backgrounds of the E-business and the changing of location in business .A brief review of the backgrounds of the E-business are put forward then analysis the potential effects of location information in traditional business and its changing in the E-business.

2 classification of the location based services in E-business. The location based services (LBS) in business are classified and the examples are given in this part.

3 Key technologies: in this part the author briefly examines the key technology (such as the web services, spatial information grid and agent technology) to integrate location information into e-business processes and the Location-specific functionality in E-business are put forward.

4 location based services in CRM: in this part the author briefly discuss the location in CRM and how to integrating location –specific information into CRM .from the location specific information ,we can (1) discuss and reveal the buyer patters ,(2) manage resources ,discover demographic trends ,(3)market potential analysis (4)product introductions (5)expansion analysis of the customer (6)mo-

bile location services ,also a chart and some examples are given.
5location in ERP: in this part the author briefly discuss the location in ERP and how to integrating location –specific information into ERP. from the location specific information we can (1)determine the optimal places for one or more facilities (2)analyze the location of the suppliers and the rough materials (3)analyze the location of chain retails
6 location in logistics: in this part the author: briefly discuss the location in Logistics and how to integrating location –specific information into Logistics. from the location specific information we can (1) navigation, route guidance ,vehicle tracking dispatching (2) assigning portions of a network to locations based on predetermined criteria (3)determining the optimal places for one or more facilities so that the services is accessible to the population in the most efficient manner (4)vehicle routing and scheduling.
7prospect:in this part the author briefly discuss the future location based services in E-business .the location based services are more integrated into the E-business and the future direction of the location based service in the E-business are (1) location based intelligent (2) location based events (3) personal location information management (5) event-based information

Key words: Location, LBS (location based services), E-Business

Delivering Services to Citizens: Changing Approach and Access to Geographic Information

Eva PAUKNEROVA

Location Based Services to support citizens during recreational activities

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Location Based Services (LBS) is a topic one comes across everywhere. There are lots of studies and prognoses considering this application as one of the emerging markets in the area of mobile communication in. Up to now lots of ideas on how to utilize Location Based Services exist and several are already on the market. Most of them are focused on urban areas using the mobile phone network to determine the customers position and short messaging service (SMS) to deliver the information. Within this paper an approach will be presented to provide information using LBS technologies for recreational activities in mountainous areas, especially for mountaineering and hiking but also applicable for other recreational activities like skiing or mountain biking. The technical premises in those areas differ from those met in urban areas as well as there are special requirements of the potential users on such services.

Within a project called PARAMOUNT funded by the European Commission (EC) an international consortium consisting of IfEN GmbH in Poing, GIS lab at the University of the Bundeswehr Munich (AGIS), Institut Cartographic de Catalunya (ICC) in Barcelona, Bayerische Bergwacht (Bavarian Mountain SAR Service) and Oesterreichischer Bergrettungsdienst (Austrian Mountain SAR Service) is establishing a LBS for hikers and mountaineers on a prototype basis.

The paper at first will present the user requirements on such services which have been collected in workshops with hikers and by means of an internet based questionaire. After that the analysis on possible service areas in the whole Alps and Pyrenees are presented. Therefore data has been collected regarding the GIS data as well as the GSM availability. Addinally the GPS availability has been calculated by means of a simulation process.

Within the PARAMOUNT project three major service categories have been defined and implemented on a prototype base. These are called INFOTOUR, SAFETOUR and DATATOUR and will be explained next.

The INFOTOUR service provides various information and navigation functionalities to the user. This can be maps as well as points of interest (huts, summits, public transportation stations etc.) and further information on them like phone numbers or operating hours. Additionally this service package will offer various routing functionality e.g. from the user's current position to a desired destination and the possibility to be guided by the system there. In addition to this other information like local weather forecast or other tourist information will be provided. It is also anticipated to provide 3D views of the user's current surroundings on the mobile device.

Every year about 150 million people are enjoying recreation in the mountainous regions of the Alps and the Pyrenees. Unfortunately with this huge amount of people lots of accidents in the mountains come along. Not only the helpful information provided through INFOTOUR can increase the safety of people in the mountains. Especially the SAFETOUR service package contributes to the safety of the users by offering tracking functionality and in case of an emergency this service package will assist in alerting/coordinating Search and Rescue (SAR) services. Within this service package e.g. the user can send an emergency call to the SAR teams. This call is received by a SAR centre where among other information the position of the distressed persons' location is automatically displayed on a map.

As capturing and maintaining the data for these services is a time consuming and therefore costly task for the provider of such a service the DATATOUR service has been developed with the goal to reduce this costs. This service will directly involve willing users in acquisition and maintaining of geographic data like hiking trails and points of interest information. Especially for the processing of hiking trails acquired by these users via GPS several algorithm have been developed to maintain the route data base.

As extensive tests with the system are carried out and will be carried out during April and July 2003 in the full paper experiences with the services can be presented. The paper will be concluded by some remarks on business models for such a service.

How to improve the use of soil geographic databases: GIS& Internet based tools

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Small scale (1/250 000) soil databases have been recently developed in many French regions in order to provide exhaustive soil information over vast areas with acceptable costs.

The soil database “Sols et Territoires de Bourgogne” (Grounds and Burgundy territories, STB) is the regional version of the national French program “Inventaire, Gestion et Conservation des Sols” (Inventory, Management and Conservation of the Grounds”, IGCS) coordinated by the French Institute for Agronomy Research (INRA).

This program concerns all the stakeholders involved in the sustainable management of rural areas and contributes to solve questions like those about soil erosion or acidification, quality of waters, management of irrigated crops, location of fallow fields, etc. from a regional to a more local scale.

The scientific and methodological principles related to the constitution of the databases are first reminded here. The basic notions of Landscape Unit, Soil Mapping Unit, Soil Typological Units, are described and their interrelations are explained. Soil mapping units defined within the soil database are complex. They include a set of distinct soil typological units, each of them being characterised by a set of relevant soil properties.

Because of this complexity, we have decided to facilitate the data access through two Internet based interfaces, one mostly to display the geographical and database content, the second to download the database information and perform all spatial analysis needed.

APNEE - Air Pollution Network for Early warning and information Exchange in Europe

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Project APNEE (Air Pollution Network for Early warning and information Exchange in Europe) has been conducted amid the Fifth Framework Programme of the European Union to design and evaluate information services to inform the citizen about the current state of air quality at their location of interest, be it at the citizen's location or any other location of interest, e.g. place of the children's kindergarten or area for jogging exercises. Apnee draws upon an array of communication channels in a complementary fashion in order to reach the citizen in the most appropriate way. Following a set of successful field trials in Apnee with SMS services, WAP servers, Internet portals and voice servers, APNEE-TU (take-up measure) has been started to expand the service portfolio of Apnee by new technologies and content. This paper will report on the design of the open architecture of the Apnee framework to incorporate new technologies and content. The paper will put particular emphasis on the results of field trials conducted so far and lessons learnt for the presentation of information towards the citizen to elevate the impact without scaring messages.

Project APNEE has been establishing a uniform information portal on air quality in different European regions. Rather than elaborating sophisticated air quality management and forecasting approaches, APNEE strives to develop a use-oriented umbrella for the distribution and customisation of existing air quality information. APNEE , in particular, em-ploys several communication channels—be it short message services, mobile communication protocols, or street panels—to transmit information on air quality to selected citizens in urban regions in customised fashion. Customisa-tion refers to the tailoring of information content, i.e. the kind of warnings or recommendations for further actions, with respect to the user group registered, to the technical capabilities of the end-user devices targeted, and of course to the geographic location.

On the one hand, environmental information represents an attractive business asset once perceived as levels of comfort improving the daily life of citizens. On the other hand, the need for high-quality information services is further supported by several European directives to inform the citizen about environmental conditions as well as ongoing initiatives concerning access, dissemination and exploitation of public sector information (PSI). Although elementary publishing services are in place, e.g. web servers on air quality, the question arises of how to reach and eventually impact the citizen with information on air quality and how to establish sustainable supply chains for environmental content. Specific references to obligations to inform the citizen are included in major directives.

"…Member States shall take the necessary measures to ensure that, in the event of an imminent threat to human health or the environment, whether caused by human activities or due to natural causes, all ***information*** *held by or for public authorities*

which could enable the public likely to be affected to take measures to prevent or mitigate harm arising from the threat is ***disseminated****,* ***immediately and without delay****." "Member States shall take the necessary measures to ensure that public authorities organise the environmental information which is relevant to their functions and which is held by or for them, with a view to its* ***active and systematic dissemination to the public****,* ***in particular by means of computer telecommunication and/or electronic technology****, where available."*

Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC

An APNEE-like portfolio of information services will be the key enabler to help authorities to fulfil these new EU directives on public access to environmental information (see above). Besides giving access to information by means of pull services (the citizen requests information), the APNEE solution also allows one to actively push information to the public in case of an accident or emerging episodes, i.e. the citizen will be actively informed by an alert message. The latter is accomplished by a SMS alert message to a citizens' mobile phone; in addition, APNEE services with MMS on GPRS are currently under development and will be tested soon. Complementary to these message services, smart phones and PDA interfaces as well as email, voice server, street panels, and web access are offered with APNEE. For the web a map-based interface with coloured indices allows a quick and easy to understand view on the current state of air quality in the surrounding of the concerned citizen. Major emphasis has been put on the visualisation of information and appropriate classification schemas.

However, APNEE services cannot be operated by one single party. A trans-disciplinary business chain is required, ranging from a trusted source of information on air quality, via technology providers for customising information services, up-to portal providers offering and maintaining such information services. Public bodies are by far the largest producers of information in Europe and due to national and EC directives all environmental state authorities now have a strong web presence and in general make information available on websites free of charge or at very low level charges. Mobile technology is in the starting blocks for active information dissemination services, but how should authorities be able to master the technical challenges of new communication technologies with its rapidly change of standards as well as large variety of mobile devices offering different technical capabilities?

Telecommunication providers, on the other hand, might not know about the quality and semantics of data, but they in turn can provide the technological backbones of an information dissemination platform. Portal operators are also experienced in information presentation, structuring and of course marketing of content. But they again need help for interpreting data to information as well as for operating a technical dissemination platform.

The successful combination of these partners creates a valuable business chain, where each partner contributes its experience and receives revenues from the overall customer fee. Taking into account the upcoming directives to give active information to the concerned citizen, this business model can help authorities not only to fulfil these directives, but moreover to market their service portfolio, allowing them to

improve their services with the revenues gained, and therefore lower the burden of state expenses.

In APNEE and APNEE-TU this "business collaboration concept" has proven successful:

- In each APNEE region an authority provides and authorises the measured air pollution data.
- Research institutes and universities operate and control models for forecasting of air pollution.
- Technological partners designed and realised the Internet and WAP portals as well as street panel interfaces.
- Mobile and Internet information portal providers integrated the APNEE solution in their portals.
- And telecommunication companies distribute the messages over SMS, MMS and WAP, as well as via smart phones and PDAs.

APNEE does not represent a new air pollution management system, but provides a conceptual and technical umbrella for already existing ones, that is, a bridge which allows the export of data to one common regional database from where it can be extracted from different service providers. Thus, the APNEE architecture allows new users sites, new interface providers as well as alternative types of data to cover new information domains, such as pollens, weather information, bio weather, or real-feel temperature to connect easily. APNEE provides in principle the dissemination core, i.e. broker platform, employing several communication channels to be used by content providers, in our case information on air quality and levels of comfort.

This paper will give more in depth details about APNEE and APNEE-TU and its main objectives to

- provide an air quality portal with pull and push services,
- employ complementary communication channels to reach the citizen, and to
- implement a supply chain of content from trusted sources, via portal operators to the citizen.

We will present design, implementation, and results of our field trails with information services in the regions Marseilles - Région Provence Alpes Côte d'Azur in France, Athens and Thessaloniki in Greece, Madrid, Canary Islands, and Andalusia in Spain, Oslo and Grenland in Norway, and Stuttgart and Dresden in Germany.

APNEE has been supported by the European Commission DG XIII under the 5th Framework Pro-gramme, IST-1999-11517. Partners include FAW Ulm, Germany (Co-ordinator), Airmaraix, France, Aristotle University Thessaloniki, Greece, Ayuntamiento de Madrid, Spain, Expertel Consulting, France, NILU, Norway, NORGIT AS, Norway, Seksjon for kontroll og overvåking i Grenland, Norway, SICE, Spain, Telefonica I+D, Spain, Universidad Politecnica de Madrid, Spain. APNEE-TU is supported by the EC under contract IST-2001-34154. Additional partners are Storm Weather Center and National Road Protection Agency, Norway, ITC Canarias and Andalusia Network, Spain, OMPEPT and Siemens, Greece, as well as UMEG, Fraunhofer FIT (new co-ordinator), and t-info GmbH, Germany.

Forest Monitoring Prototype System Using Web Mapping Technology

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Earth observation data has been highly effective in environmental monitoring but it is not being used effectively enough in operational systems. Within NASDA there is a desire to promote increased use of Earth observation data in operational systems used for environmental monitoring. Further, through the rapid development of the Internet GIS has expanded from local applications to applications distributed over the Internet through various tools and interfaces that support distribution of image (map) and location information over the Internet.

In recognition of the need to increase interoperability of geographical spatial data and Earth observation data NASDA decided to develop a prototype system for forest fire monitoring in Thailand using OpenGIS Consortium (OGC) technology as a means to study new services and possibilities of data interoperability for forest monitoring applications as a joint research project between NASDA and the Ministry of Agriculture, Forestry and Fisheries of JAPAN (MAFF).

The prototype system includes two OGC Web Map Servers, an OGC Web Feature Server and a web-based Viewer Client. Web Map Servers provide Fire Risk maps made by MAFF and provide JERS SAR mosaic images and other data made by NASDA. The NASDA Web Feature Server will provide AVHRR hot spot information and DMSP/OLS hot spot information for Southeast Asia generated by MAFF. Target users are forest fire monitoring operators in Thailand. The following scenario for monitoring a forest fire was assumed:

- Operators can find the latest fire locations and evaluate further risk of fires by combining fire risk maps with the latest hot spot information.
- For a more detailed understanding the operator can zoom into an area and overlay hot spots onto the JERS-SAR mosaic image to understand the topography. Also, the operator can overlay state boundaries, rivers, roads, etc.
- For confirming the location of fire spot the operator can see the lat/lon information on other window.
- Operator can do temporal searches on historical (past) Fire Risk maps and hot spots database.
- Operator can save the image in JPEG format and hot spot lat/lon information in text format.

In addition, above data will be available to the Digital Asia Network for Southeast Asia as a demonstration system.

This paper describes the overview of prototype systems and detail information of a forest monitoring prototype system using OGC web mapping technology.

Including GIS functionality in a JAVA and XML based system

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A platform independent, portable system, capable of handling heterogeneous data formats and types has been developed based on Java and XML. The system generates reports about specific areas of interest in various text formats and includes images and vector data in these reports. The user community receives this digital product and can browse and read it using the system. By means of the system's built-in viewer, images and vector data integrated in the text through hyperlinks can be visualised and manipulated. Also, spatial analysis can be performed with the vector data.

Web Map Services (WMS) Global Mosaic,

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The WMS Global Mosaic provides access to imagery of the global landmass using an open standard for web mapping. The seamless image is a mosaic of Landsat 7 scenes; geographically-accurate with 30 and 15 meter resolutions. By using the OpenGIS Web Map Service (WMS) interface, any organization can use the global mosaic as a layer in their geospatial applications. Based on a trade study, an implementation approach was chosen that extends a previously developed WMS hosting a Landsat 5 CONUS mosaic developed by JPL. The WMS Global Mosaic supports the NASA Geospatial Interoperability Office goal of providing an integrated digital representation of the Earth, widely accessible for humanity's critical decisions.

The national atlas as portal for the national spatial data infrastructure

Ferjan ORMELING

GIS and Internet within atlas production

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The World Wide Web has become an ideal media for maps. Web maps have evolved from static raster images to dynamic, interactive, and multimedia representations of geography. Through the Web, maps are not only fulfilling their traditional roles as pictorial abstractions but also becoming a window to the wealth of information around the world. Maps find many innovative uses that were not possible before the widespread of the Web.

The paper deals with several concerning topics: multimedia electronic map, conceptual and design factors, dynamic representation for map contents and for visualization of map contents, electronic map engineering and design pattern of Web maps.

Multimedia electronic map combines several medias such as graphs, images, texts, charts, sound, animations, videos etc., and can express spatial information directly, visually and vividly via sense perceptions like vision, hearing, sense of touch. The conceptual structure can be subdivided into steps that should help create the interface's general conceptual structure. Design factors play an important role – the interface's usefulness and acceptance is not only determined by its technical and conceptual realisation, but even more so by the design of the single elements. The use of colours, typography, icons, and pictures is an important design aspect that has strong influence on the interface's usefulness and transparency. A design pattern of Web maps is a concise description of a common sense approach to a design problem.

State Mapping Center - Mapping services over the Internet as a part of the Governmental Portal

Martin VRATNY, Zdenek DRBOHLAV

TUESDAY
September 23, 2003

The Art and Power Welding Science and heritage in a Knowledge Economy for the 21ST century

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A powerful trend is emerging throughout the world, of relevance to my assertion that countries abounding in natural and cultural riches hold a historic opportunity to set a course for the economies of this new century. The ever-greater importance of science, which fuels the growing momentum for the "knowledge economy," is the essence of this global megatrend and the impetus behind the mission of PANGEA WORLD. Targeting a potent knowledge resource base that has eluded the world's economy thus far, PANGEA® seeks ***to fashion science-driven valuation of the world's heritage wonders into an engine of leadership economies and corporate philosophies***.

This ambition rests on the credentials of the *TCR economic-development model*, which intertwines the growth of the tourism and hotel industry ("T"), conservation of natural and cultural resources ("C"), and scientific research ("R") into a strategic partnership with the capacity to catalyze the strength, sustainability, and international prestige of national and regional economies. The TCR has been endorsed by the American Association for the Advancement of Science, the Smithsonian Tropical Research Institute, and other prestigious international agencies and expanded into the flagship TCR Action Plan for the Republic of Panama at the invitation from the Panamanian Government.

In presenting the TCR blueprint for a "knowledge-powered, heritage-nourished economy"—and its pilot implementation in Panama— I will emphasize TCR's core focus on positioning, profiling, and appreciating a country's heritage resources as databanks of knowledge that is systematically harvested and employed to drive a dynamic economy and prominent international image. Underpinning this focus is an original concept of *TCR heritage themes*, conceived as tools of a proactive valuation of a nation's or a region's reserves for a knowledge-cum-heritage economy. These themes are about capturing the dynamics of, and the relationships among, multiple heritage resources, and about doing so in a manner that systematically and simultaneously energizes the scientific, conservation, and economic values of these resources.

From the platform of PANGEA WORLD—the catalyst and symbol of harnessing the promise of this new economic paradigm—I will then offer an outlook about this paradigm's prospective contribution on a global scale, in the context of the ever more globalized and information-spanned world and in the light of PANGEA's aspiration to establish a novel system through which research funding and expertise flow into heritage-rich environments whose untapped economic worth is in the knowl-

edge they contain. A number of countries, for example Ecuador and the South Pacific island nations, are superbly positioned to capitalize the opportunity PANGEA stands for. In profiling this opportunity I will highlight PANGEA's capacity to motivate academic, business, and government leaders to engage in actions and collaborations that promise to intertwine world-class science, heritage conservation, and business stewardship into an engine of leadership knowledge economies.

A special point will be made of PANGEA's commitment and capacity to engage in and achieve, selectively and exclusively, projects that are exemplary in substance, quality, and the art of execution. These TCR Leadership® and TCR Vanguard® initiatives must be articulated and communicated at the level of excellence and prestige that captivates international attention and inspires following—and, thus, spearheads the fulfillment of the specific objectives of PANGEA WORLD, including:

- to engage world-class research as a prime safeguard of conservation areas and heritage sites;
- to portray support for scientific exploration as a hallmark of political and business stewardship; and
- to seek the international hotel industry's transformation into a leading benefactor and beneficiary of the advancement of science for enhancing the environmental security, social well-being, and international image of countries and regions.

Tuesday, September 23, 2003 ***stream I.***

topic 1

DATA, INFORMATION, KNOWLEDGE, TECHNOLOGIES AND TECHNIQUES

Geospatial Virtual Environments, towards a new paradigm in geovisualisation

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Most of the research in the field of Virtual reality and Visualization of environments has been done on the technical side, focusing on the technical limitations and trying to build systems that just work efficiently. But the nowadays availability of powerful computing machines and a variety of software packages (from 3D GIS to 3D computer games production) does not limit our imagination and meets our needs. We propose a methodology for geographic information visualization in virtual environments for participatory plan preparation. The methodology was tested in a virtual reality prototype, Virtual Landscape viewer, developed for a project that will significantly change the landscape in an area in the north of the Netherlands, the Meerstad project. The prototype integrates different geospatial datasets and the stakeholders are able to fly over the landscape and to "zoom in" to access detailed and different georeferenced data. In "landscape change projects", the stakeholders group is numerous and heterogeneous by nature, with different sensibilities and with different interests and concerns about the project. It is fundamental to display the correct information in a correct way to assure that all have the same understanding of the goals and consequences of the project. Geospatial Virtual Environments provides an effective way of presenting large amounts of complex information to a wide audience, including those with no Geographic Information Systems (GIS) or mapping experience. The system was designed taking into consideration cognitive principles and is able to integrate high quality mapping of the current situation, 3D representations of the future and (geo)multimedia (regarding real world information). The people involved can understand the proposed plans and proposed changes. This new approach was built based on a geo-information infrastructure which supports open plan process and participation and is able to integrate all available sets of data.

Data Integration and Visualization for a CRM System: an Internet-based Solution

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This paper describes the framework and methodology used in designing the analytical CRM (Customer Relationship Management) system, referred to as the Brand X Test-Drive. The objective of this analytical CRM designed is to provide valuable understanding concerning how effective advertising is performing, and at the same time gain valuable feed back when a particular automobile distributor launches a new model to a market segment for the first time. The system allows expensive print type advertising to be tailored to the best potential buyers based on the demographic profiles, thus enable the distributor to maximize the effectiveness of large advertising expenditure by reducing costs on campaigns that would not reach the best potential buyers.

The CRM system developed is based on GIS and Internet technologies, huge volumes of geo-referenced data, statistic databases, and customer records have been integrated to support the visualisation and analysis. The application consists of powerful modules for web-based data capturing, demographical profiling, current market trend mapping, and target buyers predicting. Using these modules, the performance of an individual PMA (Primary Market Area) can be assessed by comparing a dealership's market share and unit sales performance, and some key performance indicators can be generated to provide both a distributor from a dealer network development aspect and a dealership an understanding of market potential as well where to target the best sale opportunities spatially within their PMA.

Preliminary Study on Building Standardization System of Digital Mine

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Digital mine is essential stratagem of everlasting development in mine enterprises. Building standardization system of digital mine is the most important work to perform the digital mine projects. The standards of digital mine is a system with abundant content and lots of kinds, so we must pay close attention to study and establish some necessary standards in constructing system of digital mine combining with concrete condition of the mine. The authors have a preliminary study on building standardization system of digital mine on the basis of studying standardization systems at home and abroad. The authors study three aspects of problems. The first one is to establish the standard system for vocational work of every branch in mine enterprises; the second is to build standard system for data0information technology and metadata management in order to ensure the unified data and information sharing. The last one is to build technical standards for mine system development.

Key words: Digital Mine Standardization Build Mine System

Harmonised Geographical Information System for Mine Action in South East Europe

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The International Trust Fund for Demining and Mine Victims Assistance (ITF) is non –profitable organisation established by the Slovenian government with the aim helping mine affected countries in the region of South – East Europe in their mine clearance and mine victims efforts. ITF was initially established as support of the Republic of Slovenia to Bosnia and Herzegovina in its efforts to clear the land of the «hidden killers«. It soon extended its operation to other mine affected countries in the region of SEE, so the countries of ITF operations today include Albania, Bosnia and Herzegovina, Croatia, Serbia and Montenegro (including Kosovo) and Macedonia. ITF Managing Board as well as ITF Board of Advisors approved the extension of ITF operations also to Caucasus (Armenia, Azerbaijan and Georgia) in the limits of ITF capabilities and under the condition that the focus of its operation remains in the region of South-East Europe.

In this contribution is presented the ITF part of the implementation of "Geographical Information System (GIS) for Mine Action in South – East Europe" and technology used for that. Presented are methods of help to the regional mine action centres in South – East Europe for demining and the implementation method of the distributed information system in which is the GIS main part.

The problem of mine contamination in S.E. Europe continues to be very serious, causing casualties and creating obstacles to socio-economic development. Planning and monitoring of Mine Actions requires the use of Geographical Information Systems, and these will be more effective at handling regional and cross-border aspects if systems and data are harmonised at the regional level. There is therefore a need to establish a regional (Geographical Information) Infrastructure among the organisations in the Mine Action community.

On meetings with experts from Mine Action Centres in S.E. Europe the urgent need for reliable maps for all mine-affected countries was repeatedly raised. A project was subsequently started to strengthen the GIS and mapping resources available in the region, and to work towards harmonised methods and data for this community. The project was jointly funded by the EU and the US Department of State and has been implemented through the International Trust Fund. It included a multi-resolution approach to the development of imagery and vector data for the region and aimed to bring the different organisations up to a similar technical level through training, joint projects and shared experience in the working group. Through the work of the Working Group it was identified that a multi-resolution approach to mapping was needed in order to satisfy the diverse range of requirements for Mine Action which cover different spatial scales. The requirements ranged from Regional

Planning (requiring approx. 1:100,000 scale maps), through local planning and monitoring (requiring approx. 1:25,000 scale maps), to detailed mapping and monitoring of mine clearance operations in specific areas (requiring imagery at 1:5,000 scale). It was also found that the EU Satellite Centre had already developed significant digital map coverage, based on satellite imagery for Kosovo, Montenegro and Macedonia. Albania was identified as the next country to be covered by medium resolution data, as its mine action centre had virtually no digital data resources.

The multi-resolution approach currently being implemented therefore includes:

- Low resolution coverage of the whole region with Orthorectified Landsat 7 imagery, land cover classification, change detection for 1990 - 2000 and basic vector layers
- Medium resolution, IRS PAN/LISS imagery coverage and GIS vector maps for Albania
- High Resolution Aerial orthophotos for priority areas defined by BHMAC and CROMAC;
- A Comparison between Aerial photogrammetry and satellite imagery for high resolution work on a test area in Croatia

Principles of Spatial Data Mining and Knowledge Discovery

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A growing attention has been paid to spatial data mining and knowledge discovery (SDMKD). This paper presents the principles of SDMKD. First, the motivation and development of SDMKD are overviewed. The necessity to take advantage of the databases makes data mining proposed, a geo-spatial branch of which is (SDMKD). Second, the intension and extension of SDMKD concept are presented. Various kinds of knowledge can be discovered from spatial databases. Furthermore, the interdisciplinary characteristics make SDMKD related to other subjects. Third, the discovery mechanism is taken as a process of discovering a form of rules plus exceptions at hierarchal view-angles with various thresholds. Fourth, mining granularity is proposed as the measurement of data, information and knowledge. Fifth, the existing theories and techniques are briefed. Finally, the whole paper is concluded and discussed.

Key Words: spatial data mining, concepts, principles, granularity

Priority Based Dynamic TCP Send Buffer Allocation

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Network plays a pivoting role in today's cyber world. The efficient utilization of available resources can mark an immense change in server's performance in any network. One such valuable resource which should be optimized is the **TCP Send Buffer**. Conventional methods of allocating send buffer do waste a lot of server resources and are also inefficient. The new **Fair allocation algorithm** proposed makes efficient use of server's resources by dynamic allocation of **Send Buffer**. In this algorithm, priority level is set for each request from a client and depending upon the priority, send buffer is allocated proportionally. To accomplish this, the **bufferable space**[1] of the server is divided into two segments. One segment allocates send buffer for the new entrants and some time later it will be swapped to the other segment. This helps in processing the incoming requests at a nominal rate as well as to provide good service to the connections that need a great deal of server's resources. This algorithm differs from the rest of such similar algorithms in its approach to allocation of resources. This algorithm is also capable of handling critical conditions. Since this algorithm rests basically on server characteristics, the efficiency is superior. A **simulation** has also been done for the same in C++.

bufferable space[1] : The memory space that can be provided by the server for the connections to be shared among themselves.

GIS for creation of geodynamic model of mining areas

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The north Bohemia brown coal mining area has changed seriously within last 150 years. The reason of the fact were the ground mining activities lasting from the second half of the 19th century and open mining activities since the second half of the 20th century. All these activities are already finished and the landscape can be regarded as stable. Changes of land morphology, of hydrology, of road and railway network, of urban areas, and in climate are phenomena characterizing the geodynamic model. Their development in time steps since the first half of the 20th century defines the time development of the model. The model was created in the region where half of the area was dedicated to ground or open mining activities.

A Composite Method to Generate Fuzzy Land Cover Objects from TM Images

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Spatial features are usually simplified as crisp objects in GIS data models. However, this kind of abstraction is not accurate enough since in more cases the natural phenomena are continuous and there are no determinate boundaries between different spatial objects. Handling these fuzzy spatial objects is one of the most important questions in GIS.

In order to model fuzzy spatial objects in spatial databases, the first step is to form fuzzy spatial objects. The key problem is how to represent the fuzziness and then how to calculate membership functions for fuzzy spatial objects. According to Fisher (1996) and Burrough (1996), two kinds of fuzziness exist in spatial objects such as fuzziness in spatial extent and fuzziness in object definition. Understanding the fuzziness helps us to design membership functions and compute membership values for a fuzzy object. In general, membership values are calculated by two kinds of methods: active and passive. The active method derives the membership function and values by experts or based on some knowledge. The passive method calculates the fuzzy membership functions according to the data itself. Cheng et al. (2001) discussed the general processes of identification of fuzzy spatial objects. They also proposed three models to form fuzzy objects by use of active and passive methods. However, the passive method, which was applied in TM image classifications needs more discussions since the extent of fuzzy spatial objects covers a too broad area.

The paper firstly introduces the general procedure how to form fuzzy spatial objects by use of the passive method. The procedure includes three steps: analysis of fuzzy type of spatial objects, computation of membership values and evaluation of accuracy of fuzzy spatial objects.

Based on this procedure, this paper puts forward a composite method to form fuzzy spatial objects. The method includes seven steps: analysis of fuzziness in land covers, selection of appropriate initial membership functions, computation of parameters of membership functions, fuzzy convolution for adjusting the membership values according to the land cover texture, rule-based processing for finalizing membership values, representation of fuzzy land cover objects and testing of accuracy. Sanya city is selected for the test of the proposed method. The city is located on Hainan island, in the south of China. The TM image was obtained on 18 April 1990.

The study area ranges from E108.97257° N18.160917° to E109.550161° N18.5904583°, covering the city and rural areas, with 1960*2350 pixels on the TM image. Eleven land cover types will be classified from the 7-band TM image: *forest, bush, shrub and grassland, waste land, bare land, water body, beach, built-up area, rural area, paddy field, dry land*. The definition of these land cover types is as follows:

The conventional maximum likelihood classifier is selected to calculate the initial membership values. Although several sampling methods are taken to check the correctness of the classification, it should be pointed out that the final result is obtained by sampling data in small polygons conventionally. The classification is done by using ERDAS Imagine.

After the classification, the weighted distances of each pixel belonging to every class are calculated. By checking the results, several errors can be observed. For example, some dry land was classified as rural land; some land cover objects are too small. This is because the maximum likelihood classifier classifies images pixel by pixel. In order to derive a better result, the fuzzy convolution is applied to adjust the weighted distances of the pixel belonging to all classes, because it considers the membership values of neighbour pixels.

After fuzzy convolution, two problems can be detected: (1) On some pixels the membership values of a land cover type (for example, bush) are very small. These pixels definitely belong to other classes, for example, to forest. (2) There are also some pixels whose membership values of a land cover type are very large but less than 1. These pixels actually must belong to bush.

We can define thresholds to cut off small membership values and enlarge the big membership values according to the variance of the distribution. In the normal distribution, if the membership value for a certain class equals 1, then the pixel covers all characteristics of that class. If the membership value of a pixel for a class is greater than 0.69, then the pixel falls within the interval of one variance (s). We can cut off the two tails. That is, if the membership value is not greater than 0.16, then it is set to 0. It means that after classification, if the pixel covers only 16% characteristics of a certain class, the membership value is changed to 0. On the other hand, if a pixel covers the characteristics with 84% (=100%-16%) = 0.84, then the membership value is assigned to 1, showing that it definitely belongs to that class. The membership values between 0.16 and 0.84 are then normalized by a linear transformation: $p_n = p_o / 0.69 - 0.16 / 0.69$.

The other problem is that some pixels definitely belong to a single class, however the membership values for that class is far less than 1. In this case, the dry land and paddy field are defined as the crisp land cover class:

(1) If a pixel has membership values belonging to dry land and other classes, then it belongs to the class whose membership value is the maximum of all membership values, and is assigned membership 1.

(2) If a pixel has membership values belonging to paddy field and other classes, then it belongs to the class whose membership value is the maximum of all membership values, and is assigned membership 1.

Several comparisons have been done based on test data. 162 sample points are selected from the area that are difficult to be classified. The truth value of fuzzy land cover objects is estimated based on expert knowledge. At each point, membership values belonging to two land cover classes are simulated: dominant and secondary classes. The comparison results between membership values of the dominant class of the classification result with expert estimation shows that at each point 143 points are classified correctly, i.e., 88.2% of 162 points. This also represents the accuracy of the crisp classification. The average of the differences is 10 between the membership values. It denotes that if the pixel is correctly classified at the first layer, then the accuracy of the membership value is 90%. Between the secondary class with the true values, it shows that 121 points are correctly, i.e., 74.7% percent. The mean difference is 2, which denotes the accuracy of membership values is 98% in the correct classes. It can be seen that if the land cover class is correctly classified, then the differences are very small between classified results and the true classes. That is, the classification accuracy is the key that affects the accuracy of membership values of each land cover object. The total overall accuracy is 66.7%.

This paper proposes a method to form fuzzy land cover object. According to the results of the test area and evaluation of the accuracy, it is shown that the proposed method is suitable to form fuzzy land cover objects.

Mapping from Space

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Traditional mapping by photogrammetry has been successful to provide a near global coverage at the 1:200 000 scale. For the more useful scale 1:50 000 only 2/3 of the globe were covered, however, there is a serious lack of update of these maps in the developing world. Mapping from satellites can bridge the existing gap in providing timely information.

The paper lists the historical development of optical and radar satellite sensors. The present high resolution satellite sensors are more expensive than aerial photography products. In the future there will be competition to existing systems by small satellite operators. Advances in digital mapping technologies have led to the efficient creation of software systems for the restitution of aerial and satellite images. Radar interferometer technology has proved useful for small scale digital elevation model creation. The advantage of using satellite data is in its integration with data from other sources.

Mapping Information from Space with Quickbird Satellite Data

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Very high resolution satellite data are now available on a full commercial basis, disclosing a large number of new opportunities for the use of the Earth observation data. Satellite data can now observe every location on the earth with a detail up to 61-centimeters in the case of QuickBird satellite; therefore it is now possible to carry out, with EO data, many applications that in the recent past were exclusive to airborne and on site surveys.

Information mapping from space requires that the information can be extracted from satellite imagery and reported, with a good accuracy, on a map or on a geographical reference system. In this framework, QuickBird is the satellite that offers the most powerful source for the extraction and mapping of information in a wide range of applications. In fact, key features of QuickBird for mapping information from space are:

- High geometrical resolution. 61 centimeters in panchromatic mode when collecting at nadir, that become 66 cm when collecting with a 15° acquisition angle, is a resolution that can be compared with medium to high scale aerial flights
- Multispectral capabilities. Spectral information is collected not only in the panchromatic band but also, with 2,44-meter resolution, in three visible bands and one infrared band. Since the three bands collect spectral infromation in the blue, in the green and in the red band, it is possible to generate natural color views, that can be used as a starting point for technical and not technical maps. By using the infrared band, it is possible to generate false colour images for a more technical analysis of the territory. Natural and false color views can be improved in terms of geometrical resolution by merging with the high resolution panchromatic band, applying fusion techniques, and generating high resolution pan-sharpened multispectral images. By using pan-sharpened data, it is possible a better discrimination of land cover features, since the black & white geometrical information is improved by the color information, enabling a better information extraction from the imagery
- Radiometric sensivity. For each band, a range of 2048 (11 bit) possible values is available. This feature enables, through the use of proper techniques, a more detailed information extraction
- Good positioning accuracy. QuickBird data can be geometrically processed and orthorectified through the use of a rigorous sensor model or through the use of the RPC (Rational Polynomial Coefficients). Both techniques enable a very good geometrical processing of the data, supplying a positional accuracy that can target up to one meter depending on the quality of the ancillary data involved in the processing. The first approach is possible since the Basic QuickBird product packaging includes not only the image file, but also a list of ancillary data files, such as those containing the ephemeris and the attitude parameters that, managed by a proper software that model the satellite sensor, enable the generation of accurate

orthoimages. Software packages that can handle the rigorous QuickBird sensor model are already on the market.
- Revisit capabilities. The sensor can tilt along and across track, therefore enabling the collection of images not only in nadiral mode. By using this feature, it is possible to improve up to few days the revisit capability of the satellite over a specified area, in order to supply a proper number of images when a multitemporal mapping with high temporal frequency is required.
- Large image area. The minimum size of a single QuickBird frame is 16.5 x 16.5 km, that is 272 sqkm. With a single shot is then possible to cover, for example, a large city, enabling a better synoptic view and reducing the processing time.

QuickBird spectral features, combined with a proper geometrical processing, enable the extraction of topographic and thematic information on a very detailed scale; topographic maps down to 1:5.000 scale can be targetted, while for thematic mapping it is possible to work on a more detailed scale. Therefore QuickBird can be considered a key instrument for a deeper knowledge of almost every part of our planet.

Innovative Technology for Creation of 3D Map

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An innovative technology for creation of 3D (three-dimensional) map is “From Paper to Virtual Map”. The technology is proposed as very cheap and easy creation of 3D maps. A power graphic station is not necessary for this aim. This is very important for countries as Bulgaria where is not easy to have expensive computer equipment.

This technology, proposed by author was developed by a novel application – 3D cartographic symbol system.

3D city maps created consist of 3D geometry, topographic information and photorealistic texturing and 3D symbols, which brings quantitative and qualitative information about the objects. Animation presentations are made for user’s needs.

The Bulgarian 3D maps are one of the first ones consisting cartographic symbol system. Systematisation and classification of objects and designing of symbol system is based on a number of conditions, counting in map creation: contents, purpose, and method of usage, peculiarity of visual perceiving, esthetical requirements, and hardware and software possibilities.

Digital Photogrammetry and Digital Fujian

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This paper provides detail information and discussion on the problems encountered using digital photogrammetry for spatial data acquisition in the Digital Fujian project – a special project set up by the government of Fujian province. It also explores the issues surrounding the future research and development of the project.

Tuesday, September 23, 2003 ***stream II.***

topic 3

GLOBAL SOCIETY DIALOGUE

The Global Society Dialogue: Thinking about a Sustainable global future

F. J. RADERMACHER

The central objective of the Global Society Dialogue is to contribute to frameworks which can orient a globalised economy towards sustainable development for the benefit of all.

- The core topics are the agreements needed between North and South within global contracts.
- The approach is civil society-oriented, and the background is the information society and its overriding impact on the future - for good or for bad.
- Major issues in compromise finding deal with the tension between shareholder value and social solidarity, diversity of cultures and common global values, increasing consumption and care for the environment.
- The Global Society Dialogue deals with sustainability in all its 4 dimensions: environmental, social, economic and cultural.

The Global Society Dialogue is an active civil society forum with an ongoing commitment to reach for and find consensus on core values that could be translated into a coherent framework for international governance and trade.

National Boundaries in Cyberspace

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Our perception of the boundary's meaning basically depends on our perception of distance. Cyberspace defines a new perception of distance and so it changes our understanding of boundaries. National boundaries and the very solid perception of them during human civilization are going to be challenged by new definitions of distance. How this challenge would be responded is the theme of discussion.

Innovative Technology Intelligence and Transfer Framework

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Economic globalisation has led to increased industrial and economic competition. Intense pressure is now placed on companies to be adaptable, innovative and fast and to develop and sustain competitive advantage in a complex business environment. Markets and technologies are changing rapidly, cost pressures are increasing, customers are more demanding,and product life cycles and time-to-market are shrinking. In this environment firms need to focus on their future markets and use technology intelligence technique to stay ahead of the game. Rapid technological developments and need for timely anticipation of new opportunities and threats have also intensified the search for suitable and innovative technology intelligence tools to face these challenges.

Moreover, since it has been widely recognized within the **UN** system (including our institution ICS-**UN**IDO) that the technology is a powerful tool to narrow the gap between those countries that are benefiting from globalization and those for which globalization has led to heightened marginalization, we have started the development of our own innovative technology intelligence and transfer framework in order to help our target beneficiaries coming from underdeveloped world.

Technology intelligence (TI) aims to identify relevant information in the technology environment of a company by collecting, analyzing and communicating the best available information. Technology intelligence techniques like technology assessment and technology foresight are used in order to generate knowledge about current technological developments and to derive a complete picture of possible future trajectories. They represent major instruments supporting technology-related decision-making processes.

Technology Intelligence practice is usually focused on delivering results for key stakeholders and strategic planners. Our innovative technology intelligence framework provides a structured view of the technology industry, trends and impact on the companies. It is also a critical step in gaining the competitive advantage companies seek to outwit and to outperform their competition. This type of help will permit a company to anticipate future developments in its sector or industry and to prepare itself for possible problems.

The Internet has dramatically revolutionized both technology intelligence and transfer of technologies across borders and around the globe. In the last five years, there has been a dramatic growth in the number of companies facilitating the transfer and licensing of patents and technologies across cyberspace. Predictions abound over how this faster and more efficient method of technology transfer will affect the overall speed of innovation and development.Although there have been some initial con-

cerns over recent declines in computer and internet company stock prices, industry insiders generally agree that the web-based model for technology intelligence and technology transfer is here to stay.

For ICS-UNIDO, the Internet represents a key tool for providing inexpensive, "recipient focused" on-line technology intelligence and transfer services to beneficiary institutions and individuals from developing countries and the wider community. Also, governments, and organizations in developing countries have realized the benefits and opportunities that the Internet presents for social and economic development, increasing organizational and national competitiveness. As a result, the Internet developments in third world countries have accelerated significantly in the past few years. More and more developing countries are connecting to the Internet with the hope that it will help reduce the isolation experienced by these countries and facilitate their economic developments. Of course, the poor infrastructure presents serious barriers to rollout of the Internet in many developing countries. Consequently, many international aid financed networking initiatives are under way. World Bank, UNDP, ISF, USAID are among the most active supporters of such initiatives. Moreover, the latest developments in data communications technology (particularly wireless technology) makes it possible to bypass the existing poor infrastructure and have more faster and reliable Internet connection.

Therefore, the ICS has begun developing an Internet available repositories of the best available technologies, economically viable and environmentally respectful (BATEV) and decision aid for evaluation of those technologies (DEBATER) to help its users from the developing countries to acquire and assess various available technologies taking into account all relevant aspects. A holistic assessment of technology requires a full multicriteria exploration of the technical, economic, ethical, social, environmental and political impact that can result from the application of technology or technological systems. Our Internet accessible, multiparadigm decision support system brings together artificial intelligence, operations research, engineering, economics, and public policy concepts to help its user make technology investment decisions. It integrates knowledge and data from a variety of sources to facilitate users conducting multicriteria analyses of technology alternatives and to justify appropriate investments. With DSS, users in developing countries are able to make rational choices among technology alternatives by using their specific subset of criteria and their relative measures of importance, among a huge set of criteria concerning technical performance, economical feasibility, environmental soundness, socio-economic impact, etc.

Another technology intelligence service that will be presented in more detail is a provision of a software tool assisting in technology foresight exercise. The technology foresight process seeks to identify those technologies that will be key to national and-or regional sustainable development in the longer term and to make recommendations to address the opportunities and challenges associated with these technologies. International experience demonstrates that technology foresight is rather complicated and time and resources demanding. Therefore, the technology foresight exercise of one type or another has been undertaken mostly by the leading industrial countries, while the developing and transition economy countries were left aside of the process. To remedy this situation, the ICS-UNIDO has opted for the develop-

ment of a software tool, which will help its target beneficiaries to perform the exercise in more cost effective and less time consuming manner.

Using our via-net intelligence software (CyberDelphi) it is possible to include a diversity of actors and inputs, with acknowledged diversity of visions, to ensure full transparency, openness and bottom-up spirit, and facilitate interactivity among participants and appropriation of the process to the actors and stakeholders. The software enables policy-making processes, in which collective learning is developed in the technology –related arena via interaction between industrial, academic, governmental and social actors. It operationalises interactive processes aimed at exploring openly and collectively possible futures. In this way, it both increases and distributes strategic intelligence among social actors on emerging technologies and innovations. Such processes help to formulate and co-ordinate the forward-thinking of institutions concerned with (technological, social and organisational) innovation, thus enhancing their strategic capabilities.

The distributional proposition for the information society

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A large number of econometric studies have been carried out linking the tangible (and sometimes intangible) characteristics of the Information Society to more-or-less tangible indicators of sustainability. Most of these use regression methods that effectively relate aggregate and/or average values of these indicators. This paper, derived from the work in TERRA2000 on the implications of Information Society Technologies across sustainability domains, looks more closely at the distributional implications in two connections: the relation of inequality to growth and the relation of inequality to conservation. The first part continues the study begun by Kuznets in 1955 into the origin, evolution and impact of inequality. The first studies looked at the impact of growth on (income or wealth) inequality; recently the reverse connection has been studied. This line of work links economic and social sustainability, and looks at the impact of ISTs on both factors. Ideally, the work would use welfare inequality, or at least wealth inequality, but most papers have had to content themselves with data on income inequality, adjusted where possible for public provision of health, education, etc. The connection between income and growth is, however, indirect (going through both the demand side and (via education) the supply of human capital. The present paper uses data from the Barro-Lee data set to carry out a panel study of the relation between human capital inequality and growth, and finds more intuitive, stronger and robust relations than those linking income inequality and growth. In addition, the evolving impact of ISTs can be seen more clearly. This exemplifies a more general proposition that distributional details matter - not least because they give a clearer picture of absolute vs. relative effects, and also because the response of individuals in the 'tails' of distributions is likely to differ qualitatively from those at or near the mean. A further paper develops this proposition through theoretical analysis of the impact of between-country inequality on conservation, fleshing out an observation by Olson in 1965.

Tuesday, September 23, 2003 ***stream II.***

topic 2

GLOBAL SUSTAINABILITY: CONCEPTS AND DEBATES

Sustainable Information Technology for Global Sustainability

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Designing and implementing the Digital Earth vision [1], or even parts of it, is a daunting task. Several large scale projects are aiming in this direction, and interesting and impressing results have started to emerge. Many of the initiatives are quite technology intensive, like NASA Goddard's Digital Earth Workbench [2], requiring sophisticated special purpose software and hardware, often expensive and definitely not in the out-of-the-shelf category. Other projects relies heavily on complex coordination of contributions from a large number of organizations, e.g. the Global Mapping Project [3]. The authors are of the opinion that complex technology and/or complex management may be an obstacle in realizing the Digital Earth objectives. We think that technology for supporting global sustainability in it self should be sustainable. In this paper we discuss criteria for analyzing and classifying the sustainability of a given technological framework and it's components. On this backdrop we present Project OneMap [4], which has been designed with longevity, survivability, simplicity and other aspects of sustainable technology in mind. The main objective of this project is to provide free access to a large, global online map. The map will be incrementally build by seamlessly integrating a large number of independent and uncoordinated contributions of geodata. A sufficient level of quality and consistency is assured by applying a peer review process to all submissions. In many ways the project will be a grass root effort, thus orthogonal to many other more centralized (or slightly decentralized) projects. In this extended abstract we outline some of the main features of Project OneMap, and leave the discussion of the sustainable aspects to the main paper.

Project OneMap

Project OneMap is in every aspect an open project. On the technological side, it is entirely founded on free Open Source software and standard hardware components, deploying suitable de-jure and de-facto standards where ever it is possible. The geodata in the system is published as Open Content. OneMap will be managed in a distributed manner, loosely integrating the efforts of interested people and parties of all kind. OneMap is functionally comprised by three main components: Repository, Gateway and Clearinghouse. The alpha version has been up and running for a year, and the beta version will be released in the summer of 2003. Currently, the size of the content, measured in number of coordinates representing the original geodata, is around 50M, and is rapidly increasing.

Repository

The repository is a distributed storage infrastructure. This is basically a (huge) set of

OpenGIS Geographic Markup Language files structured to efficiently support retrieval and updating of the geodata comprising the world map. The total amount of base data is currently in the magnitude of 50 M points, and is expected to expand to around 500 M points within the next few months. The data is structured in levels of detail to facilitate global overviews as well as street level inspections. The files are distributed redundantly on a set of servers. This facilitates both storage scalability and parallel processing of retrieval queries and updating procedures.

Currently we use a straight forward directory based management of the distributed data. However, work is in progress to implement a P2P infrastructure to avoid bottlenecks and single-points-of-failure.

Gateway

The Gateway is a browser based user interface for retrieval of OneMap data. We are currently using an SVG/javascript implementation, which provides simple but sufficient navigation and query possibilities. In addition to the SVG view, the users may download the GML version of the response. The Gateway client interacts with a server based on the OpenGIS Web Feature Server specification.

Clearinghouse

One of the main objectives of OneMap is to make it possible to build a huge map in an incremental and uncoordinated manner, with contributions from a wide variety of parties, but still guarantee a reasonable level of reliability and quality. The main problem is to integrate submissions with the existing geodata. We address the problem by using a framework based on the well known principles of peer review. The process of contributing new geodata or updates of existing data may be outlined as follows:

1. A piece of geodata is submitted to OneMap (as a GML instance).
2. The OneMap (distributed) server analyzes the data, and identifies affected geodata already submitted to the system. It also identifies potential conflicts and inconsistencies.
3. The system generates an integration map, which essentially is a presentation of the integrated data including information of conflicts in need to be resolved. This map is also automatically distributed to all the “owners” (peers) of existing data affected by the new submission.
4. The submitter and the peer group then start a process of iteratively editing the integration map until conflicts are resolved and consensus gained.
5. The Repository is updated according to the submitted data.

Keywords: Digital Earth, sustainable technology, web mapping, GML, WFS, WMS, distributed geodata management

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New partnerships for Sustainable development in the Knowledge Economy

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Background

The Lisbon summit, in March 2000 adopted the strategic goal for the EU to become by 2010 to become "*the most competitive knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.*"Increasingly, the EU is emphasising the desirability of an inclusive sustainable society. A sustainable society is one that enjoys:

- environmental sustainability – ability of ecosystems to maintain themselves indefinitely and provide species with critical ecosystem goods and services
- social sustainability – assuring jobs, social protection, and equal opportunities
- economic sustainability – financial viability and security for individuals and society that also supports sustainability of the environment, society and culture
- cultural sustainability – sustaining and valuing cultural diversity

Of these four types of sustainability, economic sustainability is pathway through which the other important aspects of sustainability may be supported.

There is a compelling urgency to develop and implement enabling systems and infrastructure within the next three years in order to realize the Lisbon vision. The trend toward increasing transparency of information and greater citizen participation also shapes the requirements for the emerging feedback system for a sustainable economy. The calibration mechanism for the Lisbon vision must include consistent, relevant, and comparable indicators that allow a high degree of participation and usefulness to a wide variety of users. The way forward will also strengthen the role of the ICT industry sector in achieving a new era of sustainability and competitiveness for the European Union.

The NESKEY project

The NESKEY project addresses the problem that the current feedback mechanisms and system of indicators is not only too limited, but if not dealt with immediately may seriously impede the emergence of the new practices and metrics that will be required to achieve the Lisbon vision. By analysing the current state of sustainability reporting, intangible assets management, efforts toward sustainable cities, and ICT capability, the NESKEY project has surfaced the key factors for developing the enabling systems that will be required to forge new networks and partnerships for sustainable development in the knowledge economy.

NESKEY project has met its research and learning objectives through careful and deliberate support of global thematic learning and action networks. NESKEY partners include EPPA, GRI, GeSI, VTT, Accountability and subject matter experts Marc Luyckx and Verna Allee. The NESKEY partners have attempted to model their belief that the foundational organizational and societal level competency that must be in place for success in the knowledge economy – is working as and through networks.

The NESKEY vision

The NESKEY vision is that of a participative network of cities, companies, government, and civil society, all moving toward a society of responsible organizations. This sustainable society is based on a solid platform of a sustainable economy, which is guided by a systemic feedback system. The feedback system supports 360 degree accountability, 360 degree transparency, and 360 participation and utilizes a core set of measures, indexes, and methods commonly used by business, cities and regions, civil society, and governing bodies. Global networks and closely linked practice communities collaboratively improve measures and methods, and ICT capability supports databases and analysis tools for a wide variety of users and contributors.

Such a vision requires a core of widely accepted methodologies, frameworks, and metrics that will allow a wide variety of users to both contribute to and access the core data and indicators. Integration of frameworks and methods must happen not only within each specialty area, but more importantly in between each specialty area through linking practice communities. In the center of the following diagram is the core vision of 360 degree accountability, transparency, and participation. The three overlapping circles represent the three primary professional disciplines of Intangible Indicators, Sustainability indicators, and Built Environment Indicators. This systemic approach comprises all the methods, tools, frameworks, and indexes that are required for coherent gathering, analysis, and reporting. Below these three overlapping circles is the foundation of technology expertise that includes social technologies for linking practice communities and behavioural change as well as ICT Capability– to realize the vision of 360 degree accountability.

NESKEY has identified nine thematic areas to focus research and activities beginning immediately and extending roughly over a 30 year period. The NESKEY Roadmap includes detailed research questions, socially and technically focused activities and supporting infrastructure issues in a detailed timeline to achieve success.

Biological Diversity - Real Threat and Virtual Rescue ?

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The aim of this contribution is to examine the relation between the present decrease of biological diversity on our planet and the information society. Biodiversity exists on three levels: ecosystem diversity, species diversity and genetic diversity. The relation between information technology and biological diversity is not visible at first sight. But many changes which are induced by the information society influence our natural surrounding. And today we know, that this influence is theoretically positive and practically negative. The potential positive effects are the reduction of resource consumption by videoconferencing and monitoring of the environment. And the practical negative effects are caused by the fact that we hardly use the new tools to replace real travel by online travel and ignore the alarming results of scientific research about the state of nature in our everyday life. Also, the information society will probably not substitute the information society but add to it. And this, together with the IT-supported globalisation, can have a large impact on biological diversity.

GIS—the Digital Models of Regional Sustainability

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The globle or regional sustainability is a complex problem.Though recalling and analyzing the development history of human—nature system,we try to find the foundation stone of it—-some mechanisms between the human culture and natural ecosystem.we conclude that the human culture is the foundation course of the problem and the human beings must resolve this promble though the culture way.

Digital Earth is the representative of modern human culture of new centrary.It is the digital recognition of the earth and the big integration of the modern science and technology.GIS—the model base of Digital Earth,should play an important role in the regional sustainability.In it's great spatial database,GIS includes many social and natural laws.Though the advanced modeling technique,GIS should and could offer the spatial decision-making services to the regional suatainability.

Key words: sustainability; Digital Earth; GIS; ecosystem; digital model

Tuesday, September 23, 2003 ***stream III.***

topic 7

GLOBAL SPATIAL DATA PROJECTS

Global Spatial Data Infrastructure (GSDI): Finding and Providing tools to Facilitate capacity Building

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The Global Spatial Data Infrastructure (GSDI) supports ready global access to geographic information. This is achieved through the coordinated actions of nations and organizations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes. These actions encompass the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are facilitated in meeting their objectives

The GSDI is currently developing into a formal organisation and has successfully filed to become a non-profit corporation. The nonprofit status is beneficial in partnering with other global, regional, national agencies, NGOs, and industry to facilitate the pursuit and distribution of support funding for capacity building for local, national, and regional SDI development. To be successful, it needs to expand its capacity building program globally. Historically a small group of dedicated individuals leveraged the limited resources of the US FGCD and others to conduct training and other capacity building exercises largely in Africa and Latin America. This is not sufficient.

Goals of the organisation are to help governments to be more responsive to complex community issues encouraging the development of business practices to managing critical geospatial data and develop coordinated approaches for open and interoperable access to geospatial data. Accordingly he GSDI needs to develop a realistic financial plan maximizing funding sources from dues, individual donors that support the aims of the GSDI, grants, and other sources. Further it needs to develop global partners like all of the GSDI permanent committees, the International Steering Committee of the Global Map, the UN organisations, and others to jointly seek and distribute funds for capacity building on a local to a global basis. It will also be necessary to seek out and partner with global donor organizations for capacity to leverage our limited resources locally and globally. Only then can the GSDI build on past and current successes like the GSDI Cookbook, the GM/GSDI/ESRI grant program, collaboration with the ISCGM, the Intergraph grant program, and others to reach out to more nations.

Global Spatial Data Infrastructure (GSDI):at the Crossroads, Moving Forward

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The Global Spatial Data Infrastructure (GSDI) supports ready global access to geographic information. This is achieved through the coordinated actions of nations and organizations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes. These actions encompass the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are facilitated in meeting their objectives

The GSDI started as an alliance of people, organizations and private companies that have interest in and promote the creation of National Spatial Data Infrastructures (NSDI) within their country's. Additionally, because the impacts of both natural and human induced changes rarely are limited to political boundaries, they recognize the advantages of sharing their geospatial data with adjacent states/countries. The first GSDI meeting was held in Bonn, Germany in 1995 with a small group of invited attendees. The sixth meeting was conducted in Budapest, Hungary in September 2002 with over 250 attendees representing more than 50 nations and ran for 4 days with workshops and many parallel sessions examining the technology and policy changes associated with local to global SDI development.

The GSDI is currently developing into a formal organisation and has successfully filed to become a non-profit corporation. The nonprofit status is beneficial in partnering with other global, regional, national agencies, NGOs, and industry to facilitate the pursuit and distribution of support funding for local, national, and regional SDI development. To be successful, it needs to move into the following areas quickly:

- Complete the organizational processes with membership and dues categories and mechanisms to attract membership.
- Develop a realistic financial plan maximizing funding sources from dues, individual donors that support the aims of the GSDI, grants, and other sources.
- Hire appropriate staff and provide incentives for increasing the membership and donor organizations.
- Expand the circle of global bodies including the regional permanent committees to maximize the SDI impact around the world.
- Develop global partners to jointly seek and distribute funds for capacity building on a local to a global basis.
- Seek out and partner with global donor organizations for capacity building locally to globally.
- Build on past and current successes like the GSDI Cookbook, the GM/GSDI/ESRI grant program, collaboration with the ISCGM, the Intergraph grant program, etc.

What barriers are blocking SDI in developing economies

Santiago BORRERO

A Geospatial Interoperability Reference Model

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The U.S. Federal Geographic Data Committee (FGDC) Working Group on Geospatial Applications and Interoperability seeks to facilitate and promote the use of georeferenced information from multiple sources over the Internet. This requires interoperability ("working together") among the software systems that provide geospatial data, maps, services, and user applications. Geospatial interoperability is based on voluntary consensus standards governing essential geospatial concepts and their embodiment in communication protocols, software interfaces, and data formats.

To further these goals, the Working Group has developed a Geospatial Interoperability Reference Model (GIRM), an online document that references standards and specifications underlying interoperability among distributed geospatial services accessible over the Internet. The GIRM is not as a standard or rule in itself, but an evolving tool that technical managers, software engineers, and others may use to understand what standards are available and how they relate to each other, and to find the standards documents themselves for in-depth review.

The Second Administrative Level Boundaries data set project (SALB) concepts, progresses and future

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All over the world there is a great need for consistent global data sets that can be shared with the international community. Geographic data are vital for the execution of many United Nations operations in the areas of peace and security, development, and environment. Nevertheless, data sets, where they exist, are often outdated or sometimes difficult to access (ie. they come with a specific redistribution policy).

The constitution of the United Nations Geographic Information Working Group (UNGIWG) in March 2000 and the meetings that followed in 2001 and 2002 allowed the creation of specific task groups aiming at improving the accessibility to digital data of importance for the work of the United Nations and the international community.

The Second Administrative Level Boundaries data set project (SALB) is the first attempt, proposed by the Administrative Boundaries Task Group, to take advantage of existing administrative boundaries data sets and to meet the general need for a consistent global coverage down to the second administrative level within the context of the United Nations Geographic Database project and the UNGIWG.

Co-ordinated from WHO/EIP the SALB project can count on the active support of many UN and non-UN institutions including committees like PCGIAP or ISCGM (complete list can be consulted on the SALB web site, http://www3.who.int/whosis/gis/salb/salb_home.htm).

The major characteristics of the SALB data set as decided at the beginning of the project were:

- global coverage (concentrating on the UN member countries)
- representative of January 2000
- international borders and coastlines standard developed by the UN cartographic section
- specific coding scheme developed for the context of the SALB project
- freely redistributable for non-commercial purposes
- map validated by the National Mapping Agency (NMA) of the respective countries

Since the launching of this project, during the 2001 UNGIWG meeting in Rome, an important amount of information and data have been collected. Since this informa-

tion finally covers a much broader period than just January 2000, a database on historic changes has also been created which is now part of the initial SALB data set. Updating protocols have also been elaborated in order to code changes occurring after January 2000.

The principal strengths of this data set are:

- the importance given to the representativity of the information,
- its specific coding scheme,
- the validation through the country NMAs,
- its redistribution policy allowing an extensive use,
- the protocols developed in order to homogenise the all process from data collection until its distribution on internet.

The coding scheme developed for this project has now become one of the core element of the database and different institutions are already implementing it in their database (Measure for their DHS survey, CIESIN for the GPW3 project,…) or evaluating it's implementation.

At the beginning of May 2003, 170 NMA have been contacted allowing us to post tables of codes representative of January 2000 for 102 countries, historic changes for more than 60 countries and maps downloadable for 11 countries on the SALB web site.

By the time of the Digital Earth Conference we should be able to report interesting progresses regarding the amount of data available on the SALB web site as well as new protocols allowing the codification of administrative units before January 2000 which will extend the capacity of the SALB data set for sub national data management.

Reference and core data - is there still anything to taking care of ?

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"Reference data" and "core data" have been hot topics in context with a lot of spatial data infrastructure initiatives. The same has been the case of the Czech Republic and Europe.

Examples of some Czech approaches in European context will be given. The paper will summarize the current proposals and discussion going on in the Czech Republic reflecting the European INSPIRE project initiative.

The topic seems to be essential not only for data exchange and integrating of data from more sources. Especially the impact on conditions of data accessibility (organisational, financial etc.) and the state of age and some current approaches and possible solutions will be presented and discussed too.

The view of general context of reference and core data in frames of spatial data infrastructure will close the contribution.

WEDNESDAY
September 24, 2003

Knowledge-Based Society in Czech republic: the state-of- the-art

Dana BEROVA
Deputy-Minister
Ministry of Informatics the Czech Republic

Discourse of data: Geographic Information, Society and Globalisation

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Governments (and International Agencies such as the UN, IMF and World Bank) promote a range strategies for under headings such as e-Government, e-Society, Information Societies, Knowledge Societies. The very language of ICT-based strategies directs agencies and states to embrace modernisation, development, competition and deregulation. The aims of such strategies can be diverse and often conflicting. Governments 'join-up' their information sources to 're-invent' government service delivery through 'downsizing' to reduce the costs of government, yet the organisational behaviour of government focuses mainly on the protection of agency power. A key component of delivering integrated government services is integrated and detailed geographic information, with Geospatial/Spatial Data Infrastructures being the structure of co-ordination and integration. With such geospatial information the associated technologies (in particular GIS) are envisioned as a form of health service for the environment: monitoring the vital signs, identifying and analysing processes of change, and contributing to the development of strategies to overcome existing ills or avoid problems for the future. GSDIs, however, present fundamental dilemmas. Joined-up information can significantly enhance citizen surveillance, with resulting loss of privacy. Fine resolution geospatial data aid local policy and service development, but the concerns of statistical disclosure control fight against detailed resolution. Policies that promote the wider access to public sector information not only contribute the an 'information commons', but also empower hostile elements such as terrorism - hence the processes of 'data scrubbing' post September 11th 2001. Nations are encouraged to adopt electronic information strategies so that they can participate in globalisation, yet by making their information resources readily accessible they can significantly advantage multi-national corporations through deregulated access to intellectual property rights. Society and community hope to be enriched and empowered by access to ICT and geospatial information-based services, with existing social exclusion and rural isolation being diminished, yet unequal access to ICTs and information can exacerbate exclusions - the Digital Divide. This paper debates the discourses within SDIs in the context of the contradictions, based on strategies from local, through regional, to global levels.

Scrubbing/identity/disclosure

Wednesday, September 24, 2003 ***stream I.***

topic 1

DATA, INFORMATION, KNOWLEDGE, TECHNOLOGIES AND TECHNIQUES

The Application of GIS in the Archaeology – intra and inter site analysis in Breclav - Pohansko, Czech Republic

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Breclav - Pohansko is a fortress dating to the 9th century AD. Archaeological research at the site has been underway since 1958 and has uncovered a wealth of artefacts providing insight into Early Medieval society and culture.

In 1995, Department of Archaeology first began applying GIS technology at the Breclav - Pohansko site. Since then, the researchers have digitised the archived excavation data, incorporated new information and initiated complex analysis projects with the GIS.

In 2002 was published the fully digital catalogue of finds and terrain documentation, based on GIS technology.

At the present day processing of the intra site spatial analysis by the using of the combination of GIS and multivariate statistics (PCA) continues. Geospatial technology enables not only to store and retrieve a variety of data types instantly, but also to spatially correlate relationships between artefacts and their discovered locations in the fort to better understand how tools and ceramics were used in daily life or rituals.

The GIS was also used for archaeological predictive modelling in the neighbourhood area of fortress Breclav – Pohansko since 1999. It is a relatively new non-destructive method of archaeological research and study of the influence of landscape on distribution of archaeological sites. There is also possible to identify areas containing the unknown archaeological localities with help of archaeological predictive models.

Models predicting the presence of seven types of archaeological sites were created for the near hinterland of fortress Breclav – Pohansko. These archaeological predictive models were produced on basis of Boolean layers in GIS and their outputs were maps showing three levels of potential presence of archaeological sites. These outputs were of relatively high quality.

Key words: archaeology, GIS, archaeological predictive models, Breclav - Pohansko, early medieval age

GIS and Earthquake Disaster Assessment

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Because of the specific geological situation, where the famous Circum-pacific active structure zone intersects the Himalayas-Mediterranean active structure zone, China has a high earthquake disaster risk and hazard. The earthquake disaster is a huge negative effect on the sustainable healthy development of the country. The government has always laid stress on making a series of measures to reduce the level of risk and hazard since 1970s. By now, the accepted abilities of earthquake risk and hazard have been greatly improved in recent years. According the statistics, all of main cities and large state enterprises have set up their own special earthquake disaster emergency response program and operable system. Some cities which locate in high earthquake risk area almost rehearse the rescuing and rush-repairing procedure in designed earthquake every year. The anti-seismic awareness of the public is trained. The forecasting of earthquake is not easy; some weak places should be found out and are reinforced in advance in order to reduce the loss and death; it has been proved that the earthquake disaster assessment is one of the important and powerful tools to realize the aim. The earthquake disaster assessment, including the earthquake risk analysis and vulnerability analysis, is very complicated, specialists have always been attaching importance to it, and many valuable achievements have been got. This paper presents the building procedure of digital system for earthquake disaster assessment based on GIS.

Earthquake risk analysis includes earthquake parameters forecasting in the designed duration, and possible hazard assessment. The China are building the digital system of earthquake monitoring and forecast, by now, the National Digital Seismic Network composed of 49 seismic station with digital strong shock seismograph of broad frequency band and large dynamic range has been completed. In Yunnan Province, which has a high activity of earthquake in recent years, a demonstrating zone for earthquake risk analysis is being constructed. Some perfect strong earthquake records have been got. GIS has been applied to earthquake risk analysis since 1990, the first digital map of earthquake zonation was finished in 1995. This project and other related project are introduced in this paper.

Vulnerability analysis includes the estimation of damage level and damage rank of all sorts of buildings and constructions, such as lifeline systems, apartment, dam, workshop, business center, and so on. Some digital systems for earthquake disaster assessment have more detailed and integrated information than that in general digital map of digital China projects. The digital systems for earthquake disaster mitigation have been absorbed in the Great Digital China Program. A typical digital system for earthquake disaster mitigation is also presented in this paper.

Key words: GIS Digital System Earthquake Disaster Assessment

GeoScaN, the future of data acquisition

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GeoScaN

On 21st March 2003, British Waterways launched their GeoScaN system , designed to offer engineers valuable tools and information in data acquisiion.

The system, developed by the Technical Services Department of British Waterways at Leeds, **offers the worlds first boat-mounted 3D spatial survey system.**

The GeoScaN system will provide information on the canal and river beds, heights of banks above water level and provide information on bank protection. Research has been ongoing into the dredging of river and heights of flood banks and the effects on recent floods. Now this research can be carried out in one simple exercise, offering agencies and the general public much needed reassurance.

In addition the system will provide a geographical reference for all structures such as locks, bridges and weirs. All the information will be logged on computer and will also be recorded on digital video for future reference. Positional information will utilise Differential GPS as well as satellite imaging for flood plain mapping.

Laurence Waterhouse, the system designer at British Waterways said **"The GeoScaN project is cutting-edge technology utilising lasers, infra red sensors and sub-bottom profiling and we are taking out a patent for the system. As far as I know it is the first time combined hydrographic/topographic/GIS data collection from one piece of equipment has been used**.

We will be able survey everything above the water line with a scanning laser, whilst profiling the bed with scanning sonar. This is all linked to a sub metre accuracy DGPS offering a resolution of less than 0.9m RMS horizontal and less than 3cm vertical. All the data collected can be verified by four on board digital video cameras also linked to DGPS. These cameras follow the line of the laser scanners so data can be checked and assigned to GIS assets. The boat is also fitted with an underwater infra red video camera and a magnetometer

It will offer real time information on dredging requirements, flood bank height and condition, asset location etc, in fact all the data that hydrologists and flood defence engineers have been requesting for years. Until now, actual collection has entailed sending out three or four different teams of surveyors which takes time and costs money. Now we will be able to collect the data quickly, efficiently and economically.

"In fact this system does it all "

John Grogan, Member of Parliament for Selby, launched the new survey boat called the Endeavour, on which the GeoScaN system will be mounted, at Bank's Boatyard, Selby, on 21 March at 2 p.m. Mr Grogan said "The GeoScaN system is 21st Century technology that will greatly improve our knowledge of how our local river system works. In any battle knowledge is power and that is particularly true in the continual battle against the threat of flooding. I am delighted that this world beating system is being unveiled in my constituency".

Note to organisers

British Waterways who are responsible for over 3000kms of canals and river in the UK claim GeoScaN will provide a fast, accurate and comprehensive survey system saving time and money on separate surveys.

British Waterways hope to develop the system for mounting on other movable platforms for use on highways, railways and for military use.

GeoScaN will provide :-
A full hydrographic survey including hard and soft bed level
A corridor topographical survey
A level survey of banks, wharves, docks, bridges etc.
Cross sections of flood banks etc.
Ultrasonic and magnetometer surveys below water
Underwater video
Geo-referenced GIS data
Asset management data
Forward, side, rear and u/w geo-referenced video

All this data will be logged to a single high specification computer and will be collected at a fraction of the cost of traditional methods.

Forest Management Institute and its projects

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The Forest Management Institute of the Czech Republic [FMI] is a government organization established by the Ministry of Agriculture of the Czech Republic. FMI has been collecting data concerning forests and forest management for 60 years. We started create first digital GIS data 9 years ago. We decided systematically sort and interconnect amount of different data sources in one environment and create Data store 4 years ago.

Our Data Store is built on Microsoft SQL server platform. Now we have 9 main numerical and graphical databases. Other database stores metadata about 70 000 raster images. The biggest database has about 30 GB of numeric and graphical data and the biggest table has over 9 000 000 rows. The presentation contains the main scheme of the Data Store structure. The report describes Information and Data Center of Forest Management Institute (IDC FMI) in relation with Regional Plans of Forest Development (RPFD).

The Regional Plans of Forest Development is a project defining forest management principles in relation to the natural forest regions of the Czech Republic. Experience from this project was improved and developed in two projects under 5th Framework program EC. The Wirelessinfo project was aimed to implement advanced wireless communications into multimedia systems and services for agriculture and forest administrations, business and NGO to improve access to agriculture and forest information. The Wirelessinfo project was finished this year. The ReGeo project is the second. Within the ReGeo project an information system will be developed, based on a virtual geo-multimedia database, which will serve different applications. An extensive tourist information system will be created to test and to demonstrate the objectives and advantages of such an innovative information system. The system will be accessible by offline, online and mobile devices, such as palmtops, info-terminals and PCs. Additionally, advanced multimedia presentation (such as 2D and 3D visualisation, audio, video) will enhance the attractivness for the user. The ReGeo project will be finished till October 2004.

Wednesday, September 24, 2003 ***stream I.***

topic 6

DIGITAL CITIES

Digital and Sustainable Cities

Lennart FORSEBACK

Spatial Decision Support Systems – An approach for Intelligent Communities

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Building Intelligent Community – the definition of community in a networked knowledge society - need no wait until we are covered by the technology: it can begin by studying normal life, the cultural level of every community and then exploring acceptable ways of using the technology to enhance daily experience. As *Ronan Sleep* mention in "*Ambient Intelligence: a UK Perspective*"(in ERCIM NEWS, no. 47, October 2001):

"At one extreme, access to the "ambient intelligence landscape" could be restricted to those engaged in high powered decision making involving much travel and many meetings. At other extreme, the technology could be used in a much more diluted fashion to make small, but ubiquitous improvements in the lives of most citizens".

This paper propose a model for Spatial Decision Support Systems for Intelligent Communities based on a really amalgamation of the current trends in Knowledge Management and GIS. The first section contains the theoretical aspects and definitions involved and a general architecture for **Spatial Decision Support Systems for Intelligent Communities (SDSSIC)**. In the next section it is presented the description of the components of a flexible, integrated and distributed decision support environment followed in the third section by the partial implementations in Romania and preliminary evaluation of benefits and possible extensions. The last section addresses various issues in consequences, positives and negatives of the utility and usability of this solution.

Keywords: ***Spatial Decision Support System, Intelligent Community, Knowledge Management and GIS***

Study on the digital cities and location–based services - from the perspective of urban system

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Urban system is a self adapted huge complex system. Digital cities, one important parts of the digital earth and virtual reflection of the real urban system .is also a self adapted huge complex

System .it is necessary to study the digital cities from the perspective of the urban system and study the characteristics of the digital cities system and its adapted evolution process. location based services is a most fundamental services in the urban services with a long history ,especially in recent years ,with the development of computer technologies wireless technology the location technology make the location based services more accessible and ubiquitous especially in urban lives., but what is relationship between the digital cities and location based services and what role the location based services playing in the construction of the digital cities is deserve thinking and studying.

In this paper ,the author want to anatomy the digital cities and location based services from the perspective of the urban system .the characteristics and the self adapt theory of the digital cities is put forward and the role of the location based services in the urban system and digital cities is also discussed First ,the characters of the digital city and its relationship with the urban system is discuss used from the perspective of the evolution of the urban system .then the adapted system of the digital cities is discussed followed by the discussion of the location based services in the urban system and urban life. The author point out that location based services is the most fundament services in the urban life and ubiquitous urban LBS is the aim of the digital cities

Key words: Digital cities, urban system, LBS (location based services)

Terrestrial Laser Scanning for Documentation of Buildings

Bengt RYSTEDT

Data bases in spatial planning on a local level.

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During costing the case study on a local level of administration a geographical data bases are come into existence. In many cases these data bases are the firs test of putting in order geographical information with using the GIS application. Furthermore they are included impressive and systematic quantity of information about territory of community. These data bases are also sources of direct access to spatial information and assistance implement in planning inquiry.

The basic planning documents on the local level are: the case of the study - as a strategic planning of the management and the master plan of the community – the local low. The spatial planning on the local level places great importance, because in fact on this level the planning inquiry is formed. Follow the statistics only 8% of the planning documents are presently accomplished in digital database. That is not impressive quantity, specially that information technology could be beneficial to spatial planning process.

The authors experience on this field shows, that comprehensive geographical database can be great assistance in decision making process also in managing the area of the commune. This way the public participation in difficult planning inquiries could be improved as well.

During the creation of geodatabase the authors encountered a lot of problems, ex:

There is no metadata

The quality of necessity data is not adequate to needs of the planning documents

There are no standards for digital case study

"Digital Beijing" and location based SARS control system

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The outbreak of SARS, an epidemic which has affected many countries, is a disaster for China, especially for Beijing , Which is one of the places hardest hit by SARS. How to keep this disaster under control is a big challenge to the municipal government of Beijing. Digital city, which make up by the urban spatial database and a series Location based Services, can offer a platform for Location-based SARS information services and study, and above all a location based SARS emergency response system and location based SRAS control decision system .which can help the municipal government of Beijing curb the SARS and can be a great heap to the construction of the digital Beijing information project.

In this paper ,the author want the reader know the usefulness of the "digital Beijing" to the SARS control and try to set up a location based SARS information control system on the digital Beijing platform. After a review of the study and construction of digital Beijing ,the history of using cartography and GIS on the study of the epidemic disease and the GIS related technology on the urban emergency response system and the related human behavior in time geography ,the author discuses its implication for the study and control the SARS and put forward a prototype of the location based SARS services system ,which make up by the location based SARS information federal database ,the location based SARS services ,the location based SARS study ,location based SARS emergency response system ,location based SARS decision system.

Key words: SARS (severe acute respiratory syndrome) digital cities LBS(location based services) emergency response

Study of the Standard Architecture and contents of Digital City

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Data resources share is one object of digital city. Building the standard architecture is the base of the digital city. The authors present a wholly contents for digital city: The first part is data standard system that includes information index system standard, information sort code standard, data control and data quality standard; The second part is the information processing standard that includes information system development standard, information exchange interface standard, spatial data exchange format standard; The third part is system construction standard that includes software environment standard, hardware environment standard and database standard; The forth part is management standard that includes management method standard, term standard and so on. Finally, the authors present to develop the meta-data information system in order to ensure the standard and share of the digital city..

Prague Environmental Information System and Use of Geographical Data

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The City of Prague has many-year long tradition in the processing and providing of environmental information as a basis for the city management and development in effective interaction with experts and public. The Prague Environmental Information System (IOZIP) collects and processes data (including geographical data) and provides standardised public information outputs containing a comprehensive set of facts on the state of the environment and maps as well as specific data and information services (data for environmental modelling, e.g. air quality, noise). The most known of regularly produced information outputs are the Yearbook - Prague Environment, Atlas of the Prague's Environment, CD-ROMs dedicated to and named Prague Environment and information services on the Internet (http://www.praha-mesto.cz/zp/rocenky/eng.asp or http://envis.praha-mesto.cz).

The Atlas of the Prague's Environment integrates all significant and available GIS data on the environment in Prague. The Atlas is based on a set of maintained data (more than 300 GIS layers in ESRI ArcView shapefile format and related database tables) and presents about 80 maps structured in the same way as the Yearbook. The Atlas has been developed by the IT Department of the Prague City Hall by means of the WebMap® software (product of the company of Hydrosoft Veleslavín, Prague), which enables the dynamic viewing of map layers in GIS.

The IOZIP system and the Atlas provide information to the city management, environmental experts, and the general public. Digital outputs are available on the Internet (http://www.premis.cz/atlasen/) and a set of CD-ROMs (latest CD No. 5 was released in June 2003). The new version of IOZIP products integrates maps in the Atlas and other information outputs.

The Study on Strategy and Policy of Narrowing "The Digital Gap" in Guizhou Province

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There is a trend that the digital gap is widen between developed and developing regions. Guizhou Province is one of the undeveloped provinces in China. Following some other provinces Guizhou government has made a big plan to realize "Digital Guizhou". To narrow the digital gap "Digital Guizhou" must be realized earlier and be more efficient to benefit Guizhou people. The study of possibility to narrow digital gap and the study of difficulty to realize "Digital Guizhou" must be done first. Then the strategy and the policies can be studied. In this paper, the mode of the development of "Digital Guizhou" has been proposed and the difficulties to realize "Digital Guizhou" have been listed. Among the difficulties some are common to most provinces in China some are quite special in Guizhou province. For example, Guizhou province is a typical carst mountainous area, where more than 90% of the area is in mountains. Then an initial action of enhancing data sharing among various departments of government is introduced. Lastly, some studies of strategy and policies to narrow the digital gap are discussed in the paper.

Wednesday, September 24, 2003 ***stream II.***

topic 2

GLOBAL SUSTAINABILITY: CONCEPTS AND DEBATES

The COSMOPAD modelling framework: Conceptual System Dynamics Model of Planetary Agricultural & Biomass Development*

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COSMOPAD is a conceptual system dynamic model of planetary agricultural and biomass development. Originally intended to be the "agriculture and food module" of a conceptual integrated world model created to be the successor of WORLD III, the model has been worked out as a stand alone module or holon. The aim of the modelling effort was to create a model for generating insight in human induced worldwide biomass production and its effects, mainly from a sustainable development point of view, without cluttering the model's users with to much detail. This line of reasoning led to the development of a strongly aggregated model. The resulting simplicity of COSMOPAD allows for relatively straightforward collection of and integration with data, easier interpretation of results and offers a lot of possibilities for functioning within other models. As a matter of fact COSMOPAD still fits seamlessly within the Insight for TERRA model. A disadvantage of this high level approach is that the only policies that can be evaluated are conceptual "meta-policies".

In the first section of this paper the structure of COSMOPAD is discussed along with the issues for and the context in which it was originally meant to be applied.

In a second section the data used to populate the model variables and equations are extensively elaborated upon.

A third section shows some simulation results for different future scenarios in which the impact of different agricultural policies are assessed. The time horizon for these simulations is 2030.

In the next section the simulation results, their validity as well as that of the model are discussed and based on those simulation results some early ideas for alternative more sustainable agricultural meta-policies formulated.

The fifth and final section of this paper is concerned with further applications of the model as it exists and possibilities for its extension. An initial roadmap leading to the construction of a regionalized model is set up, as well as blueprints for some additional modules for COSMOPAD dealing with fisheries, aquaculture and forest-management more specifically.

Bridging over the Digital Gap for Sustainable Development

Shupeng CHEN

The Focus Topic "Public Procurement" in the Project "Roadmap for a Sustainable Development of Information and Communications Technologies"

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In May 2000, the German government and the Federal Ministry of Education and Research (BMBF) initiated the project NIK (Nachhaltige Informations- und Kommunikationstechnik, or Sustainable Information and Communication Technologies) and commissioned the DLR to carry out the project. The general objective of NIK is to link development toward the information society with the concept of sustainability. Using the method of the roadmapping – a method it is creating accepted results in future development and acting between industrie, policy makers and scientist – the project NIK has defined concret action items with basic information in three focus fields.

- mobile communication
- display technologies
- public procurement

Within the NIK focus topic "Public Procurement", participants are analysing the status quo, formulating statements describing current trends in their respective areas, developing visions for more sustainability in the future, and suggesting strategies ("paths") for realising these visions. An analysis of trends within the area of public procurement in the project yielded the following priority fields of action: Work and Mobility, Energy-efficient (Office) Terminals, and an area focussing on sustainability criteria and implementation strategies. Herein espacially the criteria defintion in the area of social responsibility is a main workingpoint of the project.

For the implementation phase, commitments governed by time horizons are being sought from all parties involved. An iteration process consisting of discussion and practical testing has the purpose of continuously refining the objectives defined within the roadmap and taking on board new developments – so that at the end of the project, a well-coordinated roadmap emerges which enjoys wide acceptance.

When one considers that the political will of the population is increasingly influenced by a belief in the need for sustainable policies, such exposure provides an excellent opportunity to set a good example. Moreover, as large employers, public authorities have a responsibility to influence the private behaviour of their employees. By the power of example, employees can be encouraged to use sustainable devices, software and organisational forms they have come to know at their workplace within their private spheres as well. Additional opportunities for implementing sustainable strategies stem from the responsibility of public authorities to support the further development of the diverse skills of their employees as well as the compatibility of family life and career through the use of innovative models for organising labour. Finally, the increasing significance of e-governance and public-private partnership provide further potential while at the same time underscoring the necessity of integrating sustainability criteria in the procurement process.

Spatial Analytical Technique in Developing a Digital River Database with Particular Reference to a South Asian Nation's Flooding Issues - an Integrating Approach of Geosciences, Electronics and Information Technology in Natural Resources Management

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In today's project management and monitoring in a diversified discipline, the geographical information system (GIS) has become a very efficient and a dynamic tool, which plays a vital role in spatially analysing our resources and presenting its output in many dimensions. By using this geo-information technology, we can process and manipulate our data beyond tabular forms and present the results by virtue of digital maps and corresponding detailed digital database in a real world perspective for planning, monitoring and decision making processes. This paper will discuss the success story of a digital river mapping project as a case study with a particular reference to Bangladesh's flood management initiatives. Bangladesh, a small deltaic nation crisscrossed with numerous rivers and water bodies that form a complex and dynamic hydrologic system, occasionally has severely suffered from natural disasters such as flood, cyclone to name a few. The socio-economic condition of Bangladesh is largely shaped by this riverine landscape, which plays a vital role in the lives and livelihoods of its people and proper management and monitoring of these resources is essential to ensure that the country has a sustainable agro-ecosystem. The prime objective of this project was digital mapping and develop a detailed digital river database covering all the rivers, streams and major water bodies for the purpose of planning, analysis, and applications at a national or regional scale. Provision of a basic rivers layer with river morphology, sedimentation and river modelling as well as data for regional and national level natural resource management and research were also included. The methodical approach adopted to develop such a database was, the project first acquired a river database that had been digitized from United Nations Development Programme/ Food and Agriculture Organization (UNDP/FAO) 1:250,000 Agro-Ecological Zone maps by Agriculture Sector Team (AST) project, funded by Canadian International Development Agency (CIDA). It yields low resolution digitized major rivers as the source maps were of small scale. The basic data source were SPOT multispectral image maps at 1:50,000 scale with ground resolution of 20m by 20m which provided more graphic detail on the rivers, topographic maps at 1:50,000 scale compiled by Survey of Bangladesh (SOB) were used as a reference to assist in image interpretation. Besides, maps at 1:7920 and 1:15840 compiled by Bangladesh Water Development Board (BWDB) during 1960s and 1970s were also used for the purpose. This case study was an output of a project funded by USAID and carried out by EGIS I and subsequently funded by the Dutch government and carried out by EGIS II project for Ministry of Water Resources, Government of Bangladesh to better manage its rivers and water resources and help mitigate its chronic flooding problem. This paper will

enlighten its audience and help broaden their horizon of knowledge with respect to Bangladesh's chronic flooding issues and approaches to solution with the help of vector (GIS) and raster (Image) maps, one of the other techniques to help manage water resources. Thus, geospatial or geo-information technologies playing a pivotal role in modern days workplaces by utilizing digital data with respect to the real world scenario, which manifests the advancement and rapid growth of information and communication technology (ICT) and utilization of digital electronics to its peak in providing solution to manage our natural resources. This also indicates, how multidisciplinary subjects such as geosciences and different engineering fields could work at par to reach a common goal and therefore, address the socio-economic and ecological burning issues before us in a global perspective.

Geographic Targeting Information System (GTGIS): a Prototype Urban Poverty Management Initiative for sub-Saharan Africa

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Economic theory and practice often used in tackling poverty the world over are well established and known in literature. However, underlining all expressions of the poverty problem is the influence of geographic location. Understanding the impact of geographic location on regional economic dualism where poor and non-poor entities such as households, neighbourhoods, municipalities, and states are juxtaposed together (they tend to cohabit side by side in space) is highly required. To improve on the existing poverty alleviation strategies in sub-Saharan Africa, first, the theoretical and practical linkage between poverty and geographic location should be acknowledged and demonstrated. Secondly, it should be noted that poverty, being a multidimensional problem, is caused by a combination of demographic, socio-economic, political and geographic factors. Accordingly, poverty management systems that are capable of integrating these diverse factors in their problem-solving approaches are beneficial to public managers and administrators. Such systems are designed to enhance qualitative poverty assessments/measurements, targeting, alleviation simulation and poverty monitoring. This paper, therefore, describes a prototype spatial information system, the GTGIS, aimed at urban poverty management in sub-Saharan Africa.

The Role of Social Enterprise in Building Sustainable Community Networks

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Introduction and Background

Social Enterprise is not a new phenomenon. Throughout history, men and women with entrepreneurial spirit have sought to use their talents for the benefit of their community. These benefactors have often been empowered by their own wealth or privileged backgrounds, or have had a strong social conscience to share in their good fortune.

Evidence of this phenomenon can be found in social housing, hospitals and philanthropic organisations throughout the world, but with the emergence of the welfare state and the transfer of social responsibility from the private sector to the public sector, social enterprise has, until the current Information Age, dwindled in importance and relevance in the developed world.

Social Enterprise and the Information Society

The Information Age has had a dramatic effect on society as the pace of change has accelerated exponentially. As in all previous communications revolutions throughout history there has been a dislocation of the established order in all aspects of life. Security of employment and a "career for life" are the exception rather the rule. We are seeing the breakdown of families and communities as the Information Age brings a new freedom and independence to the individual.

Goods can be purchased from anywhere in the world via the internet, Supermarkets move into banking, and Record Companies set up airline, travel, insurance, mobile phone and soft drink operations, all made possible by developments in Information Communications Technologies.

In this age of uncertainty, the impact on the social and economic development and sustainability of communities can be substantial. The closure of a major employer in a small town can be devastating, and rural villages find themselves losing the key services which make them viable and sustainable.

It is this combination of circumstances which is creating a crucial role for social entrepreneurs empowered by Information Communications Technologies (ICT) to build social and economic wealth within sustainable communities.

Discovering Community Wealth

Every community has a huge pool of indigenous knowledge, skills and talents which remains largely untapped. It is a paradox that the age in which there are unprecedented tools to collaborate and share information is the age in which community

values have been eroded in favour of individualism. ICT has the potential to harness local skills and talents to build social and economic wealth and strong, sustainable communities and social entrepreneurs can be the catalyst in that process.

This paper describes the experiences of 2 UK projects – The Community Commerce and Knowledge Network Project (ComKnet) and the Harborough Community Learning Network in pioneering social enterprise and ICT for development.

The Design of Ecological Environmental Dynamic Monitoring and Management Information System in Fujian Province

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Abstracts This article is composed of four parts? It systematically describes the importance of the ecological environment dynamic monitoring and management information system, the goal of building the system, the principles and detailed contents of the system, the technical design and implementation method, and the significance and function of the system after it is developed"Ecological Environmental Dynamic Monitoring and Management Information System in Fujian Province" is one of the major application projects in Digital Fujian. The project consists of three parts,i.e.,ecological environmental dynamic monitoring, ecological environment database, and ecological environmental decision support and management information system,which cover eight detailed portions, namely, Fujian ecological environmental remote sensing dynamic monitoring system, ground dynamic monitoring system, emergency response monitoring system, Fujian Provincial ecological environmental comprehensive serial maps, multi?media dynamic display system and electronic atlas, comprehensive information Geo-information Tupu, Fujian Provincial ecological environmental database, and decision support management information system.

Key words Ecological environmentÿDynamic monitoringÿManagementÿInformation system

Digital Mapping of Climate History of the Czech Republic from Documentary Sources

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The presented paper deals both with the conception and practical solution of conversion of historical climatology data from analogue paper sheets to the spatial digital database. The aim of this transformation is to map data on climate history in GIS.

Data from instrumental period covers relatively short time span and it is rather problematic to demonstrate e.g. the increasing frequency of the occurrence of severe weather phenomena on the local or regional scale. A significant means for extending this knowledge can be information obtained from documentary evidence. Since the beginning of 1990s a database of weather and climate history of the Czech Republic (CR) has been created. It contains reports from sources of narrative character (such as annals, chronicles or memories), visual daily weather records, diaries, personal correspondence, official economic documents, early journalism and newspapers.

Such kind of data covers the second half of last millennium and it has been used so far mostly for a chronology compilation of selected meteorological characteristics. Emphasis on the spatial aspect of such data gives quite a new dimension to its interpretation and enables also a new way of its presentation.

Problems connected with the process of original data transformation to digital database are discussed. Both advantages and drawbags of historical climatology data are mentioned with respect to its spatial location, time resolution and ways of interpretation.

Considering above-mentioned specific features of historical climatology data a set of tools was created in Arcview GIS, which can be used for mapping of selected meteorological elements in the form of indices. Moreover it is possible also to map spatial aspects of impacts of severe weather phenomena (gales, hailstorms, floods) on society. Depending on density of records maps for individual years, seasons or months can be created. The present state of database allows mapping weather and climate history of CR since 1500. On the examples of “gales of century” some outputs are presented in this paper. Possibilities of further development of the system are outlined.

Mapping for Sustainable Development – Cartographic Endeavours in the Republic of South Africa since 1994

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In 1994 the Republic of South Africa changed from an apartheid state characterised by minority rule into a state with a democratic system of government committed to reconstruction, sustainable development and the maintenance of biodiversity. To achieve these ideals, mapping programmes that had already been in progress were redesigned for greater efficiency, and new mapping programmes were put into place. This paper briefly describes the topographical mapping executed by the national mapping agency, the Chief-Directorate of Surveys and Mapping; the geological mapping accomplished by the Council for Geoscience; the soil mapping undertaken by the Agricultural Research Council; the socio-economic atlases compiled by the Human Sciences Research Council; the digital atlases developed by the Department of Environmental Affairs and Tourism as an environmental management decision support system, and the Land-Cover Mapping Project which will provide critical information on the rate and extent of change in land-cover. Together these cartographic endeavours strive to provide the necessary georeferenced information critical for decision-making processes within the sustainable development framework.

Small Scale Digital Landscape Model – applications for monitoring and management of environmental processes in Haraska Watershed

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It is typical for the landscape of Central Europe that both environmental conditions and landuse dramatically change on relatively small area. The amount of data is highly correlated with the area and the complexity of landscape. To be able to build up valid models of selected processes we decided to work with relatively small area of one watershed to prevent the effect of generalization and associated data lost. The spatial database was build up for the Haraska watershed (50 km^2) in South Moravia region, Czech Republic. The digital landscape model integrates environmental and landuse data of high resolution.

Although the spatial database is based on digitized thematic maps we used also aerial ortophotography and terrain mapping for data verification. During the complex analyze of the area we found several conflicts between landuse and environmental conditions. We identified areas and processes, which are critical for the sustainable development of the watershed.

Erosion and associated transport of pollutants is one of the most important environmental problems in the landscape with intensive agriculture. The monitoring and management of these processes is problematic - erosion depends on the collection of environmental parameters and agricultural operations, distribution of pollution (fertilizers, pesticides etc.) is not uniform over the area and sources are mostly non-point. Therefore erosion and pollution transportation models are important. Spatial analyses and AnnAGNPS Pollution Loading Model allowed us to create continuous simulation of erosion processes and to determinate problematic areas. We were also able to estimate the influence of agricultural pollution on the water quality of Haraska River.

Keywords: GIS, erosion, AGNPS, agricultural pollution, non-point sources, water quality

Storytelling and Mapping

Gershom NAHUM

Sustainability supporting agriculture and forest applications based on GIS

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Geographical information systems (GIS) and with it the agricultural map – for a farmer or a region - is the centre point for all other applications. All applications are planning driven, documentation is more or less the result. More then 25 applications for machine- or farmer cooperatives, for single farmers or for in depth precision farming use, for the food chain or for the agro/forestry logistic, they cover the complete agro-food area. They all have integrated modules and control/verify better sustainability of farm works.

The WinMAP LT embedded map – an easy to use PC GIS tool as a subset of WinGIS, the high end PC GIS - out of orthoimages and/or cadastre information, where available, is the kernel and is used for all geographical oriented questions like size of the fields, slope if needed, location for logistic questions, visualisation etc. Hundreds of Austrian farmers are working with it and show the easy usability.

As add-on applications there are available the Soil manager for all soil related questions like soil analyse, fertilizer planning etc., the Funds manager for subsidy proposals and criteria examination as well as the Euro manager for detailed cost analysing. These are the main modules of the farmers AGROffice suite of programs.

Beside geography (where?) and database (what?) the factor time (when?) is linked to all activities. Planning questions like “what if” are easy answered, variants easy calculated with pressing one button.

Lease manager and Insurance manager are two applications that are recently under development and will be available end of 2003 as well as a group of programs for the traceability of fertilizer and pesticides use.

The Machine cooperative manager handles the needs for machine enterprises or cooperatives like machine calculation, time control etc., the Harvest logistics manager handles harvest logistics for sugar beet, potatoes, grain, vegetables etc.

All these products are enabled to be linked to GPS modules or to Precision farming modules like machine interfacing, ISO Bus, high end planning tools for consultants as DTM, elevation, 3D etc.

Further several applications have been developed for governmental departments in Austria and abroad that fit exactly to governmental needs – the use of targeted GIS technology with powerful customized applications for non GIS experts. Also versions for public or private consultant organisations that are able to handle hundreds

or thousands of farms and doing cost calculation or subsidy calculations, storing documentation archives etc. for them, are available.

For the foresters Inventory applications as the tool for the day by day use are as well available as Forest logistics applications where forest enterprises, sawmills and freight forwarders are virtually linked. Also many hundred software packages are installed, further intensive cooperation with forestry consultants handle also their needs.

PROGIS also develops on demand for machine producers (tractors, harvesting machines) to integrate their equipment to the upcoming world of precision farming.

In general we can state that PROGIS is one of the very few GIS producers in Europe that beside its own GIS - more then hundred thousand installations worldwide - also has the focus and the understanding for the agriculture/forestry and ecology markets with its specific needs. End of 2002 PROGIS could sign a country wide covering contract with the Bavarian machine cooperatives (KBM) that handles tracing, field calculation and EU-subsidy calculation needs based on GIS technologies linked to applications as well as these systems are foreseen for logistics use as well as for precision farming.

Further PROGIS was selected recently by the EU institute JRC to present its technology towards 28 agriculture ministries throughout Europe.

More GIS based applications are available that handle water- and wastewater-organisations and the communities needs and integrates naturally also internet needs with the PROGIS Map-server.

The PROGIS focus is GIS and applications for the rural areas that in general are targeted to more and better sustainability.

The main owner of PROGIS is further agro- and ecology consultant since 25 years as well as practical farmer and could also help to establish the first Austrian Geomatic University at the PROGIS location in Villach/Austria that again will give better advantage and more know how for PROGIS and its target oriented specialists.

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Problems and approaches to the unification of cartographic GIS information in hydrological modeling

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Mathematical models possessing spatial coordinated data as the parameters often use cartographic GIS information. The use of geographical maps as the source of information in mathematical modeling of hydrological processes raises the issue of the quality and unification of their content. Information contained in map is characterized by specific content, details and generalization depending on spatial proportions of catchment area. In this case the information quality is determined by classification of phenomena, sign systems used as well as by the complexity of the object or phenomenon under study.

To define the set of original cartographic information on the base of basin-landscape approach required for modeling the problems of elimination of the indices' discrepancy and the consideration of their importance for regional and topological research should be solved. It offers problems in the use of valid indices representing the object's state and available for further mathematical interpretation, and makes high demands on the information quality and compensation of its deficiency at qualitative-descriptive level.

Adequate presentation of the territory features and rational use of geographical present a severe problem. In real situations river basins with an area of about 1000 km^2 and presenting interest for modeling can have a lack of large- and medium-scale subject maps characterizing the major indices necessary for modeling. When small-scale maps are used the exact information is hardly available. In going from the original maps to digital layers the information adequacy can reduce drastically as dictated by the character of its transformation and the original quality.

It is a relatively simple matter to use GIS technologies, to automatize single algorithms of cartographic information unification including the projection transformation, transition from the discrete representation of information to the continuum one and vice versa, definition of areas by specific parameters, etc. The problem is more complicated when it is necessary to automatize operations associated with complex logical constructs and generalizations found, for example, in synthetic maps.

A number of problems can be solved at the initial separation of spatial-distributed display indices of natural components into qualitative and quantitative, natural-evolution and anthropogenic, partial and integral, major and secondary, direct and indirect ones. There is good reason to typify the problems arisen for basins of different order varying in area and geographical position.

Investigations are carried out on the rivers of the Ob basin as the test site.

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topic 4

A NETWORKED KNOWLEDGE SOCIETY

Integration of GIS in the Professional Practices of European Land Management Stakeholders

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For the management of rural areas, Geographical Information Systems provide modern methods for diagnosis, help in decision making and evaluation that are specially suited for use by land administrators.

Their use requires these administrators of rural areas to develop new professional skills. Hence the requirement of specialised training programmes. Substantial efforts have been made to this regard by European countries but it remains required to improve the capacity of the concerned technicians and engineers to be able to use these new professional tools for land management. As regards land management, agriculture and the environment, the European Union, its member states and the territorial communities are giving an increasing importance to the use of these tools in formulating community, national and regional policies (specially agricultural and environmental policies).

The LEONARDO DA VINCI funded programme entitled “Geographic Information Systems and Agricultural Education in Europe” started in November, 2001 for a 36 month duration. It aims to produce an integrated and adaptable offer for training in Geographical Information Systems. The full set of pedagogic tools (course texts, presentations, case studies, exercises) is to be developed in off-line and online versions. Finally, the approach will be formalised in an educator’s manual, a methodological guide to the creation of a training programme suited to the needs of its target audience and to the adapted pedagogic products.

The partnership is made of 8 partners from 6 different countries (Belgium, Czech Republic, France, Latvia, Spain and Sweden). They bring to the project the complementary nature of their approaches and skills and their real-life experience as regards European projects, especially in professional training, research and development and project management.

It has been decided to put all the educational content into an integrated tool called **Form@gri**. This tool is developed by the CNERTA for e-learning. It acts as an interface between teacher and learners, allows structuring a course, guiding the learner’s progress, evaluating the knowledge step by step, etc. Its usefulness is here demonstrated through an example.

Integration of E-government and Geodata Policy: Challenges and Opportunities

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In many countries all over the world the electronic government (or e-government) is being built and introduced as a means to facilitate the processes and procedures within the government and between the citizens and the government. This involves many aspects of secure transactions, privacy, encryption, digital signatures, and the one-stop-shop principle.

At the same time every country holds a wealth of spatial foundation and derived data in the domains of cadastre, topography, environmental protection, health, and general administration. Normally, these data a spread over many different government and public organizations and are kept in various formats and resolutions. Due to the increased need for up-to-date and to-the-point information and the widespread use geographic information technology the need for policies regulating the acquisition, management, use, dissemination, and sharing of public spatial data became very pressing.

This paper addresses the interface between e-government and geodata policy. It discusses criteria for a successful integration of e-government activities and geodata policies as well as challenges and opportunities in such an approach.

Economy - the ‘e’ in e-democracy

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This paper examines the impact of ISTs on the e-voting, e-participation and e-governance aspects of e-democracy. It begins with a discussion of the central characteristics of voting schemes in terms of motivations (influencing outcomes or expression of preferences) and the consequences for preference aggregation, candidate and platform selection and ultimately for societal decision making. The section goes on to examine the likely impact of ISTs on both the performance of voting mechanisms and the relocation (or otherwise) of societal discourse to points before or after elections. The second section examines e-participation - specifically the turnout in various electoral set-ups. It finds that typically there are multiple equilibria, of which the most robust is characterized by low turnouts. The analysis is extended to take account of the lower costs and greater information anticipated by use of ISTs and finds that the high-turnout equilibrium may respond perversely to reduced voting costs (lower costs leading to lower turnouts). The third section looks at institutional reform and the impact of ISTs on the evolution and dissemination of democratic governance - in particular on how the advent of the networked knowledge society changes the case for and characteristics of representative democracy.

Enhancement of Knowledge Sharing via Enterprise Portal in Network-Based Knowledge Society

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Our society has become a network-based knowledge society in which data, information, knowledge, human beings and organizations are connected and integrated without restricting to organizational and national borders. The networked knowledge provided by Internet has given tremendous impacts on our society and our everyday and professional life. Prerequisite for the impacts is that information and knowledge integration works satisfactory.

In spite of the difficulty to define a Network-based society, the following characteristics could reflect the significant features of such a society. They include:

- Moving information from one system to another one. Information and system integration turns as a key issue of systems development where semantic integration seems more interesting for human beings to directly utilize shared knowledge on the web.
- From function-oriented organizations to process and customer–oriented organizations. This indicates that business processes oriented towards legacy issues can be carried out almost automatically in the network-based society, giving more time for establishing relations and creating values.
- From satisfying public needs individual needs. There will be more need for personalization and security, i.e. secured information dissemination in the digital environment where global communications transcend national and organizational boundaries.
- From face-to-face communication to web-based communication and collaboration. Communication and solidarity will be the main uniting forces. Web-based communication includes either synchronous and asynchronous communications or face-to-face and distributed communications.
- From the technical focused to the social interactions. The usefulness of the information is very difficult to measure but it is beyond all doubt that the usefulness is the very base for all information processing.
- From single function provision to application service provision and value-added services. Knowledge about how work gets done has huge financial ramifications.

On the basis of a detailed discussion of basic concepts such as data, information, knowledge and business processes, the semantic integration and information usefulness are considered as the most crucial factors. An enterprise portal focuses the enterprise and Internet resources most important to users in a single Web page, a very easy way to obtain knowledge. Developing an enterprise portal is a way to manage the enterprise knowledge and offer inside and outside users to share their knowledge bases, applications and other enterprise resources one the one hand, and combine all resources to deliver personalized content based on what each user is

actually doing. Enterprise portals act as the gateway between the Internet and myriad proprietary networks. Enhancement of knowledge management at the enterprise's level could contribute to the knowledge sharing in the whole network-based society. Using knowledge management tools, content and knowledge can be easily published and integrated into a computer network. This paper will present the experiences from a project of developing a research institution's portal.

How to Strenghten Public-Private co-operation in the field of Geoinformation: a Case Study of NEMOFORUM

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The paper gives a presentation of Nemoforum, an association of institutions from public administration, municipalities, professional unions, associations and chambers and academic subjects active in land- and geo-information. The association Nemoforum is active in the Czech Republic for almost 4 years and it represents a useful platform for discussion, co-operation and co-ordination in the field of GI. The presented characteristics of structure, role, aims, activities and issues important for further development of Nemoforum can serve as an example of public-private partnership model which contributes to spatial data infrastructure building in the Czech Republic in compliance with international/European trends.

ENV-e-CITY: creating a marketplace for environmental data and services

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Access to quality assured environmental information sources is still time consuming and pain staking. For example, the delivery of meteorological data required for an environmental impact assessment study (EIA) can take up to two months after ordering, while the study itself may sometimes only last for a period of 3 months. The aim of the ENV-e-CITY project is the design and deployment of an on-line platform serving as a marketplace for content already captured for environmental tasks. The e-content domain covers four areas: air emission, air quality, topography and meteorology. The application framework to be developed includes meta-data structures for all application areas, export and import filters, interfaces and various e-content basic services.

The user community targeted consists of city authorities, consultants involved in environmental impact assessment studies, citizens as well as other providers of data and services seeking new business opportunities based on public sector information. These user will be able to enter the system and to identify relevant data (directly or via an online service to be invoked), identify the owner of the data/service and the price, order the data online, and directly invoke download services for data or order the data on a CD ROM via snail mail. The content will be supplemented by a news section, link lists, discussion groups and the like.

One characteristic to address is the distribution of data and services favouring a distributed architecture. Not only the sheer amount of data and computing capacity needed for the services prevents a centralised solution. Also the requirement of the suppliers to keep their data and services at their site (under their control and maintenance) makes it necessary to find a way to integrate them not physically at one location but in the sense of a broker by linking them via meta information at one central meta data base.

For reasons of content management, identification and delivery, the portal includes components for

- a meta-database of available data and services (including geographical references and pricing information) supplemented with search functions and *thematic* and *geographic* navigation;
- a framework for access to external databases and service invocation.
- a comprehensive e-commerce tool, providing functions for shopping data and services with dynamic properties as well as for billing and accounting.
- a content management system to include all visible output and to provide basic infrastructures such as user management, security, discussion groups, and the like;

The heart of the broker architecture will be a meta database maintaining information

about data and services accessible via the system. This includes all common meta data about data and services like owner, creation date, formats, comments, parameters, access types and the like. The data is geo-referenced making textual-thematic search possible as well as map-based graphical navigation.

The classification scheme used is Dublin Core with extensions for the environmental domain and ENV-e-CITY as it is on the one hand compatible with other systems because of the use of a generally accepted metadata catalogue, while on the other hand tailor made extensions suit the special demands of the system.

As for the services (and parallel for the databases), we have defined three levels of integration: Each of them has its own characteristics of co-operation with the provider and the level of control.

T1 The service is hosted by and runs on the central ENV-e-CITY server. This type of service has to adhere fully to the technical set-up on the server.

T2 The service runs on a different machine (probably at the service provider's location) but an interface with the ENV-e-CITY 'look and feel' exists within the portal.

T3 ENV-E-CITY just refers the user to the service/interface which is completely outside the ENV-e-CITY portal.

The technically most interesting case is T2. We have decided to use a rather pragmatic approach for the first demonstrator: For each remote offer, a user interface exists in HTML that connects via CGI to the remote service. Of course, webservices like Microsoft .NET or Sun ONE would offer a technologically more generic solution. However, neither a considerable amount of environmental real world applications exist nor do webservices include a user interface as required by many services available in ENV-e-CITY.

Special attention has to be paid to the shopping and billing system in ENV-e-CITY. Some portal engines already provide basic shopping functions, but have not all functions required. One requirement is dynamic properties, i.e. dependent of the product and selected options, other options become available. Data and services have different ordering options than conventional products: the price will be determined not only per piece, but also per quality of service, time consumed and the like. Generic pricing schemes that take into account service properties are not known to our knowledge and will be one objective of ENV-e-CITY.

The application of the billing mechanism in several countries makes it important to include different currencies and tax schemes. An advanced, reliable billing system will be necessary to ensure customer trust and security. Data and services can be shopped in advance or subscribed and therefore a tracking system of ordered and consumed goods has to be implemented. ENV-e-CITY will make use of a mature shop system from the public domain.

A content management system (CMS) will provide a personalised, attractive user interface towards the customer. Further, it provides the basic infrastructure such as user management, security and the like upon which the other components can be built.

The usability of the system has a high priority. Target customers of ENV-e-CITY are domain experts which are not necessarily computer experts. Therefore a simple, clear and intuitive interface, which is oriented at the expert needs, has to be used

The functional and technical specification have been finalised and a first prototype will be available soon. The system has been designed to make it easy to include environmental data and services.

However, technology can only prepare the ground. It is crucial for the success of ENV-e-CITY to acquire a critical mass of databases and service for the initial rollout. Each partner of the consortium contributes data and services, be it especially developed for ENV-e-CITY or adaptations of existing services. Examples will be AIRBASE/AIRVIEW (European monitoring data collected by the European Environmental Agency), a directory of EIA consultants for Germany or a wizard to air quality models.

Rural Wins as strategy for e rural policy

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The relationships within human society has been progressively transformed as a result of dramatic changes in the course of the 20th Century, particularly by the increasing industrialisation, mechanisation, immediacy in global trade and communication, rapid increases in population size and densities, and the expanding use of new technologies. National, regional and international perspectives must examine these and other factors in order to provide the best possible basis for allocating resources, establishing rules, formulating policy and making decisions. Rural areas are associated especially in the view of urban inhabitants with notions of “culture,” “tradition,” and “identity.” These notions are perceived as a positive, indeed an essential, good for many rural areas. However, rural communities have undergone dramatic transformations. For example, labour migration to cities and linkages to these centres have major impacts on rural incomes and resources. In the most rural zones, the resident populations have become dependent on a permanent exchange with and remittances from the exterior. Ties to urban and often international markets are consistent features of rural economies. Rural development is not about a competitive European agriculture, but each day it is focusing more on meeting the expectations of citizens in rural areas, 80% of European area and 22% of European inhabitants, achieving a deeper integration into today’s society and promoting economic development.

The scope of Rural Wins is to clearly understand why the “Rural population” have difficult access to ICT services and to create scenarios and recommendations to overcome present barriers (Policy, technology, business models) Internet and mobile communication are tools offering good possibilities for a sustainable development of rural regions. This development, based on utilisation of ICT technologies as one of the tools, could be named e (sustainable) rural development. ICT technologies could bring the part of activities, which were until now the domain of urban areas into rural regions. We can name for example software development, tourism market, education etc. This task is not easy and a lot of work must be done. The structure of the communication technology for rural regions must be developed and the influence of this technology on life of rural society evaluated. The development of new communication systems offers the possibility for sustainable development of rural regions. The Rural Wins is on from the document supporting new e rural policy. The basic ideas of this policy were supported by Valencia declaration.

Rural development is one of the two pillars of the Common Agricultural Policy of the European Union. Out of a total EU15 population of 370M in 2000 (Source: FAO), 77M correspond to rural areas, out of which only 16M are dedicated to the agriculture sector.

The new rural development policy has three main objectives:
- To reinforce the farming and forestry sectors.
- To improve the competitiveness of rural areas so as to provide their communi-

ties with employment and quality of life.
- To safeguard Europe's environment, landscape and rural heritage.

The draft of working document of Directorate-General Information Society, Information Society Technologies: New Methods of Work and Electronic Commerce "Electronic Commerce Information Society As Key Enabler For Rural Development And Integration" define next vision: "Develop Information Society in rural areas to foster European development and integration, and to increase competitiveness of European companies."

Rural Wins has identified that the barriers and disadvantages of rural and maritime areas are due mainly to their remoteness and isolation. ICT broadband access offers the possibility of bringing new activities, services and applications to rural and maritime areas, or to enhance those already there, providing thus an opportunity to overcome the barriers and bridge the rural-urban digital divide. The isolating factors of rural and maritime areas are based on their physical remoteness, lower size & density of population and smaller economic and labour markets. The following 4 barriers should be addressed by Broadband ICT data-intensive communication applications and services for rural and maritime areas:

Distance barriers their access to administrative and governmental services and structures (taxes, subsidies etc.)

Economic barriers their access to wider business and labour markets (suppliers, customers, opportunities)

Social barriers of rural inhabitants to information, education & training facilities, health and social services etc.

Information barriers – currently the amenities of many rural areas are "invisible" to the "outside world" (inhabitants of other areas, urban centres or citizens of other states – rural tourism, local products etc.)

An application or service, to be of interest to the RURAL WINS project, should be intensive in data communication and should help to overcome some of these barriers. A consumer, to benefit from an application or service is expected to be computer literate. An appropriate training in computer literacy and application's use is a necessary precondition for a successful introduction of a service or application into practical use.

A a result of the comparative studies of various classification systems of rural areas, the European qualitative system was found as optimal:

Integrated rural areas
Activities. In general, integrated rural areas are expected to have high activity on the Internet. High proportion of well-established middle class rurbanizers and local entrepreneurs may be expected to be on the customer end of eBanking, B2C eBusiness, eShoping and eGovernment where available. Entrepreneurs and secondary and tertiary sectors may be expected to use communication and Internet for marketing, B2B and B2C transactions. Teleworking and eLearning would most probably not be exceptional.

IC technologies. A high-speed cable connection would be feasible due to relatively high population densities. The market can in most cases finance it. May be substituted or supplemented by high-speed satellite connection or satellite connection combined with WLAN.

Intermediate rural areas

Activities. While in urban and integrated rural areas we can find economies of scale, economies in intermediate rural areas can be viewed, due to smaller market, more as economies of scope. Unlike in integrated rural areas, where industry and secondary sector production is targeted for urban centre and the area itself, markets of intermediate rural areas are smaller and prosperous industrial firms are forced to target their production for export out of the region and possibly out of the country. eBanking, B2C eBusiness, eShoping and eGovernment may be expected to be less developed in intermediate rural areas. Entrepreneurs and secondary sector may be expected to use Internet and communications for promotion, marketing and B2B transactions. Teleworking and eLearning would be reasonable activities to help to cut unemployment rate and to expand economic activities beyond the region borders. Recreational and tourist businesses would use Internet for promotion and marketing purposes as well as e.g. for accommodation bookings.

IC technologies. A high-speed cable connection probably would be realised only in towns with population size large enough to make the necessary investment economically feasible. It may be substituted where needed by wireless communication or high-speed satellite connection or satellite connection combined with WLAN.

Remote rural areas

Activities. Main activities are usually connected with basic rural activities. Other activities that are supported are eco and rural tourism, tracking sport, mountaineering, yachting and other recreational and sporting activities. In northern Europe a large proportion of the inhabitants are occupied in governmental services such as care of elderly, teaching, etc.

IC technologies. Teleworking, eHelath and eLearning are important areas to achieve social and economic cohesion.. Recreational and tourist businesses could use Internet for promotion and marketing purposes as well as for accommodation reservations. The applicable technology would be wireless communication, high-speed satellite connection or satellite connection combined with WLAN. The possibility of fixed broadband is not excluded, but feasibility studies for different regions and solutions would be necessary.

A modular standard for the Cadastral Domain

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A standardized core cadastral domain, covering the land registration and the cadastre in a broad sense (multipurpose cadastre), model will serve at least two important goals: 1. avoid reinventing and re-implementing the same functionality over and over again, but provide a extensible basis for efficient and effective cadastral system development based on a model driven architecture, and 2. enable involved parties, both within one country and between different countries, to communicate based on the shared ontology implied by the model.

Until today most countries (or state or province) have developed their own cadastral system. This is often motivated by the fact that there are supposed to be huge differences between the systems. The one end has a deed, the other a title registration, some systems are centralized, and others decentralized. Some systems are based on a general boundaries approach, others on fixed boundaries. Some cadastres have a fiscal background, others a legal one. However, it is also obvious that the individual implementation and the system maintenance of a cadastral system are not cheap especially if one considers the ever changing requirements. Also, the different implementations (foundations) of the cadastral systems do not make meaningful communication very easy, e.g. in an international context such as within Europe. Looking at it from a little distance one can observe that the systems are in principle mainly the same: they are all based on the relationships between persons and land, via (property) rights and are in most countries influenced by developments in the Information and Communication Technology (ICT). The two main functions of every cadastre are: 1. keeping the contents of this relationship up-to-date (transactions) and 2. providing information on this registration. This paper starts with an overview of the progress made so far in the development of a standardized core cadastral data model based on the geographic standards from ISO and OGC (OpenGIS). This cadastral model is developed in cooperation with the FIG, the research is also related to the framework of the COST (Co-ordination in the field of Scientific and Technical Research) Action G9: ‘Modelling Real Property Transactions’. Last March the OGC has announced its Land Property Information (PLI) Initiative and the proposed cadastral model is very relevant. The new contribution of this paper consists of refined and new parts of the model (to be developed), and the introduction of a modular approach (packages).

Changes in Education, Skills, and Training for 21st Century Spatial Data Cognizant Societies

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A recent study conducted by the U.S. National Research Council of the U.S. National Academy of Sciences offered the opportunity to take a detailed look at the current and needed future skills related to spatial data needs of the 21st century, with its Information Age and Knowledge Society. This study funded by major mapping agencies of the U.S. Federal Government also looked at needed changes in the organizations and institutions that would accompany the changes in skills.

This paper concentrates on the education, skills, and training that both professionals involved with spatial data and the informed general public of the 21st century will need. The professions of geodecist, photogrammetrist, surveyor, remote sensing specialist, and cartographer are all impacted as are the major institutions and organizations concerned with spatial data today. As society learns to operate and depend upon spatial data, the necessary education, skill development, and life-long training needs will explode. Initial steps to direct and contain this explosion must be planned and implemented now.

Building communities and knowledge networks in practice

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The paper gives an introduction to the information society development in the Czech Republic and describes an important role of networking and community building for emerging markets, especially in the Eastern Europe. Based on the case studies of the Virtual Innovation Park (one of the first i-business monitoring services in the country) and the First Tuesday global business network it shows concepts and tools implemented on the Czech market for thousands of subscribers and event attendees. The first one represents an online national community built around a web server (launched in 1995), an e-newsletter and a moderated mailing list. The second one is a case study of the national chapter of the global community meeting face to face every month (in Czechia since 1999). Driving forces and constraints will be discussed in relation to formal European initiatives.

Some Lessons Learned from Implementations of Various SDI Components

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SDI today, whether part of NSDI, GSDI, ESDI initiatives etc., is much more than a trendy buzzword. It is a dynamic scene of legal, technical and organizational activities where many areas of society's interests and IT are coming together to provide a cohesive vehicle for changes in the basic functioning of modern society. For a number of years, however, many people from different corners of the GI industry have attempted to implement projects that, in today's environment, are destined to become a vital part of SDI.

This paper is discussing a range of observations and experiences of commercial vendor providing software, consultation and implementation services in building and delivering custom tailored geospatial solutions. Various aspects of the associated challenges of the building of 'the SDI' – are well known, repeatedly exercised and documented and thus easier to overcome or avoid altogether. These, being known, can serve as basis and inspiration, if not guide, for overcoming new challenges related to SDI implementations that are to be carried out now and/or in near future.

Digital data and spatial technologies for Czech forestry students education

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Sustainable management of forests endangered by climate change needs evaluation of their spatial and temporal changes. Contemporary geoinformation technologies provide powerful tools for such evaluation. In Czech republic, forest management plans (including forest maps) are often produced in digital format. All forestry students have to master digital technologies, using digital data of University forest enterprise (forest maps, historical and topical aerial photographs, DTM, land-use, GPS data, temperature records and other kinds of data.) This data is stored at faculty map server. All students elaborate semestral project, including map composition, new thematic layers creation, skidding track optimisation, flood modelling, etc.) Contextual classification software (eCognition) and satellite data of very high resolution (Ikonos) is used by doctoral students. New curriculum focused on geoinformation technologies is under accreditation.

Managing university community by utilizing Digital Earth conceptual model

Tien-Rein LEE

THURSDAY
September 25, 2003

Mapping agencies - the customer in control

Ed PARSONS

Digital Earth: Implementing the Millennium Goals

Jeane FOUST

Thursday, September 25, 2003 ***stream I.***

topic 1

DATA, INFORMATION, KNOWLEDGE, TECHNOLOGIES AND TECHNIQUES

Agent-based Cartography: A New Tool To Digitalize the Earth

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In this paper the new trends of cartography development with the advent of the new information technologies were discussed and the concept of agent-based cartography, its contents, technological platform, constitution, characteristics were put forwarded. In addition, the differences between agent-based cartography and other cartographical methods and the perspective of agent-based cartography were mentioned. Agent-based cartography will bring a revolution in geoinformatic researches and help to realize the real time, dynamic visualization and simulation of our world in a near future.

Key words: agent-based, cartography, visualization, NetLogo

Use of Digital Data and Mapping for Automobile Market Analysis

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Currently the overall automobile market is becoming more competitive, a fully and accurately understanding of the market pattern and potential customers distribution is very important for business success. Since the geographically and temporally dynamic nature of market exists, GIS presents its remarkable and unique features in automobile market analysis as a friendly visualization tool and a sophisticated analysis engine.

With the aid of widely available regional digital data, demographic data, as well as a series set of sales data and regional surveys for each brand of automobile vehicles, it is possible to use GIS technology to support the planning and decision process of target marketing by drilling into the gold mine of internal and external data. In this paper, the market pattern and sales trend of the automobile market in Sydney are presented comprehensively using GIS visualisation tools, which includes the sales patterns, weakness points, strong points, fast-growing areas, the most economical marketing campaign regions. Furthermore, the more logical potential social-economical reasons behind the sales and the customer consumer features in the region are explored using GIS analysis functions. All these knowledge gained from the intensive integration and analysis of raw digital data will help the market professionals to understand the market properly, and design their policy and strategy for targeting and advertising campaign efficiently.

M2M or machine-to-machine applications and their future in the Czech Republic

Jirí HAJEK
Vice President Corporate Communication of T-Mobile Czech Republic

telemetric applications (remote gas meter reading, etc.);
vehicle tracking;
car fleet administration.

Mobile communication is no longer limited to calls and sending SMS. A mobile phone can be a source of information and entertainment as well. Via a mobile telephone, you can connect to the Internet or, using additional applications, collect data remotely, work with your company applications, conduct marketing research studies, or vote. Jiøí Hájek, Vice President Corporate Communication of T-Mobile Czech Republic, will devote himself particularly to that area in his presentation and will lay emphasis on the use of GSM technology in the area of machine-to-machine communication.

Using Remote Sensing in Land Resources' Exploitation In China

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By use of Remote Sensing information, the paper focused on the way that land resources were spatially exploited. As the ground properties of land resources, RS information such as the first and green part of tasseled cap transformation0bands of thermal radiance0and TM_4/TM_3 etc, are also the characteristic indicators of Land resources. Therefore, both ground properties and RS information could be used as indicators to classify the land resources. In the paper, a hierarchical structure model was applied for classification. As the result of the model, the paper demonstrated the systemic structure of land resources and the correlations among the land units in terms of the different classification goals. By the way, it was not only known in details the internal structure and function of land resources system, but also clearly revealed the spatial distribution frame of land resources. Finally, the land resources were divided functionally, meanwhile a comprehensive knowledge about regional land resources were formed .

Keyword : Remote Sensing Hierarchical structure model Land resource Spatial distribution

topic 7

REGIONAL SPATIAL DATA PROJECTS

The Central-European Land Knowledge Center with Geoweb Based Service

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Three international conferences held in Vienna between 1998 and 2000 and sponsored by the Government of Austria, UN/ECE, the European Commission and the WB on the issue of real property rights and land market development, and successive discussions with the World Bank resulted in the proposal to create a network, called hereafter the *"ECA (Europe and Central Asia) Initiative on Real Property Rights"* and subsequently, in the decision to establish a Regional Center to serve as a knowledge management institution concerned with secure land tenure regimes, real property rights and land market development in the region. The Central European Land Knowledge Center (CELK Center) was formally established in January 2003 in Budapest, Hungary. Its establishment occurred in conformity with a Letter Agreement between the World Bank (WB) and the Government of the Republic of Hungary under the Property Rights and Land Market Development Project for EU Candidate and Balkan Countries. Under said project, the WB granted Hungary an institutional development fund grant (IDF Grant No. TF050701). The Hungarian Government, through the Ministry of Agriculture and Rural Development (MoARD) is co-financing the project through budget and in-kind contributions. The paper highlights the background, reasoning, mission mission statement, the participating countries and organisations, major objectives as well as the expected outputs and deliverables. Finally special attention will be paid on the solution selected for the geoweb-based knowledge and information dissemination.

Building and Exploiting a Regional Spatial Data Infrastructure: The case of South East Europe

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This paper reports the authors' work on building spatial data infrastructures in South East Europe. This geographical region comprises the countries Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Romania, Serbia and Turkey. As part of the European Commission funded project GISEE (GIS Technology and Market in South East Europe), the authors have carried out a survey to unveil the existence of spatial data in these countries as the foundation for any further action to build national and a regional spatial data infrastructures. On the one hand, policy recommendations result from the analysis of the survey - the paper will describe how spatial data can be used for the further economic development of the region, how it is included in government strategies. On the other hand, the authors initiate concrete private sector actions in order to drive the establishment of spatial data infrastructures from the grassroots. The activities that the authors are currently defining to build on the results of the GISEE project will be emphasized such as providing data services, and in particular the development of a regional atlas.

Spatial information is an important economic factor, and especially in transition countries it may have a considerable impact on the development towards a market economy. Ownership of land, development of infrastructure, water and electricity distribution, environmental planning, town planning, business development - spatial information is an important factor for the development of countries towards higher living standards, a fully functioning market economy and participatory democracy. Donors such as the European Commission, the World Bank and many others support those countries in their transition phase; however, without data about location, many donor supported projects cannot be executed effectively.

This paper reports about the authors' work on building spatial data infrastructures in South East Europe. This geographical region comprises the countries Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Romania, Serbia and Turkey. Three of these countries, Bulgaria, Romania and Turkey, are candidate countries to the European Union, whereas the other countries lie in the Western Balkan region and are also aspiring EU membership.

The current problem in these countries is availability of data; spatial information is not fully accessible, and if it exists, its sources are dispersed and not known. Knowledge and awareness of existing data is the first step in building spatial data infrastructures. This is the goal of the European Commission's study project GISEE (contract IST 2001 – 37994), which investigates and documents the status of the spatial data infrastructures in South East Europe. A spatial data infrastructure is understood as encompassing the policies, organisational remits, data, technologies,

standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are not impeded in meeting their objectives.

GISEE is a one year long study, co-ordinated by the Technical University of Sofia, supported by the partners URSIT Ltd. in Sofia, EuroGeographics and GISIG. The project has started in September 2002 in defining the elements of spatial data infrastructures and building a survey with a detailed questionnaire for the elements of the spatial data infrastructures in the target countries. This survey is carried out by partners in the target countries. It will be completed by end of March 2003, and will provide information about the actors in the field of geographic information, the data owners, providers and users, the data that exist in these countries, systems and projects using spatial data, sectors, technology, standards, and research activities. First investigations have shown that a lot of data exists, but are not well accessible. There are no formal mapping agencies, data are owned by various ministries, but also by many private companies.

In a subsequent phase, the results of the survey are analysed in order to find out obstacles and favourable conditions for the development of spatial data infrastructures, the need for data creation, the lack and the need for new technology and standardisation. This analysis phase will also be the opportunity to define and build concrete activities with the goal to make spatial data widely accessible through out the region. Aside the availability of spatial information in the region, benefits would be the creation of a GI community in this region, the stimulus to companies and users to adopt new technology, innovation and standards, which can in turn contribute to a truly European geographic infrastructure in Europe.

The authors envisage two types of activities that benefit from the knowledge about the existence of spatial data: policy recommendations and private sector projects.

Based on the results of the survey, the authors are defining a roadmap and policy recommendations not only to actors in the sector of Geographic Information, but to all decision makers, to governments and donors. The purpose of these policy recommendations is to define actions that should be undertaken by decision makers within governments in order to create truly spatial data infrastructures, and convince politicians to include spatial data components into any kind of political strategy. E-government strategies, for instance, are currently being defined by all governments of South East Europe, and the authors are in contact with their government in Bulgaria, and are discussing the issue of spatial data with the responsible government agencies.

GISEE has created links to the European initiative INSPIRE, which aims to make more and better spatial information available for Community policy-making and implementation in a wide range of sectors. INSPIRE will result in an EU legal initiative addressing the challenges to achieve the widespread use of spatial information to support European governance. These challenges are related to a number of factors, including technical incompatibility of data from different sources, difficulties in knowing which data are available, difficulties in accessing data, etc. This corresponds exactly to the goals of GISEE in South East Europe, and the GISEE

partners work towards moving the GI community of all countries in South East Europe closer to the INSPIRE initiative.

The project will conclude with the “South East European Spatial Data Conference”, which will be held on in Sofia 23 and 24 October 2003, aiming at constituting a discussion forum for spatial data in the region.

The partners are investigating several scenarios for the interregional use and provision of spatial data in the areas of environment, or disaster management. One concrete project is the development of a regional atlas of the Balkan countries, which is in its definition phase. This regional atlas will not contain data or maps itself, but is conceptually linked to the spatial data infrastructures of the participating countries. In this sense, the atlas will be built in two steps. The first step is the setting up of a metadata server, which includes metadata about those spatial data that are available in the countries of South East Europe. Via this metadata server, the real data are made available in a second step. This digital atlas is understood as embedded in the regional spatial data infrastructure of Southeast Europe, which in turn depends on the national spatial data infrastructures.

The vision is to create a seamless information system based on national spatial data, which can be used for the economic and political development of the whole region. Such an information system would render various applications possible, like social development, land registry, combat of disasters, protection of the environment, fight again crime and terrorism, tourism, and others. The atlas will be a tool to contribute to cohesion in the region; it will be a tool for the social development of the region, for poverty alleviation and for the benefit of the socially disadvantaged. Governments and citizens can access all kind of information and comparative data about the region of their interest.

Topographic Information Service in North – Rhine Westphalia Quality protection of digital maps

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The Surveying and Mapping Agencies of the German States (AdV) and the Federal Agency for Cartography and Geodesy (BKG), through the formation of the AdV, have developed and implemented the Authoritative Topographic and Cartographic Information System (ATKIS). Supplemental to their legal mandate, the agencies are also directed to serve the needs of government, industry, science, transportation, land use planning, and defense as they relate to the provision of geographic information. Thus the Surveying and Mapping Agency is responsible for a number of tasks:

- to capture, document, and represent the structure, facts, and relief of the Earth's surface according to standardized methods,
- to develop and utilize ATKIS as a tool for analyzing, presenting, and storing geographic information,
- to facilitate easy access to geographic information by storing data in a ready to use digital form that is compatible with computer systems throughout Germany.

The highest good of maps is represented by the quality, the relevance and the topicality of the content. To prove and protect these objectives, the AdV implemented a working group with the goal to build up a common concept for Germany. The concept is based on the idea, to uncover changes in the topographic as fast as possible and to update the digital maps. Therefore North–Rhine Westphalia started to set up a Topographic Information Service. The Task of this service is to ensure

- a basis topicality for the whole content of the digital map
- a high level topicality for selected objects with significance and importance (e.g. roads, trails, airfields).

To serve these requirements, the Topographic Information Service brings a lot of modern infrastructure in action. High level educated members are locating the changes with GPS and using pen computer for processing data in the field. A Web-based Information System is realised in a first level and will be opened for all participating organisations. In this way, the production of topical digital maps is realised in a modern and efficient manner.

The author wants to present the realisation of data policy in North-Rhine Westphalia and wants to focus on modern updating mechanisms (from field work to digital landscape models).

US Federal Geographic Data Committee Initiatives: Geospatial One-Stop and Implementation Teams

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Since its inception, US Federal Geographic Data Committee (FGDC) has been responsible for the creation of an elaborate National Spatial Data Infrastructure (NSDI) based on some very basic concepts: collecting data once and using it many times, openly sharing information and data, making data and tools to use the data more easily available, and others all promoting better governance and management and improved decision making. The FGDC has benefited from high level political attention through two US administrations largely because of convincing arguments that the concepts of the NSDI lead to a more streamlined government.

Initially the NSDI's major development focus was almost completely at the national level. With time and much promotion, FGDC's vision has found its way into states and local governments. To encourage states and communities to participate, the *Implementation Team (I-Team)* concept emerged by which states have been strongly encouraged to establish the mirror image of the national FGDC within each state. To date as many as 49 of the states have developed formal I-Teams and 12 have authored formal plans and 11 states more are close to completion. These plans outline mechanisms to conduct a comprehensive geospatial inventory, identify framework data, establish clearinghouses, assign data stewards, and related activities. The mission of the I-Team is now directed to evolving these plans into actions.

The central focus of the NSDI has carried into the current administration on the shoulders of the President's management agenda consisting of 24 major programs with a vision to improve the federal government's value to the citizen by an order of magnitude. Essentially the goal is to make information, data and decisions available in minutes or hours, not weeks or months. One program is *e-government* and is focused on using digital technologies to transform government operations in order to improve effectiveness, efficiency, and service delivery. *Geospatial One-Stop* grew from this vision and raises the visibility of the strategic value of geographic information. It is actually another mechanism to accelerate the NSDI development in the US. Specifically it is to build framework data standards, breathe life into portal development, accelerate data inventory, and promote data and its application throughout the marketplace.

Geographical informational resources, international standards and national infrastructure of spatial information in Slovak republic

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Integration of Slovak republic (SR) inside EU calls for adapting of information policy according to new European conditions. INSPIRE (Infrastructure for Spatial information in Europe) is initiative about building up and common use of geographical information resources (geographical informations and tools for processing them). INSPIRE declares fundamentals of building of National infrastructures of spatial informations (NISI) together. Official website http://www.ec-gis.org/inspire/ defines 12 main principles of this European initiative.

SR builds NISI. Automated information system of geodesy ,cartography and cadastre authority (AIS GCCA) is the nucleus of NISI. The thematically content of NISI is built by resort information systems. AIS GCCA is divided in to tree interoperable subsystems (http://geodesy.gov.sk) – information system of geodetic control (ISGC), fundamental base of geographical information system (FBGIS) and cadastral information system (CIS).

The INSPIRE common topographical template (TT) is important element of European infrastructure of spatial information (EISI). Table Nr. 1 shows the structure of TT. Topographical template of state information system (SIS) in SR is contained inside FBGIS. It is geographical information system whose main functions are: the definition of TT, actualization of TT , distribution of TT and base map production . The content of TT of SR is close to the Base map 1:10000 legend structure. Structure and function of FBGIS is shown in diagram Nr. 1.

Geographical database is functional part of FBGIS. It is defined by elements – object catalogue (OC) and interrelations – relational and topological. The Object catalogue of FBGIS will be issued ending the 2003 year. Formally to the OC will be implemented the DIGEST (Digital Geographic Information Exchange standard) coding system. Currently there are negotiations about content and form of OC between GCCA and Army SR. The paper presents structure of current proposals of OC, explains the use of DIGEST coding system and its implementation in the OC FBGIS. Because of acceptation of DIGEST standard inside INSPIRE it is real to conceive about its broader implementation inside resort – thematically information systems of SIS.

Information Technology and its Development in Nepal

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1.1 Historical backgrounds

The information age has opened powerful new business and social development opportunities throughout the world. The core requirement to realise these opportunities is to provide an environment that allows for the free access of information. However, success in the information age requires more than simple development of IT. It requires parallel development of supporting infrastructures, financial, legal and human resource areas co-ordinated under an agreed upon. National Information Technology (IT) Strategy.

His Majesties Government, in 1971, introduced Information Technology to process the National population census data. It also conducted regular training courses on Computer Literacy and software applications.

Private sector began its activity in early eighties after the introduction of Personal computers. There are about forty software development companies, two hundred plus companies are involved in IT trading and more than five hundred training institutes are in operation partaking training on IT at different levels.

Some areas which have successfully employed IT in Nepal, and applications of which has created some impact are: IT application on Banking has been successful in offering twenty four hour banking and country wide branch office networking. Some areas of successful application of IT in government Institutions include National Pension and Provident fund, Board, Telephone and Electricity billing systems, VAT Department, Customs department (partially), Institutional and Private schools. However the success rate is higher on smaller scale IT applications at firm / institutional levels rather than on a corporate and national level. Government and public sector has recently started academic IT courses in their respective Institution. Four universities are offering IT-related courses 5000 annual intake of students

1.2 Realisation of Information Technology:

Realising that Nepal could tap a small portion of the Global IT market it will open up new vistas in the Socio-economic and development efforts of the country. Ministry of science and technology should act in the capacity of co-ordination body for creating government information available to the public by improving: financial management, the efficiency of administration and dissemination of information with a one window policy regarding the IT sector by the MOST will facilitate the private sector to become more efficient and reducing time and cost of collecting information.

Having said that E-governance and computerisation is not achieved by only installation of computer hardware, software and establishing networks. We might even have to make organisational, structural and operational changes in the government

and its respective line agencies.

1.3 Critical reality in developing countries

"One third of the world's population has never made a telephone call. More than 3 billion people have no money to spend on communication Services, or live in rural and remote areas, where access to information and communication technologies is scarce or absent. These facts are disturbing, but do not as such provide sufficient reason to incorporate the promotion of its in development co-operation efforts. After all, one may question the relevance of talking about access to computers if the same people do not have electricity or clean drinking water. Development budgets are limited and development policy is a matter of setting priorities. This Communication makes one step forward. It is argued that, while ICTs are not to be seen as a priority sector as such for Community development co-operation, they do provide an important tool for more efficient and effective aid *delivery and need to be recognised as an increasingly important element in the economic and social fabric of countries world-wide."*

1.4 Problems in IST in Nepal:

-Major part the population doesn't have access to the web

-Lack of basic infrastructure

-Only 80-90 percent population have access to radio broadcasting and 1.07 per 100 inhabitants have access to telephone lines throughout the country

-More than 60 % people are Illiterate.

-There are still areas without electrification. Those with electricity are quite expensive.

-Lack of appropriate government policy

-Unaffordable technology (More than 50 % people have in come less than 1 US dollar per day)

POSTER SESSION

Digital model of construction of open system of steady development

Y. BURAVLEV, S. DRYCH

Comparative Planetology data Storage Center at Vernadsky Institute, Moscow: Collection of Extraterrestrial maps and Cartographic Sources

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The Laboratory of Comparative Planetology at Vernadsky Institute has a vast collection of planetary maps and different cartographic and textual sources, which could be used for the compilation of extraterrestrial maps. The review presented here is to provide the general outlines of this collection. The Data Storage Center (DSC) at the Laboratory was established in late 1960s, soon after foundation of the Laboratory in December 1967. That time the Laboratory was at the Institute of Space Research (IKI), USSR Academy of Sciences. It was a period when the early spacecrafts have been under development for the flights to the Moon. It calls necessity of the data on the properties of the lunar surface both to produce the spacecraft's construction suitable for a safety landing and to select the surface areas of a specific geologic interest to investigate. That time any data about the surface structure of the Moon and planets were not numerous and they were scattered in different sources. The aim of the DSC was to put such data together for the subsequent using them in practical work with the space stations to fly to the Moon and planets. K.P. Florensky, the founding chief of the Laboratory, and A.A. Gurshtein, the Lab's deputy chief, governed the work. N.P. Slovokhotova was a responsible curator of the DSC.

Since 1975 the Lab is at Vernadsky Institute. By that times the Data Center have grown up into a major collection of materials, connected with planetary research. Such materials are of diverse types. There are maps, photos, reports, books, etc. One could say that almost any types of data materials take place here – from hand-written and typescript to CD-ROMs. The DSC is now under general governing of A.T. Basilevsky, the Laboratory chief. The collection is under supervision of G.A. Burba and V.P. Shashkina. The DSC is aimed to collect, store and distribute the data about the solid planetary bodies of the Solar system, including planets, satellites, minor planets (asteroids) and comets. The geologic, geomorphic and the related subjects are the main ones between the data collected at the DSC. Such data are to be used both for the engineering models of the planetary surfaces and for geologic investigations of the planets. The Center includes both published and unpublished materials, and some of them are of unique origin, being produced in a restricted number of copies, such as the Soviet contractor reports of late 1960s – early 1970s. There are 1390 materials (data units) of different titles in the DSC. Each of them exists in a different number of copies – from 1 to 43. Most of the materials (1180 of 1390 titles, or 85 %) are connected with the three planetary bodies – the Moon, Mars and Venus. It reflects the higher degree of knowledge on these planets.

The data presented at the DSC comprise several groups depending on their characteristics. There are 15 types of materials in the current DSC classification: book, atlas, map, photomap, radar photomap, photo image (including both photo and TV),

[contractor] report, manuscript, working material (of diverse types – such as drafts, schematic drawings, map projects, tables of statistic data for using in analysis, etc.), abstract, poster (conference report), paper reprint, journal, bulletin, dissertation (thesis). The maps, including photomaps and radar maps, comprise the main part of the DSC materials (1000 of the total number of 1390 titles, or 72%). The maps together with atlases, photo and TV images comprise 79% of the titles. There are also some hundreds of CD-ROMs in the storage. They contain imagery for the Moon (*Clementine* spacecraft data), Venus (*Magellan*), Mars (*Viking 1* and *2*, *Mars Global Surveyor*), systems of the giant planets (*Voyager 1* and *2*, *Galileo*). These materials are not reviewed at this paper. All the data units of the DSC are listed in the electronic catalogue. The catalogue is a table in Excel format. It contains 15 characteristics for the each data unit: 1) planet (abbreviated, as in Table 1 here), 2) name (title of the material), 3) name's abbreviation, 4) scale (for maps and other images), 5) author(s) name(s), 6) year of issue, 7) an original or a photocopy, 8) notes, 9) number of copies, 10) storage case No., 11) storage shelf No., 12) type of material (one of 15 classification types – see in the text), 13) issued by …, 14) spacecraft name, 15) map series index (abbreviation).

The materials from the DSC have been used for numerous and diverse works by the Lab members as well as by the colleagues from the other organizations. The cartographic data from DSC have been used during the selection of the landing sites of such spacecrafts as *Luna 15, 16, 18, 20, 23* and *24* aimed to deliver the samples of the lunar soil to the Earth in 1969-1976. Three of these flights have been successful and the samples from Mare Fecunditatis (Sea of Fertility), Mare Crisium (Sea of Crisises) and the mountain highland region between them are now at the Lunar Samples Lab of Vernadsky Institute. The maps stored at the DSC and those produced from its data were used in 1970s for the landing place selections for *Lunokhod 1* and *2* unmanned vehicles as well as for the navigation during their cruising across the surface of the Moon. Another flights used DSC data were *Fobos 1* and *2* stations, launched to Phobos, the satellite of Mars, in 1989. A lot of data were used to support spacecrafts of *Venera* and *Vega* series launched to Venus. Some of these maps are the original ones produced by the Planetary Cartography Group at the Laboratory of Comparative Planetology of Vernadsky Institute. The landing sites for *Venera 9, 10, 11, 12, 13, 14, Vega 1* and *2* landers were selected in 1975-1984 after the cartographic data from the DSC collection. The planning map for the radar survey of the northern quarter of Venus (the area northward from 30° N) from *Venera 15* and *16* orbiters in 1983-84 was compiled with DSC data.

There is an international cooperation to add new materials to the DSC. In particular, the Branch of Astrogeology of the United States Geologic Survey (Flagstaff, Arizona) mails us every new map of the planets, published by them. Jet Propulsion Laboratory of California Institute of Technology and NASA provided series of CD-ROMs with the images of planetary bodies, obtained with the US spacecrafts in recent years. At the end of 1980s a joint Soviet-American mapping project have been undertaken to produce the maps for the planning of work of the forthcoming American *Magellan* orbiter scheduled to make the global radar survey of Venus during the early 1990s. The DSC data have been used for compilation of the set of three maps of the Northern Venus at 1:15,000,000 scale – so named '*Magellan* Planning Package', which were published by the US Geological Survey in 1989. Since

late 1990s the *Magellan* images of Venus, stored at the DSC, are used for the global geologic mapping of that planet at 1:10,000,000 scale under Vernadsky Institute, Russia, and Brown University, USA, joint mapping project.

Design of the Internet based open regional thematic atlas

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Creation of thematic atlases is nowadays more and more transferred from paper environment into digital one, especially Internet became medium for contemporary cartographic publishing. Internet technologies offer many new abilities, which not only enable smart map based atlases, they even dramatically changing conception of atlas design. From this point of view key word of or project is open. Under open atlas we understand live structure which allows continual insertion and update of the thematic content by appointed responsible institutions. The role of cartographers in such structure is to create appropriate cartographic framework which ensure positional and visual consistency of the atlas.

In the above mentioned framework we can distinguish several parts:

a) Atlas software engine
b) Reference base
c) Automated generalization procedures
d) Smart map functionality
e) Symbology sets and semi-automated identification of suitable symbology for themes
f) User interface

In first stage of the project we are focused on design of the software engine, definition of the reference base enhanced by appropriate generalization procedures and design of the initial set of symbols.

Software engine is based on W3C standards and open source software. Core of the engine is based on program language ruby, visual interface is designed in SVG format, configuration files and schemes are handled in XML format. Database background is still in stage of selection we testing various approaches - XML , relation and object oriented.

Reference base is defined by landscape skeleton (selected ridge and valley lines, river and road lines) with set of important visible entities in landscape. All spatial features in the atlas will have geometry defined in relation to this base. It is supposed semi-automatic conversion of the input geometry in to above mentioned form.

Symbol sets creation is based on analysis of the existing thematic atlases of the Czech Republic (or Czechoslovakia). Selected symbols are defined and stored in the SVG format.

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The Open NODE – An Interoperability Approach to GIS Awareness by Distance eLearning

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The **European process of integration and enlargement** is challenging for a new policy of EU in fields of agriculture and forestry. The need for a paradigm change is obviouse and the time for doing so is ripe. Therefore, a new paradigm must take into account passing away the old thinking in volumes and costs of production, and going into direction of delivering better **decision making** for increasing quality and adding value in sustainable development, especially in rural areas. The development of information systems supporting sustainable regional policies on environment, water, agriculture and forestry is one direction to reach these ambitious goals, but raising up **awareness, skills and open life-long-learning** (OpenLLL) process is another important topic in shifting the development paradigm for remote rural areas.

The situation of **rural regions in Germany**, especially taking into account the rural cross-border-areas of federal states Brandenburg and Saxony, e.g. the "Lausitz" region is characterized by serious gaps in budgets and infrastructure development. Examples are decreasing **infrastructure** fonds for rural area development, decreasing demand for **supply services** in spite of liberalized markets in telecommunication, e.g. post services, energy supply, traffic services as well as in **geodata infrastructure** development.

Therefore, a **systemic** approach has to be taken into account to bring remote rural areas as well as monitoring the environment, agriculture and forestry, and its human potential to the forefront, e.g. making rural areas more sustainable by development of new **information and communication** tools and systems for better informed **decision making,** but also continuously improving the human potential **to learn anything, at anytime, from anywhere,** and the way to use new tools for creating more employment opportunities and services for tourism in rural regions.

The **BOW**, a private – but non-profit – educational SME with its continuing Education Centers in Dresden and Leipzig, has been shifting its course & training programs to support the new paradigm of sustainable rural development where the development strategy for more GI awareness and the availability of **interoperable OpenGIS and OpenLLL processes** must be realized.

The **EU Sokrates/Minerva Project NODE** (**N**etworked **O**rganizations of **D**istance **L**earning), and in which BOW-EducationCenterDresden is a consortium member, aims to provide interoperable solutions for **open** and **life-long-learning** (**OpenLLL**).

The BOW-EducationalCenterDresden is especially focussing on the last two aspects:

- to develop tools and make them available to citizens in remote rural areas via technologies of information-communication-transaction (ICT) for **e-Learning** (the

NODE project) using Internet and Extranet capabilities, and
- to use "blended", e.g. "mixed" online & traditional learning based on DistanceLearningSystems platforms like DLS-6.5 for OpenLLL with **interoperable learning objects**, **contents, services and metadata catalogues.**
- to coordinate a rural network cluster for improving the capabilities of employment in rural areas by sustainable rural tourism (the EQUAL project) as a way to connect people of rural areas by delivering them new didactical formats for live-long-learning (OpenLLL).

The BOW Demo Poster attached shows some **interim** results of the EU supported **NODE** project. The **GIS-Colloquium** presentation will demonstrate **live** the access to different NODE-Gateways interconnected simultanously via the BOW-Academy's DistanceLearningSystem (DLS-6.6.x) functioning as a MultiPoint-Of-Learning (MPOL) within the NODE conceptual model. Still unsolved are the interoperability of granularity at LO's level, and new business models for such kind of web-based learning capabilities for citizens at school, at work, at home… anytime & anywhere.

Weblinks to EU project activities of BOW-EducationCenterDresden-Academy:
HTTP://www.BOW.de/
HTTP://www.geo.sbg.ac.at/projects/NODE/
HTTP://www.BOW.de/akademie/projekte.html
HTTP://www.BOW.de/akademie/login.html (use "GAST" account for testing DLS-6.6.x)
HTTP://www.GDI-SN.de
HTTP://www.EQUAL-DE.de/
HTTP://www.SACHSEN.de/de/wu/smwa/arbeit/esf/gi_equal/

Keywords: Awareness, CBT, Cross-Border-Communication, Distance-Learning-System, eContent, eGovernment, eLearning, Granularity, Learning Object, EQUAL, Gateway, Interoperability, Life-Long-Learning, MultiPoint-Of-Learning (MPOL), NODE, OpenGIS, OpenGOV, OpenLLL, Regional Tourism Network, Rural areas, SOKRATES, Sustainability, WBT.

Design and Implementation of DRM-based Digital Contents Distribution Server

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We have several kinds of DRM(Digital Rights Management) solutions which protect and control a content based on cryptography. The current technology of DRM focuses on the content management in the purchaser. It doesn't consider the content management in the other principles like creator, provider and distributor and doesn't provide the efficient environments of a content distribution. The currently developed DRM system supports a business model between distributor and purchaser. The progress of content production tools and technology causes everyone easily to produce contents. But, it is hard for someone to build an environment to distribute one's content to the market by oneself.

The European Commission- funded IMPRIMATUR project produced, through consensus between representatives drawn from a broad range of business sectors including rights holders, telecommunications companies, IP lawyers, and IT companies, a business architecture for rights management in an e-commerce trading environment. The IMPRIMATUR business model gives us conceptual framework for the development of electronic copyright management system.

In this paper, we propose a new digital content distribution system which processes a content and metadata with digital copyright management and provides an environment that anyone can easily distribute contents via internet. We group the role entities of the IMPRIMATUR business model into independent bodies which work and communicate in the business aspects. We define metadata to manage the information of content distribution and to communicate each others among the bodies. They are represented by XML to get a flexible and extensible structure. To make a content secure, the proposed system encrypts a content with an encryption key and packages it with metadata. To control the usage of the content, it uses a license which contains the encryption key and the usage rules which control the electronic rights management of the content. It makes on-line processing of all value-chain from creator to purchaser possible, compared with existing DRM products only supporting only limited distribution between distributor and purchaser.

New Technology Dimension of Land Management in The Integrated Administration and Control System for Common Agricultural Policy support

Cestmir KANTOR, Kamil PLACEK

Regional Medical-Ecological Mapping with the use of GIS Technoligies

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Medical-ecological mapping as a method for complex geographical research is based on study results of natural and territorial-industrial complexes as well as on the analysis of characteristic combinations of the environment factors effecting both positively and negatively on human health. Qualitative and quantitative indices of natural and anthropogenic prerequisites of human diseases are used as initial cartographic information and reveal the major components of geographical territory comfortness in geosystems of topological and regional levels. Their further interpretation makes possible to obtain integral characteristics under establishment of boundaries for natural habitats distinguished by different human diseases' prerequisites and current medical-ecological situations' parameters existing in the region. Such an approach explains spatial peculiarities of continuous state and discretion of defined counters within physical-geographic regions and provinces.

Substantiation of choice of basic, key and specialized cartographic bases is of great importance for making medical-ecological analysis. The bases mentioned above are meant for construction of medical-geographic and medical-ecological maps at the component, complex and classification (synthetic) levels. Maps of landscape structure, economic use of the territory, population density are referred to basic ones. Maps of total anthropogenic loads, pollutants, potential of natural self-purification of geosystems are considered to be key bases. This is because they serve as information-spatial basis for revealing the cause-and-effect relations between the environment quality and population health. Specialized bases are used to perform spatial analysis of nozogeographic status of territorial-industrial systems and some of their components.

The outlined approach was applied to Altai Krai and the coordinated series of maps for medical-ecological zoning of the territory, revealing of problem medical-ecological natural habitats, assessment of current medical-ecological situation, ranking the territory by levels of geographical comfortness was constructed. The obtained numerous features of the environment contain rather heterogeneous volumes of information. For prompt review, comparison analysis, links revealing, construction of new maps, tables, schemes and diagrams on the base of available data the constructed traditional series of maps was transformed into GIS version.

In deciding on software applying to the new geoinformation stage of investigations on medical-ecological situation in Altai Krai the emphasis was put on sufficiency of functional provision and the ease of use for specific practical tasks solution; as a result preference was given to ARC/INFO and ARCVIEW GIS packages.

As for now, the main cartographic material is a series of medical-ecological maps and schemes of Altai Krai constructed in IWEP SB RAS. The topographic map of

Altai Krai (scale:1:1000000) serves as a cartographic basis. Moreover, to perform complex analysis of medical-ecological situation maps of physical-geographical zoning, landscape structure, economic use and population density are used. In the first stage of GIS creation the attention was given to correspondence of information with different scale thematic maps characterized by polygonal or isoline method of information presentation that was achieved by contours superposition with further generalization. In the course of natural block maps correspondence it was taken into account that different components of the natural complex have specific features of geographical arrangement which are important under some problem-oriented investigations and, hence, their cartographic expression won't necessarily fully coincide on different maps. Even first application of computer technologies gave rather trustworthy integrated data, revealed not found earlier interrelations and interdependence under analysis of medical-ecological situation in Altai Krai.

The use of GIS technologies makes possible to carry out further research aimed at obtaining qualitatively new information on the present-day and predictable medical-ecological situation in Altai Krai.

Web services for environment e-society

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Web services are “self-contained, self-describing modular applications”. They constitute software modules that “describe a collection of operations that are network-accessible through standardised XML messaging”. A Web Service can be defined as a collection of functions that are packages as single entity and published to the network for use by other programs. Web Services are building block for creating open distributed systems, and allow companies and individuals to quickly and cheaply make their digital assets available world-wide. A Web service can aggregate with other Web services to provide a higher-level set of features. In my submission I will present technology of Web Services and I will focus on the exist web services, which are important for environment e-society. The scope of environmental web services is very wide. The most popular services are actual weather information or forecast weather. Useful can be use services for getting the actual air pollution, or for business application like waste stock. I will show where can reader find this services and I will present tools, which can be useful for accessing this services.

Application of ISDS[1] as Part of the GIS for Protected High Mountains Area Using Case Study of Czernowe Wierchy Massif (Tatra National Park, Poland)

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The study presents GIS for alpine type mountains of West Tatra, forming a part of national park and the biosphere reserve. Environmental data were gathered according to the proposed algorithm:

up-to-date and detailed field data – topographic map preparation – orthophotomap preparation – digital data modeling (TIN, GRID and others) – construction of integrated GIS.

To gather detailed input data which then formed the ground for further analysis, panchromatic and multispectral aerial photographs were utilized.

Next step was preparation of digital topographic map. Maps of this type are more detailed and not shaded by graphic elements. They can be utilized for further digital analysis.

Then orthophotomap was prepared, which is often regarded as the most up-to-date and carthometric source of data. The orthophotomap enables digital analysis of spatial phenomena and carthomeric measurements.

Data and maps were then used for commonly used TIN and GRID models which enables mapping of: slopes, relief, direction of surface flow and others. Those maps supplement the characteristic of research area and again form a ground for more detailed analysis. Topographic map, orthophotomap and digital models were used for supervised classification using maximum like-hood method.

Data gathered using digital analysis formed an input for GIS. As data were of different vector and raster formats their integration was necessary. “Shape” and “tif” were chosen as desired formats.

Data transfer possibility is an important feature of GIS. ISDS application, utilized here, enables fast Internet/Intranet access for unlimited number of users. Users are not required to use advanced software as CAD or desktop GIS.

Digital methods utilized here proved their high efficiency. Reaching most of the goals would be impossible, less objective or at least more difficult using traditional approach.

To summarize:

- the proposed algorithm for preparation of GIS comply with all necessary requirements and enables creation of a system based on detailed and the most up-to-date field data.
- presented way of GIS spatial data transfer and dissemination is effective and not complicated and therefore shall be utilized for environmental management of protected areas, national parks, and decision making support tool.

(Footnotes)

[1] Internet Spatial Data Server

Definition of fuzzygeoelements in raster representation for decision-making

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We are talking about information as economic product, i. e. as about commodity, in global criteria. Quality of information guard belongs to factors, which influences level and quality of company. Methods of work with information are changed in accordance with development of information and communication technologies (ICT).

Information systems are one of the basic assets in at present. Geographic information systems (GIS), which know to save, manipulate, analyze and make outputs of date supporting information about phenomenon on earth surface, assert oneself as part of information system from begin of nineteen's. GIS are used in forces, public administration, landscape management, hydrometeorology, and administration of technical nets. It is possible to say, IS are grand support in decision-making.

Decision-making is one of the most significant activities, which are executed by managers in organizations. The quality and results of these processes influence effective functioning and prosperity of organizations; it is the importance of decision-making. The quality of decision-making influences setting goals, quality of using information, level of exercise of the theory of decision, quality of solution decision problem, quality of object of decision.

Information plays important role in decision-making. We take decision problems as the processes of collection and transformation input date to output information including interpretation of information. Good interpretation of available information depends on opinion of decisioner. Human opinion is faithless very often. It is not changeable in cases, which we need intuition. An information technology supplies relevant information and helps in interpretation.

Decider puts into natural language, which makes possible to use vague terms. Every vague terms characterize specific kind of objects, and we can very difficulty define of border. If we use ICT for decision-making, we have to decider's deliverances to book by IT the most of accurate, because we need to use it. Decider cannot voice correctly with using two-value logic many times. There is a main problem to class border's elements to set or not to set in modeling on vague terms by classic sets. Mathematic apparatus exists, which can to model uncertainty, to some degree. Fuzzy set is the basic term as function from some set to interval <0;1>.

The goal of this article is to model of fuzzygeoelements (point, line, polygon) in raster representation, to define the basic topology and geometry, to describe analytic operation and to show on example the possibility of using in GIS for decision-making.

The hearth of this article is definition of terms: fuzzygeoelement, fuzzypoint, fuzzyline, fuzzypolygon; definition of geometry which is represented by coordinate and by distance of fuzzygeoelements; topologic property connectivity, neighborhood and conteining. There are modify the basic geo analyzes in this article. All is demonstrated on the examples of thematic mapping and precision agriculture.

It is the say in the end, that development of GIS, thanks by its strategic importance, has decision of governments of European union. We can see, GIS are decision-making in all levels of decision, from current citizen to government's decision. We can understand GIS as model of the specific part of reality. The more model keeps the necessary properties for us the better can to be more quality of decision-making. We can closely model of reality with fuzzy access and that GIS can by support of decision on higher quality level.

Keywords: Decision-making, Information, Data, Information and Communication Technology, Geographic Information Systems, Fuzzy Sets, Fuzzygeoelements

Design and Implementation of DRM Client for License-based Digital Content Distribution System

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In the process of electronic distribution of digital contents, cryptographic techniques are used to protect the content from unauthorized use. When encrypted content is downloaded into a user's computer and is being decrypted, all of the related keys must be present in the user's computer where malicious attacks and unpredicted exceptions frequently occur. We propose here architecture for DRM client running on our license-based content distribution system. Our design objectives are secure management of keys, flexible support of external viewers, and defensive facilities against malicious attacks.

Our system consists of four subsystems: secure data storage, file system filter driver, plug-in layer, and main controller. Secure data storage stores confidential information such as decryption keys, license, and hash value of each module, etc. File system filter driver decrypts encrypted content using keys stored in secure data storage. Plug-in layer controls external viewer program according to the license stored in secure data storage and handed over from main controller. Main controller receives license from license server and stores it in secure data storage. It reads and interprets license and encrypted content and other metadata, decides what DRM policy must be used, applies it to external viewer through plug-in layer, controls access of other client modules to the confidential information stored in the secure data storage.

Secure MP4 Streaming

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Changes in internet and network environment make it possible to provide high-quality content services in real time. As demand for digital content is increased, problems related to intellectual property rights are getting more important. Streaming service like video-on-demand solved this problem by preventing content from being saved. But, as the advent of several tools able to save streamed content, the streamed content is not free from these problems any more. So, with security countermeasure like access control, new technologies to control and manage rights for content are needed. One of the solutions is DRM.

MPEG-4 is a key technology for content streaming, which shows the highest quality both in wire and in wireless environment. In compared with other media type, stream service using MPEG-4 needs rather longer time to decode and play the content. That means the processing time of DRM must be minimized to guarantee the quality of the content. To satisfy this requirement, it is essential to analyze the effect of DRM on performance. Efficient encryption method can be decided from the result of the analysis.

In this paper, we propose a DRM-based streaming system which can not only protect streamed MPEG-4 content but be easily integrated with existing MPEG-4 streaming system. To protect MPEG-4 content more effectively and more securely, encryption should be considered on encoding phase and also stream server should be designed to support DRM. However that means it cannot support the existing MP4 streaming servers such as QuickTime streaming server. Our approach is to design a DRM system independent to the streaming server. More precisely, we encrypt MP4 files without breaking file format so that it can be sent by any MP4 streaming server. So, we use an encryption algorithm which can be applied to compressed MPEG-4. We evaluate a few MPEG video encryption algorithms, and describe a revised encryption algorithm for our system. We also make a performance test on the system, and then find an efficient encryption method.

Design of Track and Trace System with RFID Tag – The Track and Trace System of VIOLA e-Logistics Platform

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RFID tag logistics system will enhance the efficiency of logistics. In general, logistics system must satisfy distributors as well as consumers. Distributors need the system that can provide effective plan and the information to predict the future state. And consumers want to know the location of their goods ordered, state of product and the information like when to come, how long to wait, etc. Such information can be provided by data gathered every moment and every place of logistic process. So data sourcing, data consistency, and data continuity are the keys to the success of logistics system. But still yet, data sourcing is done by hand with scanner and bar codes, and data are neither consistent nor continuous. RFID tag is the alternative to such time consuming, inefficient operation. It has the chip with information, which is readable or writable by readers with antenna. Logistics system with RFID tag can provide all the information anywhere and anytime, and it will increase the efficiency of logistics and satisfaction of users.

World rank of industry development level

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Using the method of multidimensional classification the rank of the countries according to the level of industrial development, peculiarities of production and export of industrial products was enveloped. The world database on a dozen of indicators for different dates was carried out for all the countries.

Nature-GIS: A European thematic network for Protected Areas/ Nature Preservation and Geographical Information

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Nature conservation and protected habitats present complex problems. These range from environmental management and planning to social and economic issues and are addressed by numerous different organisations, interest groups and individuals from diverse cultural or technical backgrounds.

Many of these problems have a strong geographical element. However, the use of powerful new Geographic Information Systems (GIS) technology is often restricted because of a lack of understanding and communication between the GIS experts and the end users.

Nature-GIS is a Thematic Network aiming at bringing together different organisations operating in protected areas or nature conservation interested in Geographic Information and GIS.

A key goal Nature-GIS, then, is to bridge this gap by bringing specialists from different disciplines together, thus enabling the enormous potential of GIS to be applied in this crucial field.

The objectives of NATURE-GIS are to:

- increase European awareness about a more integrated approach to the use of GI in protected areas at a European level;
- support European policy development in the use of GI for nature conservation (in particular INSPIRE - Infrastructure for Spatial Information in Europe);
- contribute to INSPIRE specifications, through a user needs assessment as well as data modelling;
- investigate and test the feasibility of web access to distributed data in order to support the work of stakeholders of protected areas and nature conservation;

The creation of the Nature-GIS network will introduce a far broader perspective, and will enable key players and policy makers at all levels to have access to high-quality, comprehensive GI-GIS content. The effective sharing of information at local, national and international level will enable far more efficient and coordinated conservation initiatives and problem solving.

In this way, Nature-GIS will make a vital contribution to the EU's VI Environmental Action Plan, and will form a focal point for the exchange of information and the identification of specific GI-GIS requirements for promoting nature conservation and biodiversity across a whole range of EU policies and initiatives.

The project ungrounded of the assessment of:

- user needs, to characterise the stakeholders in the field, and to survey the scenarios of use of GI in this domain
- data requirements, to individuate and specify the common kernel of GI content to describe protected areas
- functional requirements, to identify the requirements for the management of Geo-Information and to define the framework for spatial databases for protected areas.

Results of the action:

- to produce Technical Guidelines for data infrastructures for protected areas to contribute to geo-data access and exchange through standardisation of data infrastructures for protected areas.
- to define and realise a web access to information on European protected areas.
- to disseminate the results towards the GIS and Nature Preservation communities. The networking and dissemination will be carried out at a national and at a European level to create a pan-European network for protected areas, the “Nature-GIS Group”, joining together the in this field, to further benefit the network of stakeholders.

Research on Image Processing and Classification of Mountain Soils in Southeast China

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It is followed with interest by soil geographer that soils are surveyed in remote sensing materials .It is not only key points but also forward position of soil remote sensing to map and distinguish TM materials automatically by GIS . The software used in the research are ARC/INFO and ENVI.

Basic information about the research area

The research area is located in Longyou county of Zhejiang province in the southeast of China(28°442 103 N^ÿ 29°172 153 N, 119°12 413 E^ÿ119°192 523 E), about 1726 Km2 of total area. Annual rainfall is 1671.6mm, annual evaporation is 960mm. The county is a river basin between high mountains in the north (peak point 940m) and the south (highest point 1438m), low plain in the middle only 50m high above sea-level. Vegetation-cover rate is 70-80% in the south ,50-55% in the north. the region grew a lot of pine ,fir ,cryptomeria ,Huangshan pine ,bamboo etc., also there are evergreen broadleaf forest, evergreen coniferous-broadleaf forest and fallen leaves coniferous-broadleaf forest . The area belongs to red soil zone and the mountain soil is yellow soil .

Remote sensing materials and technologies of processing & analyzing

Research Materials includes: TM (05/06/1997),1:50000 topographic map,1:50000 soil map,1:50000 administrative map,1:50000 rock map,1:50000 land using map .The maps were digitized by ARC/INFO .After edited, map's topology relation was created, and a coverage was formed .ARC/INFO interchange file was E00 , ENVI(image processing software) can transform E00 file into EVF file ,so a vector map and image could be overlay together , then images could be cut and analyzed easily .

Image Processing

Because of high land-cover rate it was difficult to discern soils directly from image. In the research, through technologies such as image processing ,composing model ,comparing method , the whole area was classified step by step not by remote-sensing materials but traditional maps. In the research, texture analysis and image classification were only suited to yellow soils of southeast China.

Image Classification technology

In the research, classification was suited to mountain yellow soil, which is mainstream soil type of LONGYOU mountain land with 600-1200M height. There is coniferous-broadleaf forest with high vegetation-cover rate. It could not get ideal result out of RS images, so the research designed many methods to improve classification accuracy .

Remote sensing classifications have two models: Supervised Classification and Unsupervised Classification. Supervised Classification has many ways : Parallelepiped ,Minimum Distance , Mahalanobis Distance ,Maximum Likelihood ,Spectral Angle Mapper ,Binary Encoding . Unsupervised Classification has Isodata ,K-Means . Image was divided into little parts according to elevation in order to improve its speed and accuracy before classification .

Result

3.1 When Spectral Angle Mapper was used for classification, the effect of texture processing was better than that of no processing, because processing improved image information through eliminating disorder verbose information, and involving the related information. This method was fit for soils and their evolution environment. Because Spectral Angle Mapper distinguished objects by spectrum types rather than by density of no-choosing absorbing, it could not distinguish these objects with similar spectrum types and great spectrum difference. What is more , Spectral Angle Mapper was slow in spectrum change in that classification area was large than its reality .

3.2 In the mountain of southeast ,soils were distributed with elevation (certain contour line is boundary of some soils).Other distance methods had relation with their dimensions without considering their connections. However, Mahalanobis Distance did not change during transformation, not affected by dimensions, considering the links. The result may meet practical requirement. For complicated landforms and enlarged area , Mahalanobis Distance may also gain ideal results through texture processing and adjusting max distance error .It was clear that a good visual image may not be suited to classify, but could be used as reference in comparing with result maps, such as (TM5/TM7)/(TM4/TM3) ,(TM5/TM4)/(TM3/TM1),TM1.

3.3 All better methods for soil classification had to draw support from vector map and material map. Because high vegetation-cover rate made monitoring difficult , soils should be discerned as typical section. At the beginning, some contour, material boundary etc. may be treated as temporary soil boundary, at last the boundary could be confirmed further according to the later results of computer classification.

Before research working, the author had ever been to Longyou county to survey field and built image symbols of naked fields ,treat them as typical sections ,try to obey gradually changing law of soils to find changing boundaries .The monitoring was finished finally by synthesizing technology supported by image and vector maps

The research is only suited to the southeast of China, where soils change obviously with elevation and component material. Through effectively image processing, soils could be discerned exactly. In a expanded research area with more complicated problems, Artificial Intelligence and DEM model have to be added for improving speed and accuracy, it will be developed as the significant monitoring method.

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Networking: Interdisciplinary GI Community Towards "Digital Hungary"

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The Hungarian interdisciplinary Association for Geographic Information was established in 1994 in order to pave the way for the Public-Private Partnership in the development of spatial data infrastructure for the benefit of all player of the market including the citizens. Hunagi plays active role also on the European and Global level of the SDI and its membership growth from 10 to 80 institutions/organisations/companies during the last ten years clearly shows the interest of the equally represented governmental, NGO, academic institutions and SMEs from the private sector.

The proven networking and information dissemination approach of HUNAGI is effectively contributes to the common understanding of the interdisciplinary community of the Association in trends, initiatives, and developments on international level. This is extremely helpful at the time of the EU accession, when unprecedented level of the interagency framework is a requirement and the temporally geo-referenced information plays fundamental role especially in the decision making procedures in planning, implementation and control of policies towards the information society.

Method of Potential and World Scale Models

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The main goals of the work are to show expediency of application of a potential method for analysis of the new information on distribution of the population, wealth, resources and obstacles (costs, social "illnesses" and so forth) of development, and, simultaneously, to use the method as a way of evident cartographical representation and visualization.

The work is devoted to the characteristics of gravitational models and the opportunities of a potential method. A lot of social and economic potentials of world scale are considered. A number of conclusions concerning the method of potentials itself and some characteristics displayed with its usage are made.

Integrated digital territory models for sustainable development

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Necessity of elimination of departmental information barriers, duplications of gathering of the spatial data, their effective utilization have resulted in realization of some national and international regional spatial data infrastructures (SDI). SDI may form a reliable basis of integrated digital territory models that are necessary for realization of any models of sustainable development for these territories. First of all, these are the digital model of territory considered as virtually-realistic model, supplemented with the set of the ordered remote sensing materials and with a number of thematic layers, socio-demographic, economic, ecologic etc.

The attempt of realization of this idea is carried out within the framework of information system "Sustainable development of Russia" developed in the Moscow State University and, in particular, on the example of one of its branches for Khanti-Mansijsky autonomous province. The purpose of the project is the elaboration of scripts of development not only for Khanti-Mansijsky autonomous province, but also for connecting it transport-infrastructural zones or corridors. For example, the branches of oil pipelines are equipped so, that around them some infrastructural corridor is formed, which allows the population to live along it, to serve its functioning, to keep up its safety etc. But thus, within the boundaries of a corridor the forms of traditional wildlife are not broken, traditions and customs of the population are taken into account, risks of probable failures for the population and environment are minimized. The intellectual geoinformation systems solve similar problems, being focused on complex problems of sustainable development of territories. On the other hand, such systems remind also the atlas realized in SDI environment that gives them a set of additional opportunities for practical implementing, for example, by development of scripts of the future development of territories, consideration of alternative variants of their development etc.

Dominance of building of Ukrainian transport corridors on global Ukraine map

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Research On Multi-sensor Remote Sensing Data for Archaeological Sites in Deserts of China

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Remote sensing for archaeological research is a technique of acquiring the spatial information related to ancient culture and remains in multi-spectrum, multi-resolutions and multi-scales, and is a facet of specific fields in Digital Earth. Remote Sensing Archaeology in China recently has paid great attention, which is embodied by the establishment of a Joint Laboratory of Remote Sensing Archaeology affiliated to the Chinese Academy of Sciences, the Ministry of Education, and the National Bureau of Cultural Relics. Some remote sensing archaeology works have been conducted since the establishment of JLRSA in 1999. Research on archaeological sites in desert areas is a main task of JLRSA, therefore, we have conducted multi-sensor remote sensing data investigation for Tong-Wan-Cheng site in north of Shaanxi provinces, which was a historic remain existed in 419 to 994 and now is buried partly by moving sands from Maowusu desert. The dataset used was SIR-C/X-SAR, Landsat ETM, SPOT, Quickbird, and airphoto images, which provide multi-spectral, multi-scale, optical and radar information for the same site. The study includes the environmental, historical analysis for the ruined palace, such as palaeo-drainages surrounding the palace, and the influence of desert on the environment, as well as enhancement technique for extracting the historical features of the ruin from images. The study was also made for extracting the Great Wall information in desert environment from above mentioned image data, as well as Lou Lan ruin of Lop Nur area on the silk road in Xinjiang province. This paper will present some results of remote sensing applications in the research of archaeological sites in desert areas of China.

WORKSHOPS

Standards for Enabling International Interoperability: The responses of ISO, OGC, and GIS vendors

Enabling successful global interoperability is based upon common international standards. This seminar begins with an overview of the roles and significance of the International Organization for Standardization (ISO) and OpenGIS Consortium (OGC). Enabling interoperability through implementations by GIS vendors will include presentations and demonstrations on the Web Map Server (WMS) & Web Feature Server (WFS), Geography Markup Language (GML), and Metadata standards.

Co-sponsored by ISO/TC 211 Geographic information / Geomatics and the OpenGIS Consortium (OGC)

Standards Workshop Convenor: Henry TOM (Co-Chair, Advisory Group on Outreach, ISO/TC 211 Geographic information / Geomatics)

Standards Workshop Programme

Standards for Enabling International Interoperability

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ISO Metadata Standard - Overview and demonstration

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Geography Markup Language (GML) - Overview and demonstration

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Web Map Server (WMS) & Web Feature Server (WFS) - Overview and demonstration

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Intergraph Inputs to Interoperability - Overview and demonstration

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As geographic information systems (GIS) move increasingly into mainstream information technology (IT), embracing open standards becomes more and more important. With Spatial Data Infrastructure projects high on local, regional, and national government agenda, open technology will be a key factor in building a solid, interoperable infrastructure management system. As a founding member of the OpenGIS Consortium (OGC) and the only GIS vendor at the strategic membership level, Intergraph has always been committed to open standards. This paper outlines the concept of interoperability, discusses ongoing customer projects leveraging open technology, summarizes the benefits for individual organizations and the economy, and charts Intergraph's vision for the future.

ESRI - Workshop: Vision for the Emerging Digital Earth; Technical Approaches

Jeanne FOUST

David DANKO

John CALKINS

PRESENTATIONS of COMPANIES

With annual sales of more than $469 million, ESRI has been the world leader in the geographic information system (GIS) software industry for more than 30 years. Additionally, ESRI provides powerful GIS solutions to more than 300,000 clients in more than 220 countries. Headquartered in Redlands, California, ESRI has regional offices throughout the United States, several subsidiary companies overseas, and more than 1,500 industry leaders and business partners who work with ESRI to provide software, data, and hardware that complement ESRI's suite of GIS software. Working with location information, ESRI's GIS software and solutions give you the power to solve problems you encounter every day. Organizations around the world, as well as local, state, and federal government agencies, are using ESRI GIS software to make smart and timely decisions.

As the leader in GIS technology, ESRI offers innovative solutions that will help you create, visualize, analyze, and present information better and more clearly. ESRI software is built on standard and open information technology and has been designed to operate with all-relational database management systems. ESRI's software is developed with open development tools, and our software is built on new, modern, object-component software standards that are easily customized and embedded for a wide range of application needs.

ArcGIS is a family of software products that form a complete GIS built on industry standards that provide exceptional, yet easy to use, capabilities right out of the box. ArcGIS is a complete, single, integrated system for geographic data creation, management, integration, and analysis.

Much more than a specialized offering for a small niche of specialists, ArcGIS is designed as a scalable system that can be deployed in every organization, from an individual desktop to a globally distributed network of people.

ArcGIS provides flexibility when configuring a system since it is modular and scalable. It is modular in the sense that you acquire the system in pieces.

ArcReader is a free, easy-to-use product that allows anyone to view, explore, and print published map files.

ArcView includes all the functionality of ArcReader and provides data visualization, query, analysis, and integration capabilities along with the ability to create and edit simple geographic features.

ArcEditor includes all the functionality of ArcView and adds the power to create and edit features in a multiuser geodatabase.

ArcInfo includes all the functionality of ArcEditor and adds advanced geoprocessing capabilities.

ArcGIS Desktop Products			
ArcReader View maps Print maps Identify Find, measure, and hyperlink	**ArcView** ArcReader **plus** Data access Mapping Customization Spatial query Simple feature editing	**ArcEditor** ArcView **plus** Geodatabase editing Topology	**ArcInfo** ArcEditor **plus** Advanced geoprocessing Data conversion Workstation

ArcSDE is an application server that facilitates storing and managing spatial data (raster, vector, and survey) in a DBMS and makes the data available to many kinds of applications.

ArcIMS provides the foundation for distributing high-end geographic information systems (GIS) and mapping services via the Internet.

ArcPad software is mobile mapping and geographic information system (GIS) technology.

ArcGIS is scalable since it can be deployed on an individual desktop or across a globally distributed network of people.

Built out of modern object-based components, the range of software programs share the same core applications, user interface, and operating concepts. After you learn one, you'll easily understand how to use the others. If you extend one, your custom tool or application just works with the others. This makes it easier to learn, teach, program, and produce maps. In summary, ArcGIS is a robust platform built on an architecture that will be the foundation of ESRI software for years to come.

ESRI's comprehensive product line ranges from desktop GIS to GIS for the enterprise—and our Internet software revolutionizes the way users can access and interact with Internet mapping and GIS data and to deliver web-based GIS services – the foundation for a worldwide spatial data infrastructure.

ESRI will continue to lead the world in providing GIS technology, which will allow the vision of the Digital Earth to become a reality.

Look to ESRI for GIS solutions to help unlock the spatial component of your valuable data and see your organization's information from a new perspective.

www.esri.com

A proven industry leader, Intergraph Mapping and Geospatial Solutions provides products and services, open technology and data integration, and partners and people to help customers implement successful geospatial information-based solutions, which can be deployed on the desktop, the Web, or with mobile technology. Customers across the globe include local, regional, and national government entities; transportation and mapping agencies; utilities and communications companies; photogrammetry organizations; the military; educational institutions; and more.

Broadening our horizons

The past year has been one of transformation and expansion for Intergraph Mapping and Geospatial Solutions. We have created a dynamic synergy with the merger of Intergraph Utilities & Communications as well as the acquisition of 100 percent interest in Z/I Imaging, making it a wholly owned subsidiary. Our solutions and services now highlight a very broad range of dealings - including mobile mapping, network analysis, outage management, workflow management, data capture, geospatial resource management, and more. To accentuate this growth, we have changed our name from Intergraph Mapping and GIS Solutions to Intergraph Mapping and Geospatial Solutions, embracing the full range of capabilities and emphasizing the company's solutions focus.

New additions enhance services, advance product offerings

Z/I Imaging, formerly a joint venture between Intergraph and the Carl Zeiss Group, is a world leader in the earth imaging industry, offering solutions for the acquisition, exploitation, management, and distribution of imagery. These solutions include aerial cameras, photogrammetric scanners, stereo workstations, and image management, processing, and distribution software. Z/I Imaging brings to the commercial imaging market the world's only large-format, high-resolution digital camera. The Digital Mapping Camera (DMC) features breakthrough technologies, enabling successful projects from small-scale mapping operations to precision, high-resolution corridor engineering projects. The imaging software includes TerraShare as the foundation of the enterprise system that combines the power of a client/server image management and distribution system with a high-performance imaging engine that offers individual modules for photogrammetric production, managing orthophotos on the users' GIS and CAD desktops, collaborative production, Internet distribution, and more.

The Utilities & Communications (U&C) Division serves investor-owned, public, and national companies that deliver and manage communications, electric, gas, pipeline, and water/wastewater services. In the face of challenges such as deregulation, mergers, acquisitions, and heightened competition, InService provides a fully integrated solution in a single application environment that is flexible enough to manage a broad range of tasks. U&C's tightly integrated engineering and operational applications include a robust geographic information system based on industry best practices, full-function computer-aided dispatch, and state-of-the-art outage and

mobile workforce management. These solutions result in lower total cost of ownership because, while they can be used as standard off-the-shelf products, they are highly configurable to meet individual customer requirements.

The power of wireless

IntelliWhere™ a division of Intergraph Mapping and Geospatial Solutions, addresses the emerging technologies of wireless Internet and location-based services (LBS). This division's products leverage GeoMedia technology to provide LBS solutions that are device and data independent. IntelliWhere focuses on enterprises with mobile workforces in markets such as transportation, state and local government, telecommunications, utilities, the military, and emergency response.

Industry-leading solutions enable enterprise goals

Intergraph Mapping and Geospatial Solutions has a solid foundation in the industries we serve and build our success on providing solutions accordingly, with a combination of open technology, enterprise implementation, and consulting services. Our customers want more than out-of-the-box solutions. We strive to be a business partner, helping make sound decisions that will increase our customers' efficiency while improving their business. Intergraph Mapping and Geospatial Solutions understands the business challenges customers face on a daily basis. Our unique combination of innovative technology and comprehensive professional services make us the leading provider of industry-specific solutions for:

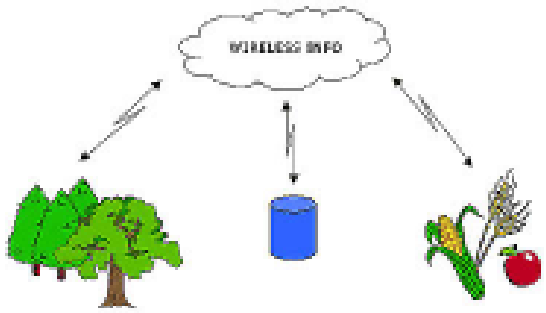
Proven technology provides the foundation

Central to our innovative solutions is Intergraph Mapping and Geospatial Solutions' industry-proven mapping and geospatial technology, including the GeoMedia®, Digital Cartographic Studio® (DCS), Modular GIS Environment (MGE), G/Technology, FRAMME™ InService™ and TerraShare™platforms.

We continue to be committed to open systems solutions and data interoperability. As a founding and principal member of the Open GIS Consortium (OGC), Intergraph Mapping and Geospatial Solutions is a visible force in ongoing OGC initiatives for industry standards and spearheads interoperability in the GIS and IT marketplace.

Professional services

The Intergraph Mapping and Geospatial Solutions professional services team provides quality-consulting services to implement state-of-the-art mapping and geospatial technologies and tools. These services enable clients to increase the efficiency of their operations while reducing their costs, thereby maximizing the value of their investments. Our experienced team delivers professional services that include system integration, consulting, project services, and implementation.



WirelessInfo is registered association of eight partners, including SMEs, Agriculture Industry and University. This association was formed by members of WirelessInfo project IS (which already successfully finished its work), to continue in research activities and sharing knowledge. The current research team was focused mainly on application of mobile technologies in rural regions, The association share expertise of partners and cover large range of activities (Research and development Masaryk University, Lesprojekt, system integration, Help Service Remote Sensing, Lesprojekt, Sysnet), application development { Help Service Remote Sensing, Lesprojekt, Sysnet), Education HSE, Lesprojekt, MJM), harware designer (ICE) consultancy and services (MJM), end user (MJM). The partners have experience from many projects related to e rural development.

WirelessInfo project

The WirelessInfo project was a part of Key Action IV.5 Mobile and personal communications and systems, including satellite-related systems and services. The WirelessInfo project was trials project, so the intention was to introduce newest results of research and technological development into new applications areas. There were demonstrated new technologies and new practical solutions for agriculture, forestry, water management, land management, rural development, and environment protection practices. The whole project was oriented on the connection of GIS systems (including GPS technologies, remote sensing, photogrammetry, 3D modelling) with wireless communication based on utilisation of 2G and 2.5G networks (GSM, GPRS, HSDCS). The main objective was exploitation of wireless communication for the both side data transport (server - terrain, terrain - server) has to short down a time between data collection and data processing. The main communication platform was Mobile Internet. Such solution offers multimodal data access (computer - computer, computer - human, human – computer, computer – machine, machine computer). The technological trials was:

- To design and implement Mobile Internet GIS system for agriculture, forestry, water management, land management, rural development, and environment protection

- To design and implement solution for remote wireless data management for agriculture, forestry, water management, land management, rural development, and environment protection

- To design and implement the wireless access to distributed data (Web Mapping Services) sources for agriculture, forestry, water management, land management, rural development, and environment protection

- To design and implemented Mobile Web Analytical Services (remote sensing, statistic, 3D modelling) for agriculture, forestry, water management, land man-

agement, rural development, and environment protection

- To design a special wireless field terminals for the purpose for agriculture, forestry, water management, land management, rural development, and environment protection

Premathmod

Premathmod project is focused on improving methods of data access and statistical data analysis in process of precision farming. Important part of the project is increasing awareness of new technology. The publishing of results and learning of the farmer is realised in project. Important part of the project is also dissemination of the results and education of farmer.

The basic principle of precision farming technology is an exact positional controlling of fertilisation with accuracy of few meters. The whole process requires a big amount of data to be collected, which enable controlling of the whole process. Among the partners, data exist from measuring provided from the past ten years. For better understanding, to all this process is necessary to improve access to this data and make analysis of this data. Mathematical analysis of this data can bring new quality to the whole process of precision farming. The real end-user of the technology is farmers and agriculture managers. The limitation of their better utilisation of data, Unfortunately, their limited knowledge of the new technology of precision farming limits a better utilisation of this data and the possibility of using of new data sources. For this reason and in the connection with building of system for better data access, the simultaneous education of managers and farmers will be provided. The distance learning methods will be used.

REGEO

REGEO system provides information finding and filtering methods for a restricted domain, .for prospective tourists that may travel in a certain region and are looking for all kinds of information, such as hotels, leisure activities, sightseeing, etc. The information is not stored in single database or in a single server. There exist virtual geodatabase with data in different formats. The information agent must gather information that is stored on many different web servers, in the form of GIS, multimedia data, database, etc. This context/user interest is crucial in defining why a user seeks for the information. Information seeking can be a time intensive and cognitively demanding task.. We are interested in building an interface agent that proactively and adaptively assists the users in a knowledge discovery and retrieval tourist

AFORO

The objective of the AFORO Thematic Network is to provide the EU and NAS scientific, industrial and technology community with a vision of the key actions and an implementation model to overcome the existing gap and enable, within the next five to ten years, the full participation of Agri-food industries into the digital economy.

The 3rd International Symposium on Digital Earth

Digital Earth - Information Resources for Global Sustainability
Knowledge, Networks, Technology, Economy, Society, Natural and Human, Resources, Policy, Strategy

PROCEEDINGS

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