InDOG

Second InDOG Doctoral Conference

Proceedings of Abstracts

October 14 - 16, 2013

Olomouc

DEPARTMENT OF GEOINFORMATICS
Palacký University in Olomouc

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The Second InDOG doctoral conference in Olomouc is a part of the project led by the Department of Geoinformatics, Faculty of Science, Palacký University in Olomouc. The conference is now convened and the next is planned in 2015.

The InDOG doctoral conference is unique. Doctoral students who are in the process of completing their theses are invited to submit papers for presentation to a group of academics with special expertise in the topics they are assigned.

The conference aims to provide the students with an assessment of their presentational skills and a constructive critique of their research by a group of peers and senior academics. It is also an opportunity to access a wider academic network and the postgraduate job market.

The conference is made possible each year by the support of the Dept. of Geoinformatics and the public and business sectors.

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Olomouc: A university city

Olomouc has always been among the most prominent medieval cities of the Czech lands. For centuries, its good geographical location, its university with a long tradition, its culture and crafts have made it a natural centre of Moravia, attractive to artists, intellectuals and merchants alike. Nowadays, Olomouc is the main city of the Olomouc Region and has over 100,000 inhabitants, which makes it the fifth biggest city in the Czech Republic. After Prague it is the second biggest historical area in the country, with its old university, Archbishopric, Moravian Philharmony, many interesting museums and theatres, vast parks and a zoo.
Olomouc has been known as a university city for centuries. It is a city full of young people that offers cultural and sports events and life in an attractive region with a low cost of living.

Palacký University in Olomouc

The Czech Republic offers a wide and varied choice of colleges and universities. If you look for high quality teachers, a wide range of study programmes, a stable scientific research base or renowned experts, you do not have to go far. In the historic atmosphere of the city of Olomouc you will find Palacký University – clearly the best choice, not only for students, but also for foreign guests, top researchers and prominent institutions and companies.

The Palacký University draws on a long tradition. It was founded in the 16th century and is the second oldest university in the Czech Republic. It has become a modern educational institution that offers a wide range of study programmes and engages in a variety of research activities. Its eight faculties are attended by 23,000 students – more than a fifth of the city's number of inhabitants. Its prestige among other universities has been repeatedly confirmed by the keen interest, not only of young applicants, but also of a high number of professionals. The demand has been so high that it far exceeds the capacity of our study programmes.

Palacký University is a research university. Promotion and development of science and research stand at the heart of its priorities. Research teams as well as students working on varied research projects can count on state-of-the-art technology. Thanks to the university projects the city has, in recent years acquired new research centres of national and international importance. Modern laboratories and other research possibilities provided by these centres make them attractive for researchers and universities from abroad.

Department of Geoinformatics

The Department of Geoinformatics was founded in 2001. The roots of geoinformatics at Palacký University can be traced back to 1989, to the Department of Geography. Nowadays, the Department of Geoinformatics is a separate academic department that offers high quality education and research.

It is renowned both nationally and internationally. The main fields are geoinformatics and geoinformation technologies in education and research, and their promotion, both in the Czech Republic and abroad. Its activities encompass teaching in the field of geoinformatics with special emphasis on geographical aspects, research projects that follow international trends and the promotion of modern geoinformation technologies in all spheres of Czech society.

The Department owns two specialised laboratories for geoinformation systems and remote sensing and one research laboratory for the eye-tracking technique in cartography. It uses state-of-the-art equipment and software. Its teaching activities are accompanied by cooperation with prominent national commercial companies in the field as well as renowned foreign universities.

The teachers do their best to react to the individual needs of students of bachelor, master and doctoral programmes, enabling them to take part in research projects, to work and gain experience in commercial companies and to excel in national specialised student contests.

PhD course in Geoinformatics & Cartography

Since the establishment of PhD course in Geoinformatics & Cartography at Palacký University in Olomouc in 2004 the department has focused thesis, publications and other activities of PhD students on three research fields:

Spatial modelling of geographical phenomena in GIS

- modelling of natural phenomena – statistical modelling of hazards (landslides, floods, fires, destructive winds, wind breakages)
- modelling of urbanization processes – suburbanization, urbanization, urban growth, regional development scenarios, spatial structure of cities
- geostatistics in transport – research, processing and analysis of data from traffic census and monitoring, analysis of data from automatic data collection from the transport network, etc.
- environmental statistics – statistical analysis of records or field research data
- analysis of surveys – socioeconomic surveys, selective surveys and analysis of categorical data

Digital cartography

- production of thematic atlases
- synthetic map-making and map-use
- usability evaluation of map reading
- geovisualization on the web

Remote monitoring of landscape

- small format landscape photography with visible and near infrared spectral resolution (using the DRONE PIXY paraglider model)
- continuous monitoring of abiotic factors using sensor networks, telemetry stations and single- or multi-function data loggers,
- identification and analysis of landscape structure with the use of GIT
- creation and analysis of records

Scientific Council of the study Geoinformatics & Cartography

prof. dr. Vít Voženílek – Palacký University, Olomouc
- Geovisualization in geoinformation technologies
- Modelling and simulation of spatial phenomena

prof. dr. Václav Snášel – Technical University of Ostrava
- Document-graphical information systems
- Data compression

assoc. prof. dr. Jaromír Kaňok – Palacký University, Olomouc
- Cartographical semiology
- Cartographical research methods

assoc. prof. dr. Jiří Dvorský – Palacký University, Olomouc
- Object-oriented technologies

prof. dr. dr. hab. Jan Andres – Palacký University, Olomouc
- Mathematical modelling of dynamic systems

prof. dr. Radomír Halaš – Palacký University, Olomouc
- Geometry of spatial phenomenon description

assoc. prof. dr. Lenka Motyčková – Palacký University, Olomouc
- Theoretical fundaments of computer networks

assoc. prof. dr. Jana Talašová – Palacký University, Olomouc
- Fuzzy sets and their applications

prof. dr. Bohuslav Veverka – Czech Technical University in Prague
- Digital cartography
- Topographical mapping

prof. dr. Ján Tuček – Technical University in Zvolen (Slovakia)
- Decision spatial support systems

prof. dr. Milan Konečný – Masaryk University, Brno
- National spatial data infrastructures

assoc. prof. dr. Jaromír Kolejka – Masaryk University, Brno
- Geoinformatics methods of remote monitoring of landscape
- GI technologies in environment management

assoc. prof. dr. Ján Feranec – Slovak Academy of Science, Bratislava (Slovakia)

- Mapping of landscape and its changes by Earth remote sensing

assoc. prof. dr. Jakub Langhammer – Charles University in Prague

- Flood risk modelling

assoc. prof. dr. Jiří Horák – Technical University of Ostrava

- Spatial data analyses
- Planning and design in GI technologies

assoc. prof. dr. Jan Kolář – Charles University in Prague

- Theory, analysis and interpretation of radar data

prof. dr. Jaroslav Hofierka – University of Prešov in Prešov (Slovakia)

- Programming for open-source GIS

Menno-Jan Kraak

Professor Menno-Jan Kraak has a PhD degree in Cartography of Delft Technical University. In 1996 he started at ITC as professor in Geovisual Analytics and Cartography (University of Twente). In addition he was appointed as professor in New visualization techniques in Cartography at Department of GeoSciences, Utrecht University between 1998 and 2010. Currently he is head of ITC's Geo-Information Processing Department.

He wrote more than 200 publications on cartography and GIS. His most visible publications are three books on aspect of cartography: Cartography, visualization of geospatial data (with Ormeling), Webcartography, developments and prospects, and Exploring Geovisualization (edited with Dykes and MacEachren). A new book titled 'Mapping time, illustrated by Minard's map of Napoleon's invasion into Russia 1812' will be published by ESRI Press in 2014.

He is a member of the editorial board of several international journals in the field of Cartography and GIScience (The Cartographic journal, Journal of Maps, Cartographica, Cartography and Geographical Information Sciences International Journal of Applied Earth Observation and Geoinformation).

He has been board member and president of the Netherlands Cartographic Society and of the Society Geo-Information Netherlands (GIN).

He is active in the International Cartographic Association as Vice-President since 2007, as National Delegate and has been (co-)chair of the Commission on Visualization and Virtual Environments (1995-2007).

In the Netherlands he is chair of the board of GIMA, chair of the Foundation Scientific Atlas of the Netherlands; was member of the Academic advisory Council of research program 'Ruimte voor Geoinformatie'(2006-2010).

He is Principle Investigator of the ITC research program Spatio-Temporal Analytics, Maps and Processing (STAMP) and member of the Twente Graduate School.
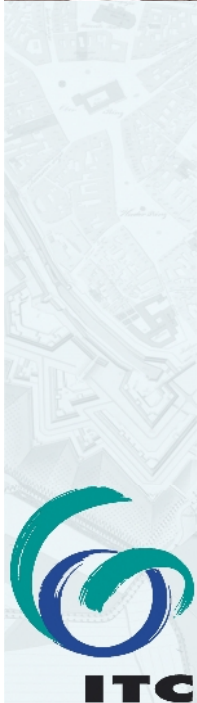
Itzhak Benenson

Itzhak Benenson was born in Yekaterinburg, Russia. After graduating from the Department of Mathematics of the Urals State University, he joined the Institute of Plant and Animal Ecology of the USSR Academy of Sciences where he specialized in ecological modelling and population genetics. His research in mathematical ecology combined theoretical and applied aspects of the ecosystem dynamics, as well as environmental problems that he studied as a deputy head of the Division of Applied Ecology.

From 1991, Itzhak is at the Department of Geography and Human Environment of the Tel-Aviv University, where he is a full professor and a head of the Geosimulation and Spatial Analysis lab. His research interests focus on the analysis and modelling of the complex spatial human-driven systems, and his favourite field is Geosimulation – high-resolution spatially explicit agent-based simulation of the socio-economic geographic systems with the applications in transportation, land-use dynamics and planning.

Itzhak Benenson is a co-editor of a Springer book-series, thematic editor of the URISA journal and a member of the editorial board of several scientific journals. He published more than 100 research paper and several books, including recent Automata-Based Modeling of Urban Phenomena and Advanced Geosimulation Models.

Terje Midtbø

Terje Midtbø is professor in cartography at the Norwegian university of Science and Technology in Trondheim and has for many years been working with education and research within Geographical Information Science and Cartography. In his work he has interests within data structures for terrain modelling, cartographic visualization, methods for distribution of geographic information on the Internet and handling of geographic phenomena which includes a temporal component.

The last years he has, for one thing, studied map animations and how these can improve the communication of map information. Web and mobile phone based experiments have been developed for this research. He has also focused on cartographic visualization of indoor environment.

He is leader of the education and research group at the Norwegian Association for Geomatics and Geographic Information Science (GeoForum).

Jan Brus

Jan Brus is an assistant, researcher and the project manager at the Department of Geoinformatics Palacký University in Olomouc. His professional skills are cartography, visualisation and environmental geoinformatics. His research is focused on uncertainty visualisation, cognitive aspects, perception and eye-tracking in visualisation of environmental data. He completed several short-term research internships in Norway, Iceland and Finland during his Ph.D. studies. He is a member of ICA Commission on Cognitive Visualization and a member of the Czech Cartography Society and Czech Geography Society. His Ph.D. thesis was focused on the uncertainty visualisations in environmental studies.

User study for representing the spatial data uncertainty in land cover maps with use of intrinsic and extrinsic methods

Paper presents a study focused on spatial data uncertainty visualization. The whole experiment is framed from typology and techniques for visualisation the elements of spatial data quality presented as uncertainty visualisation. The paper presents a user study that evaluates the perception of uncertainty visualisation presented by cartographical methods based on most commonly used intrinsic and extrinsic methods for displaying uncertainty in spatial data. The study uses data that were designed to represent the uncertainty connected with space, time and attribute components. Experiment was focused on intuitiveness of several visualisation techniques and also based on user preferences. Several cartographical methods were presented with aim to find user strategy in reading this kind of spatial information. Performance within the context of the usability assessment in this research was measured by eye-tracking metrics with help of video recording. Measurement of correspondence between their performance and preferences were analysed. Finally the most suitable uncertainty visualisation method(s) were derived and experiments results should help to determine the most suitable uncertainty visualisation method(s) for selected domain.

Alžběta Brychtová

Alžběta Brychtová is a PhD student and junior research assistant at Palacký University in Olomouc. Her professional skills and interests in cartography are cognitive aspects, usability studies and eye-tracking which are fully reflected in her dissertation thesis on the evaluation of colour distance influence on the map legibility. During 2012 and 2013 she spent four months at ETH Zurich and Zurich University, where she established a scientific cooperation. She is a member of ICA Commission on Cognitive Visualization and a member of the Czech Cartographic Society.

Color distance on choropleth maps

The contribution is aimed at investigation of colour distance influence on maps interpretation. The author describes methods of measuring colour distance and results of related research. The research was designed to uncover the influence of the colour and spatial distance on the legibility of the spatial information encoded in the choropleth map. Participants of the experiment were asked to state whether two or three selected areas are of the same colour value or not.

The research was based on results of web survey and eye-tracking experiment. Experimental stimuli covered five levels of colour distance (E00= 2, 4, 6, 8 and 10) and three levels of spatial distance between compared areas. The colour distance was determined by the method CIEDE2000.

Fundamental evaluation was done based on the analysis of correctness of answers and time to correct answers. Furthermore eye-tracking metrics and scanpaths of respondents were analysed. Research partially proved that increasing colour distance has an influence on increasing ability of users to interpret correctly the choropleth maps.

Jan Caha

Jan Caha is a PhD student at Palacký University in Olomouc. His interests and skills are programming, especially using Java, Open Source technologies, GIS and Fuzzy theory with special focus on Fuzzy Arithmetics. The main aim of his dissertation is management of uncertainty in surface analysis by means of fuzzy theory. The most recent topic of his research is the use of Possibility theory in GIS and its impact on decision making. His favourite free times activities are jogging, rock climbing and other sports. He likes fantasy and sci-fi literature as well as movies and loud punk-rock music. One of his favourite quotes is by Linus Torvalds: "Theory and practice sometimes clash. And when that happens, theory loses. Every single time.".

Visibility Analysis on Uncertain Surfaces

Analysis of visibility is a type of analysis that is very sensitive to the precision and/or uncertainty of the surface on which it is calculated. There has been some research regarding construction of so called Possible and Fuzzy Viewshed. Both mentioned viewsheds can be regarded as probabilistic approximations to the solution of the problem of visibility analysis calculated directly from Fuzzy surface. Such calculation requites use of Possibility theory to rank Fuzzy numbers. The main aim of the article is to present the algorithm for calculation of Possibilistic Visibilty. Results of such analysis are possibly visible areas, which shows optimistic variant of visibility, and necessary visible areas, that represents pessimistic variant of visibility on the Fuzzy Surface. Difference between values of possibility and necessity on each cell of the grid can be used to specify amount of uncertainty at this point. The results of the presented analysis can be except the obvious use for assessing visibility also used for identification of areas where additional data gathering would be useful to reduce uncertainty.

Vendula Hejlová

Vendula Hejlová is a PhD student at the Department of Geoinformatics at Palacký University in Olomouc. Her scientific interests cover the areas of wireless sensor networks for environmental monitoring, their usage for collecting data in the field, hydrological and soil erosion modelling. The main aim of her dissertation thesis is to design, install and operate a wireless sensor network for collecting data about basic meteorological elements and the amount of the air pollutants in the centre of Olomouc city.

Wireless sensor network components for monitoring air pollution in the urban environment: criteria and analysis of its selection

Wireless sensor networks are a new fast evolving technology that has been successfully applied to the monitoring of selected phenomena in the wide range of fields interventing to the socioeconomic and enviromental domain. The wireless sensor network consists of three main components which include nodes with integrated sensor boards/sensors, gateway and server which is used for the long term data storage. Each wireless sensor network is determined by the aims of its building, usage and localization. The presentation is focused on criteria and their parametres for the selection of the wireless sensor network components for the air pollution monitoring in the centre of the Olomouc city. The specific requirements for nodes were chosen according to the demands which are put on the outdoor wireless sensor network components for the air pollution monitoring in the urban environment. Each criterion has its own importance because there are more and less important ones. Finally, the most suitable parameters of criteria for the monitoring in the Olomouc city will be defined.

Zbyněk Janoška

Zbyněk Janoška is a PhD candidate at Palacky University in Olomouc and is currently employed as a GIS analyst for the Transport Research Centre. His research focuses on spatial data analysis in transportation studies, mainly on spatial clustering and black spot identification. Other research topics include bycicle use analysis and data mining methods for spatial data. In his thesis he develops innovative application of P systems in transportation modelling and simulation.

P Systems for Passenger Flow Simulation

This paper proposes variant of P system for passenger flow modelling in transportation networks. Mobile membranes are used as vehicles, which enable transportation of passengers within the network. Performance of the system is shown on four examples, which examine the queuing mechanisms and queue propagation in transportation networks. Two simulations use artificial networks and differ in determination of destinations for passengers, other two simulations use Prague metro transportation network with current train schedules and real passenger flow data. Observed behaviour in tested networks shows, that queues do not transfer to other parts of network on transfer stations, however this behaviour should not be generalized. Proposed model is robust and can be a valuable tool for transportation modelling.

Lukáš Marek

Lukáš Marek is a Ph.D. candidate of Geoinformatics & Cartography at the Department of Geoinformatics, Palacky University in Olomouc. His scientific interests cover mainly areas of spatial analyses and modelling, spatial statistics and application of computational methods on spatial data. His dissertation thesis is aimed at the applications of above-mentioned fields in health data. He completed the short-term research internships in Trondheim, Beograd, Kraków and Bergen. Beside his research activities, he is co-founder and editor of the web based journal GISportal.cz.

Spatial Clustering and Multivariate Statistics in Analysis of Infectious Diseases

An evaluation of spatial patterns and a clustering play an important role among methods of spatial statistics. However, traditional clustering techniques are seldom suitable for analyses of spatial data and patterns because they usually do not count on spatial relations and qualities of objects. This paper aims to introduce usage of methods of spatial clustering estimation, which are based mainly on the position of events and not only on the events attribute space. Firstly, the methods of the spatial clustering and randomness estimation are introduced and applied on a real dataset, then spatial clusters are identified and the intensity of processes is quantified. Non-spatial properties and a time are considered together with the location data. Also methods of the multivariate statistics are used for the purpose of the classification of regions with similar properties. Particularly, occurrence data of selected infectious diseases in Olomouc Region in period 2002 – 2011 provided by Regional Public Health Service in Olomouc as well as data sets provided by The National Institute of Public Health are used for the case studies.

Jana Měřičková

Jana Merickova is a PhD student at Palacký University in Olomouc. She currently works in the Czech Army for department of geographic analysis and information in Prague. She used to specialize on research in physics. Her dissertation is focused on creating prototype interactive legends thematic maps for specific target groups.

The Electronic Flight Bag in the Czech Air Force

Paper charts are still compulsory for accomplishing tasks by the Czech Air Force (CZAF). However, at present, navigation with using electronic maps and data is being favoured. One of the most important components of modern air navigation is working with the digital aeronautical charts. Digital aeronautical data can be stored, updated, delivered and displayed in the information system called Electronic Flight Bag (EFB). There are several different devices in the Army of the Czech Republic assuring work with the digital aeronautical charts.

This article briefly describes these devices and their using and its purpose is to inform reader about possibilities and limitations of the Electronic Flight Bags. The article also uses data of a study, which objective is to determine pilots' attitude to electronic products and their uses.

The project deals with cooperation between pilots and geographers of the Armed Forces of the Czech Republic and the subsequent implementation of the most suitable products for the CZAF and is conducted in cooperation with CZAF pilot 1st lt. Jakub Vilšer.
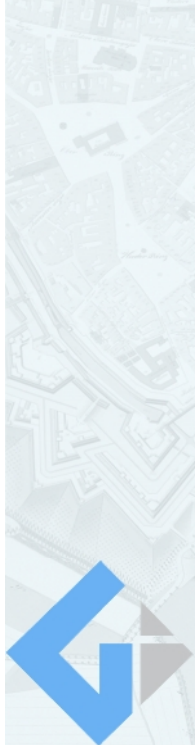
Jakub Miřijovský

Jakub Miřijovský is an assistant in the department of Geoinformatics at Palacký University in Olomouc. He specializes in Earth Remote Sensing, Photogrammetry, Surveying and Global Navigation Satellite Systems. He has taken part in several internships at academic institutions in Hungary, Poland, Germany and Iceland. His Ph.D. thesis was focused on research of river systems using UAV photogrammetry methods.

Monitoring of the shallow landslide using UAV photogrammetry and geodetic measurements

This report aims to present the latest photogrammetric techniques and procedures together with conventional surveying methods that can be collectively applied in dynamic geomorphology. Specifically the use of UAVs (Unmanned Aerial Vehicle) is presented as a source of very accurate geographic data. Based on the orthophoto and 3D terrain models which are generated from the stereo-pairs, it is possible to clearly evaluate the geomorphological processes that occur in the landscape. An experimental area is located in the Zlínský kraj about 4 km from the town Napajedla. The study area is represented by slope with inclination 10-15°, which has NW orientation. Continual monitoring of the slope movement started in March 2008. Measuring network orginally consisted of 32 ground points. After the evaluation of geodetic measurements with the period 2008-2013 one can certainly declared the lasting sliding activity, which is apparent mainly in the lower (accumulation) part of the landslide, but also in the upper part.

Rostislav Nétek

Rostislav Nétek is a PhD student at Palacký University in Olomouc. His professional skills and interests are web cartography, geoinformation technologies and open source solutions. His dissertation research is focused on implementation of RIA concept for applications in the crisis management. He passed internships at University in Muttenz, Switzerland and University of Iceland in last two years. He is a member of ICA Commission on Cognitive Visualization and "Open source and Open data" group by Czech Association for Geoinformatics.

Designing of Smart Client for Fire Brigade of Olomouc Region

Nowadays´ technology enables implementation of GIS solution into the web browser environment. Moreover, current technologies such as Rich Internet Application (RIA) and Service-oriented Architecture (SOA) enable extension of thin client by additional functionality such as "on-screen editing" which was not possible before. There was a requirement by Fire Brigade of Olomouc Region to develop a map client for online content editing. It is a unique idea that required combination of WebGIS solution with SOA approach. Generally, WFS-T enable data editing by remote access, but typically any desktop or server solution is required for map displaying and/or editing. The presentation discusses process and constrains of designing of fully web client. It was necessary to propose and develop a "connection" between WFS-T data service and online map solution. Three platforms that support WFS-T were tested (ArcGIS, Gaia, Geoserver). ArcGIS Viewer for Flex was chosen based on Fire Brigade requirements. Finally, WFS-T support was developed and implemented into customized application by new widget. It extends functionality of smart client by editing feature via web browser only. Both visualization and editing tasks are accessible fully online due to SOA approach. The smart client allows "on-screen" editing of map content via the same environment as used for common visualization tasks.

Justyna Pastwa

Justyna Pastwa is a PhD student at Palacký University in Olomouc. Her interest focus on data analysis and open software. Her dissertation thesis is on using artificial neural network (ANN) models for spatial data analysis. She completed a short-term research internship at Eötvös Loránd University (Budapest) in 2011.

Flood vulnerability estimation using FHA geometric mean method

Socioeconomic vulnerability is a complex concept necessary while risk estimation, and no standards for its calculation has been developed so far. In present work the fuzzy hierarchical analysis (FHA) is used to determine flood vulnerability of communities in Poland, in base of flood frequency, flood magnitude, the number of injured, fatalities, evacuated and flood damage. Since the evaluation criteria have diverse meanings, they have also different importance, what impose the estimation of weightings for listed criteria. It has been done by a survey carried out in most frequently flooded regions in Poland: the local experts of communities have been asked to evaluate the importance for considered factors. Nevertheless, the judgments are subjective and vagueness opinions what have been dealt by finding the fuzzy weights of criteria by geometric mean method proposed by Buckley. The results will be used in future work which final aim is to examine the flood risk for communities.

Jiří Pánek

Jiří Pánek holds a B.Sc. and an M.Sc. in Geography and GIS from the Department of Geoinformatics and currently he is about to finish his PhD at the Department of Development Studies, both Palacky University in Olomouc. His research is focused on GIS in development cooperation and humanitarian aid, with main focus on Participatory GIS (PGIS/PPGIS). He has experienced mapping in Kenya and South Africa and currently he serves as an editor of GISportal.cz.

The assessment of participatory mapping methods based on the expert system

Participatory mapping is a burgeoning practice among the development workers, however how should one choose the right method for participatory mapping?
Currently the human-decision making process is under the consideration of development workers, who solve this problem by either following certain methodologies provided by donors and development agencies or by following their own instincts. The development workers are accomplishing two critical tasks: identifying the features and the needs of the community which are relevant to each decision, and deciding which choice (method) to select, based on the values of the relevant features (community assets).
The aim of the paper is to present the blueprint and decision-making section of the expert system based on the in-field as well as academic experts' assessments of specific methods of participatory mapping. The outcome of this system will be a mechanism that will advice development workers about the optimal participatory mapping methods respective to the community assets and needs.

Vít Pászto

Vít Pászto is a PhD student at Palacký University in Olomouc. His scientific interests cover issues such as modeling in GIS, spatial information, its evaluation and visualization using fuzzy logic, fractal measurements, entropy theory and shape metrics. His latest research includes shape metrics application on urban areas and geodata scale restriction using entropy. He has undertaken several research internships (Hungary, Serbia, Norway, Great Britain) with focus on above mentioned issues.

Rural and urban areas delimitation using fuzzy inference system

Due to substantial population movement last two decades in The Czech Republic, it is very difficult to delimitate rural and urban areas. This population movement together with new settlement, improvement of municipality infrastructure and other socioeconomic changes are characteristic features of suburbanization. This phenomenon has affected many rural-like municipalities, especially those surrounding larger cities. Villages with close contact to adjacent cities have become more urban-like since then and vice versa. To maintain sustainability and quality of life in peripheral municipalities development funds has been established. But these funds respect only one strict rule - municipalities with less than 2.000 inhabitants can reach the financial support. This sharp limit is no more suitable although being very clear and simple. Fuzzy inference system could (1) combine more socioeconomic indicators for complex delimitation, (2) define transitional municipalities in order to refine their delimitation and (3) respect dynamics of suburbanization. The paper presents the usage of fuzzy logic principles for proper delimitation of rural and urban areas which much more respects aspects of suburbanization and helps consequent fund policy to be more applicable.

Stanislav Popelka

Stanislav Popelka is a PHD student at Department of geoinformatics, Palacký University in Olomouc. His dissertation is focused on the evaluation of 3D visualization in maps with use of the eye-tracking system. He spent one month in Gent, Belgium where he starts cooperation with Dr. Kristien Ooms. He also spent one month in Lund, Sweden, where he had an opportunity to stay at one of the best eye-tracking laboratories on the world. He is a member of ICA Commission on Cognitive Visualization.

Eye-tracking study on different types of 3D visualization

The development of geoinformation technologies has facilitated the creation of graphic representations and therefore they are used not only by experts in the field of geoinformatics or cartography, but also by the general public. The use of 3D visualization in maps is growing. However just a few studies focused on finding user preferences to different visualization methods were done so far. Most of them used questionnaire as the main evaluation tool.

The presentation will describe eye-tracking experiments on the user perception of 2D and 3D visualization methods.

Two eye-tracking experiments and online questionnaire were performed for investigating the differences between user cognition of 2D visualization with contour lines and perspective 3D view. Last experiment was focused on the use of 3D visualization in thematic maps.

The results of all experiments proved, that there are differences between perception of 2D and 3D visualization in maps.

Pavel Samec

Pavel Samec graduated Mendel University in Brno, Czech Republic. Since 2006 he has been working at the Forest Management Institute Brandys nad Labem. He has dealt with applications of multivariate statistical methods for predictions of forest vulnerability and development of new approaches of nutrient cycling modelling in forest ecosystems. Since 2012 he has been using the experience in collaboration with Department of Geoinformatics, Palacký University Olomouc. Long-term he is interested in the statistical analysis of environmental data, forest ecology, climatology, soil science, biochemistry and biology.

Predictions of changes in properties of forest soils

Fluctuations in soil properties indicate the trend of soil succession. In Central Europe the natural trends of forest soil succession were influenced both by post-war intensification of forestry (1948–1989) and acid deposition (1979–1994), and by ecological forest renewal (since 1995). The trends of fluctuations in the forest soil properties from the Czech Republic area were described using the analysis of time series of the clay content, the chemical (CaO, MgO, Cox, and Nt) and physical-chemical (pH and base saturation) soil parameters from the period of 1953–2008. Identical functions of regression equations of the fluctuations of bound nutrients, pH, base saturation (BS) and Cox indicated parallel trends of soil succession in different forest ecosystems. Identical periods of predictions in Cox fluctuation equations indicated the stability of the trend. Different periods of predictions in the functions of bound nutrients, pH and BS in different forest ecosystems indicated the susceptibility of succession trends to external factors. During the period of 1953–2008 soil pH, BS, CaO decreased but the content of Cox and Nt increased. Regression functions indicate that pH and BS of forest soils in the Czech Republic may temporarily increase and the content of Cox and Nt may decrease during the period of 2009–2014. Continuous increase in BS is only sustainable if concurrent with the increase in Cox.

Aleš Vávra

Aleš Vávra is a PhD student of Cartography and Geoinformatics at Department of Geoinformatics, Palacký University Olomouc. He is focused on digital cartography, advanced visualization and spatial modelling. He has also experience with creating of the e-learning systems. He has participated on project „The small format aerial photography in the study of the effect of surface heterogeneity on the habitat" and on Atlas of phenological conditions of Czechia. He passed several internships at universities in Poland, Italy, Iceland and Canada.

Spatial Assessment of Phenological Observation on the Vysoké Pole Experimental Site

The paper is focused on processing of observed phenological data on the experimental site with the support of sensor wireless networks in the field. The aim of research is to practically verify the concept of phenological mapping of the landscape. Data for spatial analysis was obtained through the field measurements and observations. The data set contains phenological observation data, records from data loggers and digital terrain model created by laser scanning. The studied area is the Vysoké Pole where phenological activities were observed in several different periods. The observation was compared with results sensor network monitoring. All results were integrated for further analyses. The primary data of sensor stations were interpolated to describe the behaviour of individual climatic elements throughout the experimental area. Next step was prepared of detailed characterization of individual sites using a laser scan digital terrain model. To define the relationship between the results of phenological mapping and air temperature measurements, sum of effective temperatures were calculated. This characteristic is decisive for the assessment of the onset of different phenological stages. The output is a map of the distribution of sum of effective temperatures resulting in the spatial interpolation of measured values. These values are then entered into the analysis of average deviations onset of selected phenological stages. This analysis is visualized in the same synthetic map.

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Alena Vondráková

Alena Vondráková acts as the cartographer at the Department of Geoinformatics, Palacký University, Olomouc. She focuses her research on thematic cartography, with an emphasis on user aspects of maps and the legislative protection of cartographic products. In present research activities she addresses the non-technological aspects of map compilation in atlas cartography and the evaluation of various aspects of map production and map use. Her methods of cartographic research include the technology of eye-tracking and the psychological evaluation of users' perception of maps. On the 1st July 2013 she defended her PhD thesis "Non-technological Aspects of Map Production in Atlas Cartography".

Making thematic maps in ArcGIS with emphasis on user issues

The results of research focused on non-technological aspects of map production (including eye-tracking experiments) were applied to the creation of maps within the ArcGIS software. Part of this research was to evaluate the need for such customization of colour scales that is required by logical nature of the dataset (instead of using default colour scales). Another example is the application of colour blindness simulator for cartographic outputs and consecutive customization of map production for colour blind users. Better explicitness of map products provides also a suitable choice of methods of cartographic visualization. This area is also suitable for user testing with regard to usage of modern evaluation methods.

There was created a set of recommendations, guidelines and examples of good and improper use of selected methods of cartographic visualization. Results are particularly beneficial for students of cartography who learn how create maps, but it is equally important for professionals who are involved in the map production.

Lenka Zajíčková

Lenka Zajíčková is a PhD student at the Department of Geoinformatics at Palacký University in Olomouc. She currently works part-time as a GIS Specialist at the Coordinator of the Integrated Transport System for Olomouc Region. Her scientific interests mainly cover areas of spatial analyses and modelling, mathematics and spatial statistics. Mentioned methods are applied to her research which is focused on public transport. Her PhD thesis deals with data model for data management of public transport.

The data model for data management of public transport in the Czech Republic

The presentation introduces the data model of transport networks for data management and controlling of public transport. The data model was created as a response to the absence of quality of geodata about public transport. It describes the static and dynamic part of the transport network including the rail and bus services. It is based on the data exchange standards of the public transport network for conditions in the Czech Republic. Due to incompleteness and lack of spatial data the approach of data collection of public transport was completed. It is based on original application for data collection according to the author´s data model of public transport. This approach of data collection was tested on bus and tram stops in Olomouc for a long time and after this step it was necessary to collect all data for a data warehouse and definition of rules for application updates and sustainability. Created model and application for data collection is based on code lists which prevent incorrect interpretation. Following pasportisation of public transport based on the above-mentioned tools involves many organisations because the project is much bigger than the capacity and capability of the authorities controlling traffic.

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