Geoinformatics in Olomouc

DEPARTMENT OF GEOINFORMATICS
PALACKÝ UNIVERSITY OLOMOUC

Palacký University in Olomouc: Quality and prestige

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 the Palacký University – clearly the best choice not only for students but also for foreign guests, top researchers or prominent institutions and companies.

The Palacký University draws on 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 vivid interest not only by young applicants but also by a high number of professionals. The demand has been so high that it far exceeds the capacity of our study programmes.

Palacký University in Olomouc: A centre for scientists and researchers

The 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 the 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.

Olomouc: A university city

Olomouc has always placed among the most prominent medieval cities of the Czech lands. For centuries, its good geographical location, its university with long tradition, its culture and crafts have made it a natural centre of Moravia that has been attractive for 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.

Department of Geoinformatics

The Department of Geoinformatics was founded in 2011. The roots of geoinformatics at the 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 promotion of modern geoinformation technologies in all spheres of the 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, work and gain experience in commercial companies and excel in national specialised student contests.

■ Head of the department:

prof. dr. Vít Voženílek (*vit.vozenilek@upol.cz*) – thematic cartography, atlas cartography, modelling in GIS

■ Academic staff:

dr. Jaroslav Burian (*jaroslav.burian@upol.cz*) – spatial planning, urban modelling, GIS in human geography

dr. Zdena Dobešová (*zdena.dobesova@upol.cz*) – spatial database, programming in GIS, digital cartography

assoc. prof. Jiří Dvorský (*jiri.dvorsky@upol.cz*) – neural networks, computer science

dr. Jakub Mišijovský (*jakub.mirijovsky@upol.cz*) – Earth Remote Sensing, GNSS, geodesy, UAV

assoc. prof. Vilém Pechanec (*vilem.pechanec@upol.cz*) – geoinformatics in environmental protection, GIS and Internet technologies, decision support systems

dr. Jana Svobodová (*j.svobodova@upol.cz*) – digital elevation models, geoinformatics in geomorphology and environmental applications

dr. Pavel Tuček (*pavel.tucek@upol.cz*) – statistical inferences, nonlinear models, geostatistics, dataprocessing in R

■ Project staff:

dr. Mukesh Boori *(msboori@gmail.com)* – remote sensing, radar data investigation

dr. Jan Brus (*jan.brus@upol.cz*) – environmental GIS, uncertainty in cartography, decision-making processes

Zbyněk Janoška (*zbynek.janoska@upol.cz*) – P-systems in transportation

dr. Helena Kilianová (*helena.kilianova@upol.cz*) – environmental issues

Lukáš Marek (*lukas.marek@upol.cz*) – spatial analyses for health data

Maik Netzband (*maik.netzband@upol.cz*) – remote sensing, urban areas

Vít Pászto (*vit.paszto@upol.cz*) –

Stanislav Popelka (*stanislav.popelka@upol.cz*) – eye-tracking in cartography, space and time visualization

dr. Miroslav Rypka (*miroslav.rypka@upol.cz*) –

Pavel Samec (*pavel.samec@upol.cz*) - forestry, analysis modeling prediction

Michaela Tučková (*michaela.tuckova@upol.cz*) – theory of optimum design of regression experiments, linear and nonlinear regression models

dr. Alena Vondráková (*alena.vondrakova@upol.cz*) – thematic cartography, non-technological issues in cartography

■ Administration staff:

Markéta Brussová (*marketa.brussova@upol.cz*) – students and staff matters

Jaroslava Mrázová (*jaroslava.mrazova@upol.cz*) – students and staff matters

Jitka Doležalová (*jitka.dolezalova@upol.cz*) – project agendas, public relations

Bc. Jiří Stankuš (jiri.stankus@upol.cz) –

There is always something going on

The Department of Geoinformatics is a centre of education and research as well as popular activities in the field of geoinformatics and cartography on national and international scale.

Cartographical Days in Olomouc

A yearly event consisting of lectures by top experts in thematic cartography and selected fields of application organised by the Dept. of Geoinformatics in cooperation with cartographic, geographic, GIS&T and other associations;

- thematic cartography in climatology and hydrology
- thematic cartography in demography
- thematic cartography in spatial planning
- thematic cartography and geography in schools
- thematic cartography in transport and statistics
- thematic cartography and landscape

Olomouc Geoinformatics Colloquiums (OGiC)

Invited lectures by prominent foreign experts aimed at academics and the professional public that take part in the activities of the Department of Geoinformatics.

- Prof. László Zentai (Budapest, Hungary) – Application of the web 2.0 in cartographic education – is it time for cartography 2.0?
- Dr. Ranka Stanković (Belgrade, Serbia) – Integrating semantic knowledge with GIS application
- Dr. Tamas Jancsó (Szekeszfehervar, Hungary) – Automatic DTM checking based on aerial photos
- Prof. Carsten Jürgens (Bochum, Germany) – Urban Remote Sensing – An Overview of its possibilities
- Dr. Maik Netzband (Bochum, Germany) – Global Urban Dynamics research with geoinformation data and methods
- Dr. Waldemar Kociuba (Lublin, Poland) – Use of Laser Scanning Technology in the Cold Climate Environment
- Prof. Richard Legates (San Francisco, USA) – Spatial Planning in GIS
- Dr. Monika Michálková (Bratislava, Slovak Republic) – Fluvial systems – new challenge for geoinformatics
- Prof. Sara Irina Fabrikant (Zurich, Switzerland) – Geographical Information Visualization and Analysis
- Prof. Terje Midtbø (Trondheim, Norway) – Cartographic Visualization of Indoor Environment
- Prof. Ferjan Ormeling (Utrecht, Netherlands) – Atlas Cartography, Toponymy, Data Quality
- Prof. Itzhak Benenson (Tel Aviv, Izrael) – Applications of Geosimulation in Transportation
- Prof. Menno-Jan Kraak (Twente, Netherlands) – Geovisual Analytics
- Prof. Jonathan Raper (London, Great Britain) – Location Based Services
- Prof. Corné van Elzakker (Twente, Netherlands) – Use and User Issues in Geoinformatics
- Dr. Arzu Coltekin (Zurich, Switzerland) - Human Vision of Geovisualization

Cartographical conferences by the Cartographic Societies of the Czech and Slovak Republic (1997, 2009)

A high-level meeting of Czech and Slovak experts in cartography, geodesy and geoinformatics.

GISday

A global educational event held on the third Wednesday of November each year that enables geographic information systems users and vendors to open doors of the Department to schools, businesses and the general public to showcase real-world applications of GIS

The Department of Geoinformatics is an important partner of the Cartographic Society of the Czech Republic. Since the first year of the **Map of the Year** contest it has been considered its secretariat and Vít Voženílek has become the chairman of the expert committee. Both students and employees of the Department have won several prestigious awards in various categories of this contest. The Department plays an equally important role when organising an international competition Barbara Petchenik Children's Drawings Award, where it acts as an organiser of national rounds.

INDOG doctoral Conference

The InDOG doctoral Conference in Olomouc is a part of the project led by Department of Geoinformatics. Doctoral students who are in the process of completing their thesis are invited to submit papers for presentation to a group of academic discussants 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 Dept. of Geoinfomatics and the public and business sector.

CARTOCON

StatGIS Conference

Geoinformatics

In Olomouc, we perceive geoinformatics as a modern information-based concept that works with top technologies and is applied in many fields. It is suitable for those interested in geography and information technologies.

„Geoinformatics deals with information about spatial phenomena and their relation. Geoinformatics is about data, maps, programmes, satellite and aerial photos, navigation systems, computer models and simulations. And it is always related to landscape, territory, states, cities, mountains, rivers and other geographical objects.“

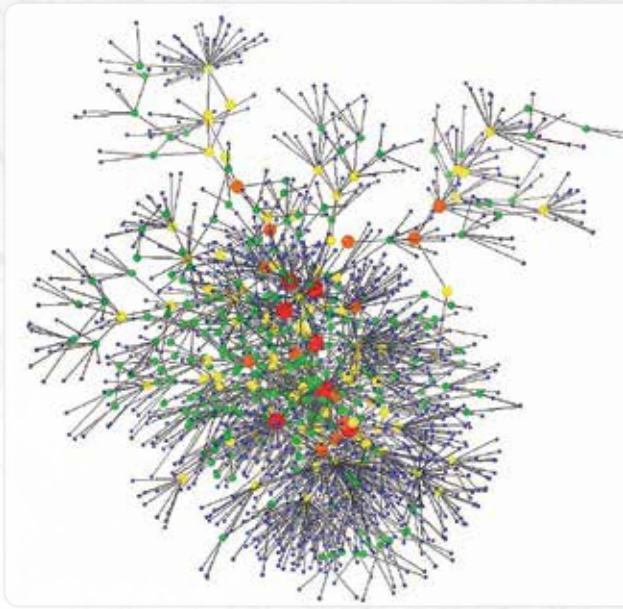
The graduates of Geoinformatics in Olomouc easily find jobs in public administration, private companies and academic institutions. They are good GIS administrators, cartographers, database administrators, project managers, programmers or developers.

Fields of research

In research, our staff focus their activity on general geoinformatics topics, development and application of geographical information systems, remote sensing data processing, thematic and digital cartography, landscape spatial modelling, spatial planning in GIS, etc.

Currently, the Department's activities concentrate primarily on three research fields:

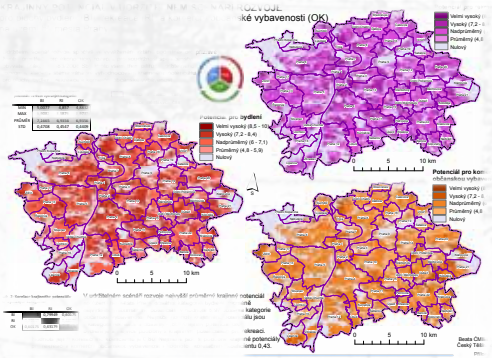
- Spatial modelling of geographical phenomena in GIS
- Digital cartography
- Remote monitoring of landscape



Spatial Modelling of Geographical Phenomena in GIS

Spatial modelling of geographical phenomena in GIS is one of the research fields pursued at the Department of Geoinformatics. It is oriented at geostatistical methods like methods of interpolation, spatial statistics, at methods of mathematical statistics like regression analysis, multidimensional statistical analysis methods (method of principal components, cluster analysis, factor analysis or discrimination analysis), or at the application of the theory of experimental design and categorical data analysis, application of the fuzzy set theory and multicriteria decision making. The main research topics are:

- modelling of natural phenomena – statistical modelling of hazards (landslides, floods, fires, destructive winds, wind breakages)
- modelling of urbanization processes – suburbanization, urbanization, urban growth, land suitability, regional development scenarios, spatial structures of cities
- geostatistics in transport – research, processing and analysis or 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

Principal researcher: dr. Jaroslav Burian

Other researchers: assoc. prof. Jiří Dvorský, dr. Pavel Tuček, dr. Zdena Dobešová, dr. Jana Svobodová, Lukáš Marek, Vít Pászto, Justyna Pastwa, Lenka Zajíčková, MIroslav Rypka, Maik Netzband, Pavel Samec, Zbyněk Janoška

Projects:

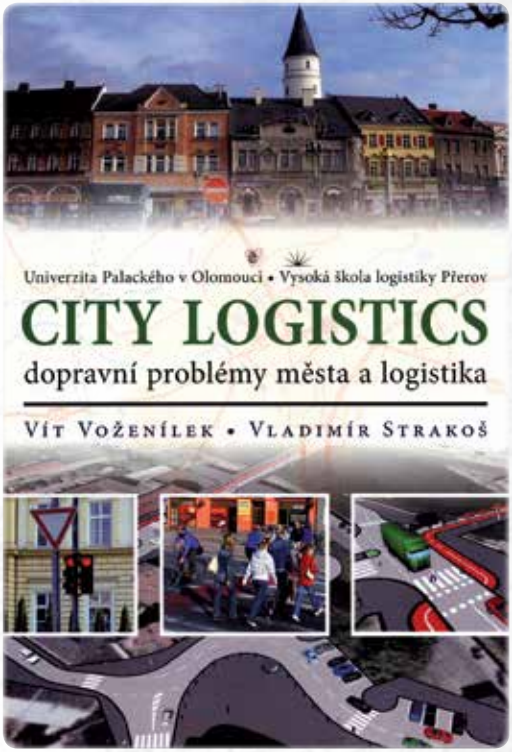
- Methods of artificial intelligence in GIS
- GeoComputation - Increasing the competitiveness of students of Geoinformatics by the innovation of studies using computationally intensive methods
- Analysis and modelling of spatial relationships dynamics of ecotons in GIS
- Shallow landslide forecasting using the dynamic model DYLAM
- Quantification of the risk to the traffic infrastructure of the Czech Republic by natural hazards
- Geomorphological research and natural hazards in the southern part of the Czech-Slovak border
- Synthesis of data on the state of grassland biodiversity in the White Carpathians Protected Landscape Area aimed at biodiversity preservation of this ecosystem
- Research on movement of persons on the boundary line of the urban and suburban area in the Olomouc region
- Urban Planner
- Spatial simulation modelling of accessibility
- EcoThermo

Selected theses:

- Temporal variation of inward journey to Olomouc using means of public transport
- Statistical Modelling of Hydrological Phenomena
- On Hausdorf Dimension in Settlement Studies
- Dependency analysis with the use of correlation and logistic regression in R
- GIS analytical extensions for spatial planning

Main publications:

- Burian. J., Voženílek, V. (2012): Identification and Analysis of Urbanization and Suburbanization in Olomouc Region – Possibilities of GIS analytical tools
- Burian, J. (ed.) (2012): Advances in Spatial Planning
- Dobešová, Z. (2011): Automatic generation of digital elevation models using Py-thon scripts
- Pászto, V., Brychtová, A., Tuček, P., Marek, L., Burian, J. (2014): Using a fuzzy inference system to delimit rural and urban minucipalities in Czech Republic in 2010■ Marek, L., Tuček , P., Marek, J., Pászto, V. (2010): Stochastic approach for deter-mining landslide activity
- Marjanović, M., Kovačević, M., Bajat, B., Voženílek, V. (2011): Landslide susceptibility assessment using SVM machine learning algorithm
- Pászto, V., Tuček, V., Marek, L., Kuprová, L., Burian, J. (2010): Statistical infe-rences – visualization possibilities and fuzzy approach computing
- Pechanec, V., Burian, J., Kilianová, H., Němcová, Z. (2011): Geospatial analysis of the spatial conlicts of flood hazard
- Burian, J., Brus, J., Voženílek, V.(2013): Development of Olomouc city in 1930–2009: based on analysis of functional areas
- Tuček, P., Pászto, V., Voženílek, V. (2009): Regular use of entropy for studying dissimilar geographical phenomena
- Voženílek, V., Dvorský, J., Húsek, D. (eds.) (2011): Methods of artificial intelligence in GIS
- Marjanović, M. (2014): Conventional and machine learning methods for landslide assement in GIS



Digital Cartography

Current cartography is closely related to geoinformation technologies. The Department of Geoinformatics deals with theoretical, technical and user-related aspects of the creation and use of cartographical products. It makes wide use of tools and data models of geoinformation systems, remote sensing materials and geostatistical programmes. The main research topics are:

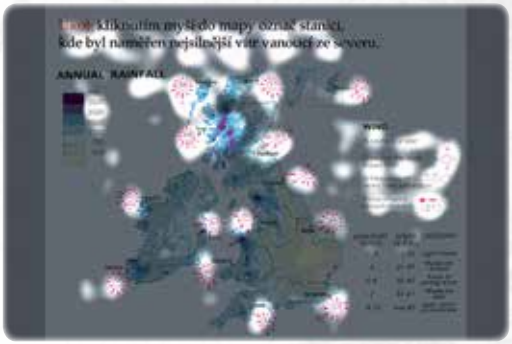
- production
- thematic atlases
- synthetic map-making and map use
- usability evaluation of map reading
- geovisualization on web

The Department of Geoinformatics publishes various reviewed maps and atlases as part of Map and Atlas Product Series (M.A.P.S., ISBN 978-80-244-2813-0)

Principal researcher: prof. dr. Vít Voženílek
Other researchers: Jan Brus, Alžběta Brychtová, Zdena Dobešová, Rostislav Nétek, Stanislav Popelka, Alena Vondráková

Projects:

- Intelligent system for interactive support of thematic map production
- Symbols and design of map composition of planning analytical materials of municipalities
- Perception of geospace by modern types of tactile maps
- Evaluation of cartographic functionality in GIS software
- Visualization, interpretation and perception of spatial information in thematic maps
- Climate atlas of Czechia
- Atlas of phenological conditions in Czechia
- Multimedia guide for Olomouc City
- Landscape Atlas of the Czech Republic
- Increasing the effectiveness of copyright protection in cartography and geoinformatics



Selected theses:

- Implementation of a language module for voice-controlled maps (into ArcGIS)
- 3D guide (visualization) of the landscape of the territory of Litovelské Pomoraví
- Cartographical representation of the climate of the Czech Republic since 1990
- Web map user profile
- Anaglyf renderings of the building of Šantovka complex

Main publications:

- Dvorský, J., Snášel, V., Voženílek, V. (2010): On maps comparison methods. 2010 International Conference on Computer Information Systems and Industrial Management Applications, CISIM 2010
- Dvorský, J., Snášel, V., Voženílek, V. (2009): Map Similarity Testing Using Matrix Decomposition. 2009 International Conference On Intelligent Networking And Collaborative Systems (INCOS 2009)
- Voženílek, V. (2005): Cartography for GIS – geovisualization and map communication
- Voženílek, V., Kaňok, J., a kol. (2011): Methods of thematic cartography – spatial data visualization [in Czech]
- Burian, J. a kol. (2010): Development of Olomouc City in 1930–2009 based on analysis of functional areas [in Czech]
- Dobešová, Z. (2009): Evaluation of Cartographic Functionality in Geographic Information Systems [in Czech]

- Voženílek, V., Šaradín, P., a kol. (2009): Atlas of Election to Region Council of Olomouc Region 2000, 2004 a 2008 [in Czech]
- Tolasz, R., et al. (2007): Climate Atlas of Czechia
- Voženílek, V., a kol. (2008): Hranicko – Atlas of development of microregion [in Czech]
- Květoň, V., Voženílek, V. (2011): Climate regions of Czechia: Quitt's classification for 1961–2000 [in Czech]
- Brus, J. (2014): Visualization of uncertainty in environmental studies [in Czech]
- Vondráková, A. (2013): Non-technological aspecst of map production [in Czech]
- Bělka, L. (2013): Ortophotomap [in Czech]

Landscape Monitoring

Landscape research is based on accurate and up-to-date data. The Department of Geoinformatics concentrates on systematic monitoring of landscape, using especially remote and wireless methods that make use of geolocation sensors with subsequent automated processing and verification, mostly in network environment.
The main research topics are:

- 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

Principal researcher: assoc. prof. Vilém Pechanec
Other researchers: Jan Brus, Jaroslav Burian, Jakub Miřijovský, Vendula Hejlová

Projects:

- Contactless monitoring and spatio-temporally modelling variability of selected differing soil characteristics
- Methods for creating scenarios of impacts of global change on land use and modelling the functional relationship between in land use changes and the provision of ecosystem services
- Small format aerial photography in the study of the effect of surface heterogeneity on habitats
- Integration of sensor network and small format remote sensing for prediction of snow hazards
- Wireless continuous monitoring
- Innovation of mapping and evaluation of changes in the landscape using geoinformation technologies
- Environmental education applied in developing practice
- Identification of hydro-causing properties of gravity driven flows in porous materials
- Analysis of biodiversity in the White Carpathians PLA as a basis for establishing an appropriate new zoning management of valuable territory
- Regional Information System for Environmental Hazards (RISEH)
- Cooperation of GIS and GPS in the process of thematic mapping of landscape

Selected theses:

- Implementation of methods Structure from motion to UAV photogrammetry
- Modeling development of land use modeling using tools Marxan and CLUE
- Monitoring and modelling of surface runoff using GIS
- Creating 3D models of geomorphological objects from stereo-photographs
- The use of small format photography in archaeology
- Sensor networks in environmental studies
- Standards for sensor networks centre
- Analysis of data produced by the Pixy carrier
- Comparison of selected per-pixel classifiers to identify built-up areas

Main publications:

- Pechanec, V., Vávra, A., Hovorková, M., Brus, J., Kilianová, H. (2014): Analyses of moisture parameters and biomass of vegetation cover in southeast Moravia. International Journal of Remote Sensing , 35:3 Taylor & Francis , 967-987s. ISSN 1366-5901
- Mišijovský, J., Brus, J., Pechanec, V. (2011): Utilization of small format aerial photography from Drone Pixy concept in the landscape changes

- Pechanec, V. (2014): Sensor systems and their integration with GIS in environmental studies. Olomouc: Palacký University.
- Michalcová, D., Chytrý, M., Pechanec, V. et. al. (2014): HIgh Plant Diversity of Grasslands in a Landscape Context: A Comparison of Contrasting Regions in Central Europe. Folia Geobotanica. Vol. 49, Issue 2 Springer Netherlands, 117 - 135s. ISSN 1211-9520
- Netzband, M., Burian, J., Pászto, V., Mišijovský, J. (2013): Geospatial analysis for Middle eastern european urban regions in transition. Spatial transformation processes in Central Europe in XXI century conference proceedings
- Marjanović M., Burain, J., Mišijovský, J., Harbula, J. (2012): Urban Land Cover Change of Olomouc City Using LANDSAT Images. Issue 71, Conference Proceedings World Academy of Science, Engineering and Technlogy, 75-81s. eISSN: 2010-3778
- Pechanec, V., Brus, J., Mišijovský, J. (2011): Monitoring of snow risks by geo-sensors in urban areas
- Mišijovský, J. (2014): Unmanned Aerial Systems - Data collection and using in photogrammetry


Portolánový atlas 1563
v Olomouci
Portolánový atlas
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Bachelor degree in Geoinformatics and Geography

The bachelor degree in **Geoinformatics and Geography** consists of 6 terms (three years of study) and the graduates acquire skills in the fields of geoinformatics, geoinformation technology and geography.

In geoinformatics students are taught the basics of digital representation of reality, geoinformation technologies of geographic information systems (GIS), remote sensing, global positioning system (GNSS), geostatistics, computer cartography and its applications in geographical problems. The geographical part of the programme focuses on various branches of geography (climatology, hydrology, etc.) and methods of study of landscape environment. Cartography and its use in geoinformatics as well as geography form an integral part of the programme.

The main aim of the study is to prepare university-educated GI experts with introduction to geoinformation technology. The graduates are able to use potential of geoinformation technologies in various geographical disciplines. This university education develops independence and individual creativeness in students. The study plan is aimed at improving practical skills. During the semester of practice students make use of both their theoretical knowledge from lectures and their practical skills.

The graduates are able to work with GIS software packages, write documentation and partly participate on research and development activities in common geographical issues using geospatial technology. During the programme students acquire theoretical knowledge and skills in geoinformatics and geographical disciplines. Students become familiar with modern software products and receive basic knowledge of computer science and mathematics, programming and information systems. Students also gain experience in implementation of software projects.

The programme is completed by a diploma thesis. Students demonstrate their ability to work independently and professionally to apply the knowledge and skills gained during their studies.

Master degree in Geoinformatics

The master degree in Geoinformatics enables students to continue improving the knowledge and skills of their bachelor studies in geoinformatics and geography in the areas of geoinformatics, geoinformation technology and its application in geosciences.

In follow-up study, students learn about theoretical approach in geoinformation technology (GIT trends in modelling of GIS, the state information policy) and about theoretical aspects of cartographic disciplines (stylistic of cartographic works, atlas and web cartography). Moreover, they use the theoretical information for practical application in the fields of applied geoinformatics (geoinformatics in physical and socio-economic geography, geology, environment and other fields such as agriculture and forestry, as well as modelling of natural hazards and landscape planning). In geography, emphasis is put on further study of geographical sub-disciplines and their methods related to landscape.

After the studies the university educated geoinformatics know the basics of geoinformation technology and can use it in the sub-disciplines of geography. The theoretical knowledge is related to practical skills developed during work on end-of-term projects. The programme enhances

individual thinking and creative approach to solution of projects. Special emphasis is put on issues that are the most popular in practice.

The programme completed by a master thesis. The student demonstrates the ability to work independently and professionally and to apply theoretical and practical knowledge and skills gained during the studies.

After this programme students are able to realize operational, documentation, as well as research and development activities, including solving problems with the use of geographic geoinformation technology.

PhD in Geoinformatics and Cartography

The doctoral study programme in Geoinformatics and Cartography focuses on the main theoretical and practical aspects of GIS, Earth remote sensing, GPS, computer cartography, geostatistics, theoretical aspects of cartographic semiotics in analogue and digital maps, aspects of atlas production, etc. The main aim of the programme is to prepare highly qualified scientists for expert and scientific work in several specializations in geoinformatics and cartography.

Requirements:

- four years full-time study (daily classes)
- lecturing (40 hours per academic year)
- examinations – four modules, English language, state doctoral exam
- publications in scientific journals
- presentations at scientific conferences
- three-month research visits at foreign universities
- PhD thesis
- participation in the Department's activities
- tuition fee

Advantages:

- scholarship
- accommodation in an international students dormitory
- longer student life
- access to worldwide libraries, Internet, new technologies
- improving knowledge and skills in demand
- networking in high technologies
- living in a beautiful historical city

PhD theses

- Photogrammetric approach to geodata collection with the use of unmanned aerial vehicles
- Visualization of uncertainty in environmental studies
- Application of GIS analyses when dealing with logistics issues in public transport
- Advanced methods for landslide assessment using GIS
- Non-technical aspects of map creation in atlas cartography
- Phenological landscape analysis with the support of GIT
- Fractals and fuzzy sets in GIS modelling
- RIA for crisis management
- Visualization in GIS
- Map Saturation
- Experimental wireless sensor network for air pollution monitoring in the centre of Olomouc city
- Neutral Networks in GIS Modeling
- Spatial and multivariate statistical analyses of epidemiological data

PIXY – UNMANNED AERIAL MODEL

Since 2009, the Department of Geoinformatics has owned a unique equipment for non-contact collection of landscape data.

Drone PIXY is a slow moving model of a motorized paraglider primarily used for close-up remote sensing, providing classic and digital aerial images and video recordings at ultra-low heights (50-500 m). The model allows acquisition of traditional and digital images, including video recording. Its maximum loading capacity allows having several sensors on the board at the same time. The Drone Pixy concept offers simple piloting, easy transportation, high resistance and wide use. Operating the device does not require a special licence.

Research group makes use of the equipment especially in the following fields:

- fluvial geomorphology
- archaeology
- landscape heterogeneity

Recent results:

- The small format aerial photography in the study of the effect of surface heterogeneity on the habitats (Project)
- Evaluation of a new remote sensing methodology for detailed international mapping in the V4 region (Visegrad Fund project)
- Miřijovský, J., Brus, J., Pechanec, V. (2011): Utilization of a small format aerial photography from drone PIXY concept in the evaulation of the landscape changes
- Miřijovský, J., Martínek J., Brus, J. (2011): Reconstruction of historical paths with using of small-format aerial photography.

EYE-TRACKING RESEARCH IN CARTOGRAPHY

Feeling the absence of objective evaluation of cartographical products, since June 2011 we have started the research on cognitive visualization of maps using eye-tracking.

The eye-tracking technology and method consist in measuring and recording eye movement of the observer in relation to the observed object. The most important part is played by a device that monitors the eye position and movement ("what we are looking at"). The observed object can be represented by paper maps as well as web pages, digital maps or any computer files on the screen.

Department of Geoinformatics is equiped with SMI RED 250 eye tracker and three pieces of Eye Tribe Tracker. Both types of devices work on the basis of non-invasive Pupil and Corneal Reflexion method. It is based on measuring the centre of pupil and corneal reflection of a direct infrared light beam.

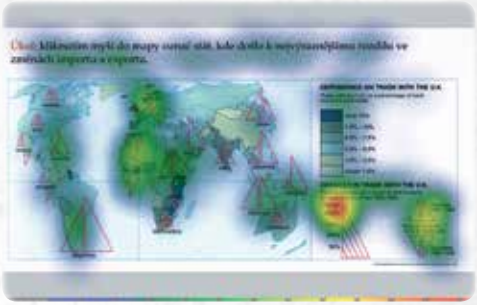
The group investigates the application of the eye-tracking technology and cognitive sciences in the field of evaluation and optimisation of maps:

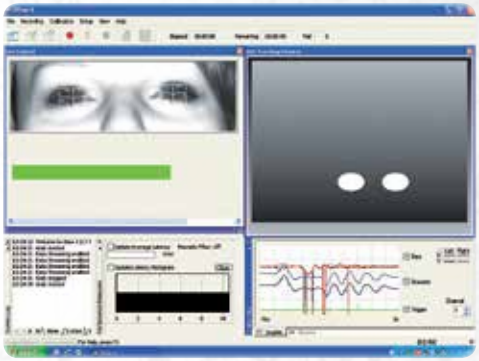
- eye-tracking in 3D visualization
- eye-tracking in map complexity evaluation
- eye-tracking in gaze driven map applications
- eye-tracking in uncertainty visualization
- eye-tracking in non-technological aspects in cartography

Recent results:

- Popelka, S., Brychtová A. (2013): Eye-tracking Study on Different Perception of 2D and 3D Terrain Visualization Cartographical Journal
- Popelka, S., Dedkova, P. (2014): Extinct Village 3D Visualization and its Evaluation with Eye-Movement Recording
- Brychtova, A., Vondráková, A. (2014): Green versus Red: Eye-tracking evaluation of sequential colour schemes
- Brychtová, A., Popelka, S., Voženílek, V. (2012): The analysis of eye movement as a tool for evaluation of maps and graphical outputs from GIS

www.eyetracking.upol.cz





COOPERATION AT NATIONAL LEVEL

The Department of Geoinformatics cooperates with a number of public institutions and private companies. The cooperation can have the form of a project, commissioned job or student work. Our longterm partners are primarily the Czech Hydrometeorological Institute, the Czech Statistical Office, the Regional Authority of the Olomouc Region, the Olomouc Municipal Authority, the SmartGIS company, the Forest Management Institute and the Transport Research Centre. These are our most important projects:

OLINA – Multimedia city guide (2009–2011)

The project consisted of creating a tourist multimedia navigation called OLINA to promote the city and improve the quality of touristic information services in Olomouc. OLINA contains hours of recordings, thousands of photographs and tens of thousands of words in a single device that can be borrowed from information centres in Olomouc. The navigation has been available since June 2011.

Symbols and design of map composition in planning analytical materials of municipalities (2009)

This project was completed on the request of the Regional Authority of the Olomouc Region and its aim was to create a symbol key for data on the territory and on the design of planning analytical materials defined in the Decree No. 500/2006 Coll. on planning analytical materials, urban planning documentation and the method of recording urban planning activity. The symbol key was designed in ArcGIS 9.3.1.

Data register for planning analytical materials (2008–2009)

The project was requested by the Regional Authority of the Olomouc Region and its aim was to set up a database used for the preparation of planning analytical materials (PAM). The database enables recording and processing of data provided to the Regional Authority, Department of Urban Planning and Construction. The processed data are used to prepare planning analytical materials. The data register ensures transparent data management, including tracking of updates and of the level of completeness of the UAM model.

COOPERATION AT NATIONAL LEVEL

Significant observation points in Olomouc (2008)

This project was developed for the Olomouc Municipal Authority and dealt with significant observation points used to get urban analytical materials for Olomouc, municipality with extended competence. A data model was designed and fed with these points in order to create maps of visible and blocked areas on the territory. This was preceded by field research and the creation of accurate digital relief models that took into account the height of buildings and vegetation cover. These were used as input for visibility analyses. The analyses were processed in the ESRI environment and used to create a digital layer of observation lines and visibility polygons.

Landscape Atlas of the Czech Republic (2003–2007)

The Department of Geoinformatics is an author of this cartographical project and originally also served as a guarantor of the unique Landscape Atlas of the Czech Republic. Tens of institutions cooperated in the project. The atlas contains 791 types of maps, 396 sections and many diagrams and pictures. Its height is 0.5m and its weight around 10kg. Its design and production cost 55 million CZK.

Digitisation of cartographical and historical works from the collection of the Olomouc Research Library

The project of the Department of Geoinformatics and the Olomouc Research Library defined the significance of historical maps, thoroughly processed important maps of the given period (century), classified them according to place of publishing (continental, state and local), completed data modelling (digitization) of the maps in GIS for further processing and cartographical visualization setting the mode and format of the output as well as its archiving.

Information system for the town of Valašské Klobouky

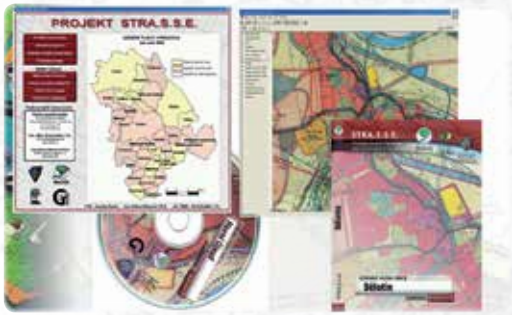
The project aimed at implementing an information system for the territory of Valašské Klobouky, municipality with extended competence. The project also included creation of data for green passportization and basic communications passportization, as well as integration of existing data.

Traffic census

In the field of GIS and transport, the Department of Geoinformatics cooperated with KPM CONSULT to provide traffic census (public urban and line transport) in the cities of Olomouc, Třebíč, Přerov and Prostějov. Apart from our staff, pre- and post-gradual students participated in the project. The students' role was to carry out the census in the field, conduct a survey, as well as complete the tasks of planning, monitoring and optimisation.

Horse paths

The project consisted in detailed mapping of planned horse paths on the territory of the Moštěnka and Hříběcí hory LAGs. The mapping was preceded by preparation of supporting thematic maps, assembling of photo documentation and verification of the paths' course. The project was completed by Department of Geoinformatics students as part of their practical training.



COOPERATION AT INTERNATIONAL LEVEL

Every year, many of our students study abroad at universities all across Europe. There are many contractual partner universities as part of the ERASMUS and CEEPUS programme, e.g. the universities of Bochum, Vienna, Valencia, Salzburg, Belgrade, Krakow, Lublin, Trondheim, Sofia, Budapest and other European cities. Similarly, our Department receives students and teachers from Poland,

Hungary, Spain and Serbia. Recently, we have been able to host among others Richard LeGates, Carsten Jürgens, Lászlo Zentai, Tamas Janczo, Maik Netzband, Ranka Stanković, Dagmara Kociuba, Branislav Bajat, Krzystov Kalamucki, Monika Michálková or Bela Markus, who give lecture as part of so called OGiC, Olomouc Geoinformatics Colloquium.

STRA.S.S.E. (Strategic Spatial Planning and Sustainable Environment) (2005–2007)

The international (CR, Italy, Greece) INNOREF grant was part of the Stra.S.S.E. project, with special focus on testing of the deployment of a new flexible and continuous planning system. The system is based on cooperation and enables monitoring of the development of a territory in terms of sustainable development, with special emphasis on environmental issues and citizens' needs. This is done with the use of improved methods of economic development, use of landscape, use of renewables and improvement of social ties. The team of our geoinformation scientists has mapped a territory of 31 municipalities of the Hranicko microregion producing output in the form of a seamless urban plan of the microregion and the thematic regional atlas HRANICKO - atlas of microregional development.

COOPERATION AT INTERNATIONAL LEVEL

Evaluation of cartographic functionality in GIS software

The project of International Visegrad Fund dealt with methodology for evaluating geospatial software projects. The main evaluated functionality was cartographic functionalities and the concept of creating thematic map output. The project developed proposals for a new approach to the evaluation of GIS programmes in terms of cartographic functions. The aim of this evaluation is to help future users to select the most suitable and appropriate programme focusing on cartographic outputs from GIS programmes. Therefore, the user does not need to conduct their own survey and random testing of programmes in order to determine an appropriate one. The newly proposed CartoEvaluation method is a comprehensive guide to monitoring all cartographic features and the subsequent selection of the programme.

SDI-EDU

The SDI-EDU project aimed at transferring former experience from EU education research projects in SDI spatial planning like PLAN4ALL, HUMBOLDT OR NATURNET Redime towards planners in European Regions and municipalities. The project uses innovative educational methods of the Naturnet Redime project and combines methods of distance vocational training, e-learning and knowledge sharing that will allow transfer of experience and teaching of how to deal with SDI for spatial planning for real users. The leader of the project was the University of West Bohemia. Researchers from the Department of Geoinformatics were involved as members of the Czech Association for Geoinformation.

To support publication of research results and outputs we launched M.A.P.S. (Map and Atlas Products Series) publishing series in 2009 and created a GeoComputation & GI Science research magazine with an international publishing board in 2010.

Social life

Partnerships & Memberships

- Department of Geoinformatics is a collective member of the Czech Association for Geoinformation (http://www.cagi.cz), co-organises its events and participates in its development.
- The Department of Geoinformatics is one of the most important bodies in the Czech Republic. Major cartographic activities in the Czech Republic (*http://www.czechmaps.cz*), the competition provides an organizational map of Children's Drawing Contest and Barbara Petchenik. It holds its annual Day of Cartography and in 2009 hosted the 18th cartographic conference.
- The Department of Geoinformatics works closely with the Czech Geographic Society (*http://www.geography.cz*) and is the seat of the Section of Cartography and GIS.
- The Department of Geoinformatics works closely with the Society for Photogrammetry and Remote Sensing (*http://www.sfdp.upol.cz*).
- The Department of Geoinformatics is actively involved in a number of international cartographic associations (h*ttp://cartography.tuwien.ac.at/ica/*) and is represented in the Commission for National and Regional Atlases.
- The Department of Geoinformatics supports activities of the International Geographical Union (*http://www.igu-net.org*) and is represented in the Commission for Geographical Information Systems.
- The Department of Geoinformatics is in close contact with the Slovak Association for Geoinformatics (*http://www.sagi.sk*).

Why don't you cooperate with us on

- joint research projects
- joint study programmes, exchange of students and researchers, fellowships
- organising conferences and workshops
- writing publications

Join our doctoral programme in

- spatial modelling of geographical phenomena in GIS
- digital cartography
- remote monitoring of landscape

Get in touch with us to

- consult your work
- discuss academic plans
- inspire us and get inspired

DEPARTMENT
OF GEOINFORMATICS

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