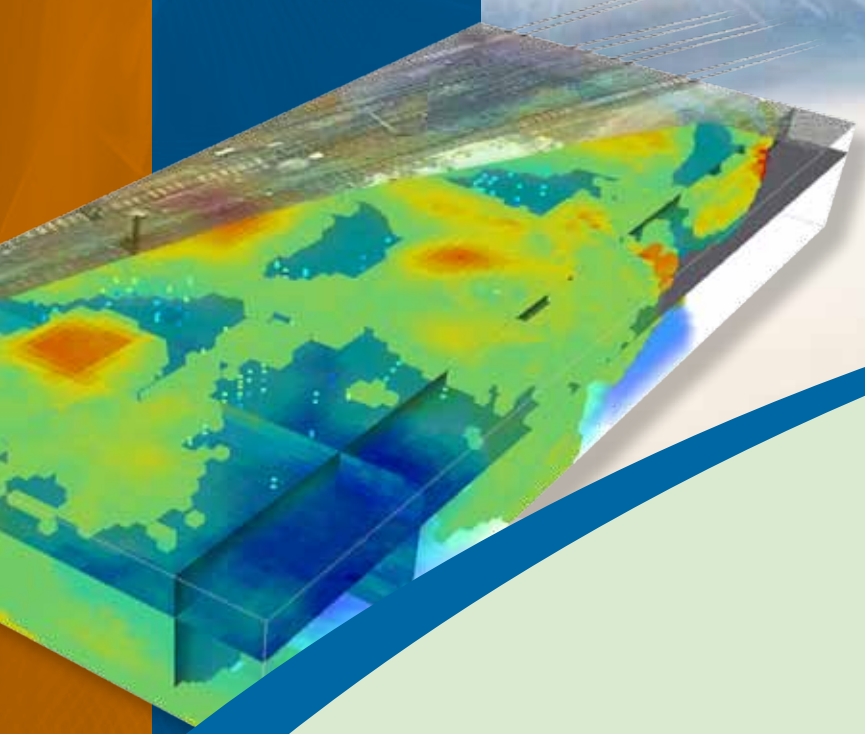
ÖAW
Austrian Academy
of Sciences

GIScience research report 2009 – 2010



GIScience

Institute for
Geographic Information Science

www.oeaw.ac.at/GIScience


GIScience

Preface

Location Salzburg

- *Cooperation and framework agreement with the Provincial Government of Salzburg, University of Salzburg and with the City of Salzburg*
- *Member of the GIS-Cluster Salzburg*
- *Research Cooperation and joint PhD supervision with Z_GIS (Centre for Geoinformatics of the University of Salzburg), and the Research Studio iSPACE*
- *Successful projects: EC and nationally funded projects*
- *Regional scientific support to various institutions*
- *Workplace for Scientists and Students*

The ÖAW Institute for Geographic Information Science was officially opened on May 30, 2007 after several months of establishing our infrastructure at Techno-Z Salzburg. Since then, significant developments have taken place, and 'ÖAW GIScience' has evolved from a scientific startup into an established and recognized centre for fundamental research in a range of Geographic Information Science topics.

Within the GIScience Research Cluster Salzburg (www.giscience-research.org, p. 13) our institute plays an important role with its focus on basic research, while other partners connect the 'knowledge chain' towards applied research and R&D with industry partners. These collaborations generate new research questions contributing to the evolution of the GIScience research agenda.

On an operational level, the GIScience Research Cluster shares technical resources as well as activities like the Geoinformatics Colloquium and e.g. the Spatial Data Infrastructure research group. Most importantly, the joint PhD program with the University of Salzburg has reached the necessary critical mass of young researchers – and recently has succeeded with being acknowledged with a 'Doctoral College' award by Austria's National Research Fund.

Outreach to a wider professional public and promoting science and technology on a secondary schools level has received much attention from our scientists: the annual Geoinformatics Forum symposium keeps expanding and involves researchers worldwide. 'GIS Day' in November continues to be a highlight for schools, and continuing education for teachers has been institutionalized through our participation in the pedagogical centre for Geoinformatics – digital:earth:at!

At the same time, GIScience researchers have achieved impressive results and noticeable impact through numerous well-received publications and presentations, public communication of science and involvement in successful research projects including EU FP7. These outcomes primarily result from a highly motivated and dedicated team of researchers, with everybody being committed to interdisciplinary cooperation within and beyond the GIScience institute.

Most of this would not have been possible without the support provided by the Austrian Academy of Sciences, the University of Salzburg, and the Government of Salzburg. We all are grateful for the resources entrusted to our research, and are confident that progress and results achieved in this past period more than justify this investment.

Looking forward towards further enhancing the scientific level of our research in GIScience, and to fulfilling the ambitions and prospects defining our agenda!

Prof. Dr. Josef Strobl
Director, ÖAW-GIScience

ÖAW GIScience supported by:

UNIVERSITY of SALZBURG

STADT : SALZBURG

Land Salzburg
Für unser Land!

Content

Mag. Gabriele Burgstaller
State President of Salzburg

» *Although the ÖAW Institute for GIScience is a very young and still small research unit, it has gained remarkable international reputation and excellence within a very short period of time. Its widely acknowledged success is due to scientists who are able to think spatially and thus contribute to new approaches in many disciplines and topics. E.g. in modern medical research GI Science helps to monitor the lesion distribution caused by Multiple Sclerosis. Other applications help to improve climate models, transport logistics or realtime traffic optimisation. Cooperations with enterprises within and beyond the GIS Cluster will support the visualisation of essential scenarios of the social and environmental changes to come.*

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IMPRINT

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GIScience: an Institute of the Austrian Academy of Sciences

ÖAW President, Chairman of the Section for Mathematics and the Natural Sciences

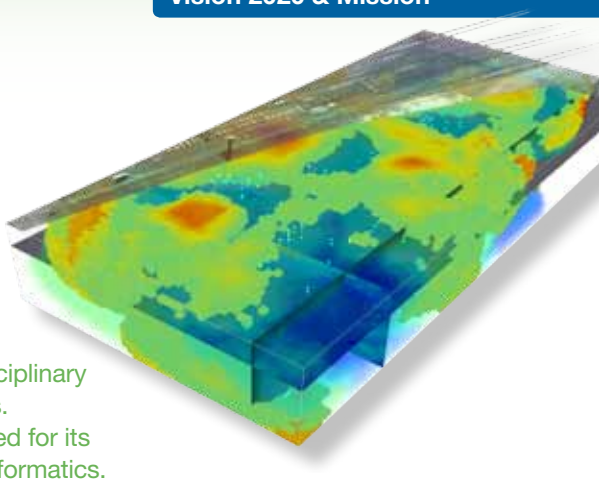
o. Univ.-Prof. Dr. Helmut Denk

» *Over recent years, Salzburg has developed into one of the outstanding R&D centers in Geographic Information Science globally. A value chain has been established that comprises postsecondary education, research and economic implementation within a cluster of GIS expertise. Salzburg thus has become one of the international hot spots in GIS. The establishment of the Institute for GIScience of the Austrian Academy of Sciences has added a basic research component in GIScience to the regional portfolio. It provides a fundamental enhancement that decisively strengthens Salzburg as place for GIS related education, research and industry. The transdisciplinary approach as well as research into new concepts of space and time will contribute to the development of further economically relevant applications in the field of Geographic Information Science.*

The Austrian Academy of Sciences, founded in 1847, represents a learned society like the great European academies on the one hand and Austria's leading nonuniversity institution for basic research on the other. The Academy gives new impetus by taking up new, forward-looking research areas. It is currently promoting more than 60 research institutions at ten locations throughout Austria.

At present the Academy counts about 1500 employees in research and administration. The research fields include Biology and Medicine, Mathematics, Physics and Materials Sciences, Environmental Research, Earth Sciences, Space Research as well as numerous fields of the Humanities, the Social and Cultural Sciences.

In addition to the research activities in its own research institutions the Academy's tasks include Advisory Function (reports, expertises), participation in international research projects and membership in international scientific organisations as well as promotion of highly qualified young researchers with grants and awards.



Vision 2020

- Our goal is to advance Geographic Information Science through interdisciplinary research with a strong focus on conceptual and methodological aspects.
- The ÖAW Institute for GIScience will be a leading research unit recognized for its contributions to and international leadership in the foundations of Geoinformatics.
- This is being achieved by addressing carefully selected key topics at the leading edge of international research in GIScience:

- TEAM: having developed a highly integrated multi-disciplinary research team that can be flexibly organized to address new research challenges and issues arising from novel applications, technologies and paradigms.
- JUNIOR RESEARCHERS: constitute a key asset throughout the organization, are given a chance to lead and implement, are being stimulated, motivated and mentored to achieve highly recognized outcomes.
- COLLABORATIVE RESEARCH within international programs in particular provides externally funded opportunities for junior researchers to establish a track record of scientific achievement.
- NETWORK: the department is providing leadership and vision in multiple overlapping international research networks, with a particular focus on tying CEE and C/S/E Asian partners into worldwide communities of research practice.
- CLUSTER: the department is leading the Salzburg GIScience research cluster (with Z_GIS – University of Salzburg and the Research Studio iSPACE) with challenges from basic research and new paradigms.
- PUBLICATIONS in established and acknowledged outlets document achievements and provide international visibility to the GIScience research group, while serving as benchmarks within the international research community.
- EDITORIAL ROLES in acknowledged journals demonstrate the recognition of academic leadership and potential for innovation in the field as well as a service to the wider scientific community.
- CAREER ADVANCEMENT of scientists at GIScience is documented through obtaining advanced degrees, awards of distinction, positions at international universities and moving on to academic leadership positions.
- CONFERENCE organization efforts in areas of particular expertise contribute to international visibility and recognition and serve as capstones in establishing leadership at the crossroads of basic GIScience and application disciplines.
- AWARENESS of a general public of the value of GIScience, its methods and application domains is indispensable for sustaining this transversal discipline in a competitive institutional environment requiring societal acceptance.
- SPATIAL THINKING is promoted, supported and researched from an early age, throughout a range of societal dimensions and into various professional domains, aiming at establishing a geoinformation society.

Mission Statement

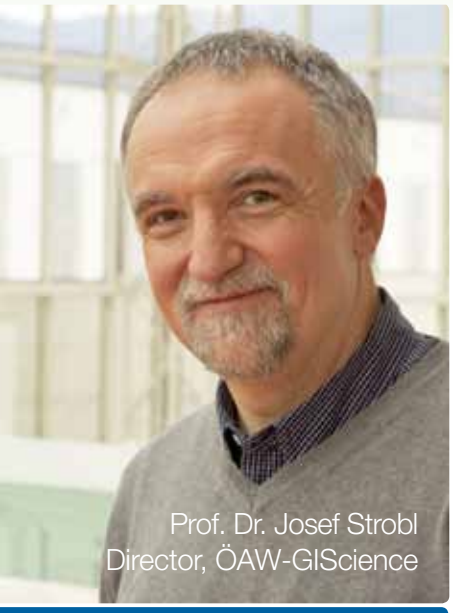
Geographic Information Science, serving as the common ground for trans-disciplinary basic research at ÖAW GIScience, is understood as the foundation and keystone of the spatial component in today's information and knowledge society.

Based on fundamental concepts from Geography and frameworks from information and communication sciences, GIScience is developing theoretical concepts, methods, algorithms and strategies for modeling the spatial and temporal dimensions of the real world.

Demands for making spatial perspectives explicit arise from numerous application domains, ÖAW GIScience has decided to focus on a research programme led by the search for common ground in concepts and methods, independent from particular application logics.

This common ground of a spatial view is leveraging ubiquitous georeferencing as a key to integrate information from disparate sources, joining natural and social science inputs, combining technical with geographical approaches to achieve innovative outcomes.

Today, we are very obviously in need of crossing borders of scientific disciplines and traditions. The extent of space is one non-extensible resource our globe is offering. Thus we better manage it well to sustain our futures. GIScience is indispensable in this endeavour.



Prof. Dr. Josef Strobl
Director, ÖAW-GIScience

Team GIScience

The initial GIScience team development was focused on building research teams and an effective organisational infrastructure. The integration of junior scientists (PhDs) and the establishment of working relationships with peers from various disciplines is receiving high priorities.

The GIScience Team currently includes the GIScience director, 6 senior scientists, 1 junior scientist and 3 PhD students working on basic GIScience research. Their expertise ranges from Geoinformatics, Geodesy, Spatial Economics, Geography, Geography Education, Ecology, Geology, Technical Physics, and Environmental Technology to Global Change. The team is complemented through one organisational manager and two IT experts. Several project staff members hold a temporary contract with the Academy and assist the core scientific team through their specific expertise.

Academic and Professional Functions

- Full Member of the Austrian Academy of Sciences
- Associate Professor at the University of Salzburg, Department of Geography and Geology
- Chair Curricular Commission Geography at the University of Salzburg
- Director of Z_GIS, Centre for Geoinformatics at the University of Salzburg
- Founder and Chair of UNIGIS Salzburg, President UNIGIS International
- Programme Chair of the conferences AGIT and GI_Forum
- President of Austrian Association for Geographical Information
- Member, GISIG Executive Committee
- Board of Directors, GSDI Association
- Visiting Professor and Honorary Professor at various universities world-wide

PhD

- **Mariana Belgiu**, MSc: Geography & Geoinformatics
- **Filippo Dal Fiore**: Spatial Economics & Geoinformatics
- **Florian Fischer,** Dipl.-Geogr.: Geography & Geoinformatics
- **Gudrun Wallentin**, Mag. (MSc): Ecology & Geoinformatics

Four researchers moving to new positions 2009/10

Filippo dal Fiore finished his PhD and is now working at the Senseable City Lab at the MIT in Boston. Karin Hörmanseder and Inga Gryl worked in funded projects and contributed their expertise to ÖAW-GIScience in the Nature-SDIplus and Schools on Ice projects. Peter Hofmann was our OBIA expert and is still collaborating with many team members.

Project Staff

- **Inga Gryl**: Geography & Geography Education
- **Peter Hofmann**, Dr.: Geography & Geoinformatics
- **Karin Hörmanseder**, Mag.: Botany & Geoinformatics
- **Hermann Klug**, Dr.: Landscape Ecology & Geoinformatics
- **Robert Vogler**: Geography & Geography Education

Senior Researcher

- **Gilbert Ahamer**, Dr. techn.: Technical Physics, Environmental Technology & Global Change.
- **Adrijana Car**, Dr. techn.: Geodesy & Geoinformatics
- **Sabine Hennig**, Dr. Geography & Geoinformatics
- **Robert Marschallinger**, Univ.-Doz. Dr.: Geology & Geoinformatics
- **Matthias Möller**, Prof. Dr.: Geography & Geoinformatics
- **Thomas Jekel**, Dr.: Geography & Geography Education

Junior Scientist

- **Fritz Zobl**, Mag. (MSc): Technical Geology & Geoinformatics

Organisation and Technical Infrastructure

- **Barbara Brunner-Maresch**, Mag.
- **Stefan Russ**, Bakk.rer.nat
- **Claudia Schmidt**, Mag.

Incoming Visitors

Robert Pazur, Phd:
Institute of Geography, Slovak Academy of Sciences. Research visit for his PhD on landscape changes, land cover/land use modelling and spatial analysis. Funded by ÖAW and the Slovak Academy of Sciences.
Duration of Stay: 04.10.2010 - 11.10.2010

» *Main purpose of my academic visit at the ÖAW-GIScience institute focused on geographical information systems. During my one-week stay I had a great opportunity to get familiar with scientific orientation and ongoing projects of each member of this institute. We have been discussing also some possibilities of cooperation through bilateral programs between Austria and Slovakia supporting scientific and research projects. Part of my academic visit was devoted to excursion in natural areas affected by human activities. I strongly appreciate helpfulness and expertise of all institute members and look forward to continue cooperation activities.*

Athina Trakas:
Open Geospatial Consortium, Inc. Keynote at GI_Forum 2010: SDI - (Inter) Operating for End User Benefit.
Duration of Stay: 06.07.2010 - 09.07.2010

Laxmi Ramasubramanian, PhD, AICP:
Associate Professor, Dept. of Urban Affairs and Planning Hunter College and The Graduate Center City University of New York. Keynote at GI_Forum 2010: Fostering Digital Citizenship through Participatory Research and Reflective Practice.
Duration of Stay: 05.07.2010 - 09.07.2010

Andreas Siebert:
Munich Reinsurance Company. Head Geospatial Solutions. Keynote at GI_Forum 2010: Geo-Intelligence in the insurance industry – Risk management of natural hazards.
Duration of Stay: 06.07.2010 - 09.07.2010

Stoyan Nedkov, PhD:
Institute of Geography, Bulgarian Academy of Sciences. Research and collaboration with Z_GIS and GIScience staff. Funded by CEEPUS.
Duration of Stay: 11.06.2010 - 12.07.2010

Almaz Orozumbekov, PhD, (Dipl. Biol.):
National Academy of Sciences of the Kyrgyz Republic. Research and collaboration with Z_GIS and ÖAW-GIScience staff. Funded by ÖAW-GIScience.
Duration of Stay: 14.12.2009 - 16.12.2009

Karl Donert:
President of EUROGEO and National Teaching Fellow (Liverpool Hope University). Research and collaboration with Z_GIS and ÖAW-GIScience staff. Self-funded.
Duration of Stay: 2.11.2009 - 17.12.2009

Dulal Chandra Roy, PhD Candidate:
Ministry of Planning, Government of Bangladesh. Research and collaboration with Z_GIS and GIScience staff "Flood Risk and Vulnerability Assessment for Bangladesh using Remote Sensing and GIS". Funded by ÖAD.
Total duration of Research and Stay: 01.03.2008 – 28.02.2011.

Dr. Claire Jarvis:
University of Leicester, Centre for Excellence in Teaching and Learning (CETL). Keynote at GI_Forum 2009: „Spatial Literacy, GIScience and Learning". Funded by ÖAW-GIScience.
Duration of stay: 07.07.2009 - 11.07.2009

Prof. Dr. Suchi Gopal:
Boston University, Department of Geography and Environment, Center for Cognitive and Neural Systems and Center for Remote Sensing. Research Areas: Neural network applications in remote sensing and GIS domains, spatial analysis and spatial statistics for environmental and public health applications, spatial data mining, marine GIS, and multi-scale spatial modeling. Keynote at GI_Forum 2009: „Towards Geosocial Networking: Integrating Social Networks and LBS". Funded by ÖAW-GIScience.
Duration of stay: 07.07.2009 - 10.07.2009.

Dr. Rumiana Vatseva:
Bulgarian Academy of Sciences, Institute of Geography, Sofia, Bulgaria. Research and collaboration with Z_GIS and GIScience staff. Funded by CEEPUS.
Duration of stay: 10.06.2009 - 10.07.2009.

Awards & Careers

Adrijana Car
moving to Oman starting February 2011

Adrijana Car, senior researcher at OeAW-GIScience, has been appointed to the position of Associate Professor in GIS at the Faculty of Economics, Department of Sustainable Tourism and Regional Development, German University of Technology – GUtech, Muscat, Oman (GUtech is affiliated with RWTH Aachen University).

GUtech is not completely new to me; as a visiting lecturer since 2009 I have already taught students at the Faculty of Economics and the Faculty of Science. I will teach GIS related courses at undergraduate and graduate level. My research will focus on GIScience & Technology, in particular related to conceptual modeling, spatio-temporal analysis and geovisualization considering local and regional aspects and needs. I also see potential for research and teaching cooperation across the GUtech departments such as Geosciences, with GIScience acting as a common "spatial" language.

The move from OeAW-GIScience to GUtech opens a new chapter in my professional life, and I intend to build further on foundations I set up in Salzburg. For example, I will remain the chair of the GI_Forum program committee, and will continue my research activity in Space-Time projects. It would be great if this collaboration could grow from individual to an institutional one. Academic positions in various geographical locations have enabled me to gain experience in different academic environments and scientific communities, and in various cultural surroundings; I am looking forward to the new challenges that await me in Oman and the Middle East region."

From February 2011 Adrijana can be found at http://www.geo.gutech.edu.om

Professor for Cartography, Geoinformation Science and Remote Sensing

Matthias Moeller, a senior researcher at ÖAW-GIScience, completed his habilitation entitled „Semantic-Quantitative Modelling Approaches for a Synoptic Monitoring of Urban Areas" at the University of Bamberg in April 2010. In October 2010, Matthias Moeller has been appointed Professor for Cartography, Geoinformation Science and Remote Sensing at the Beuth University of Applied Sciences in Berlin.

Prof. Dr. Josef Strobl, director of the Institute for Geographic Information Science has been elected a Full Member of the Austrian Academy of Sciences.

The decree has been handed over during the "Feierliche Sitzung" on May 19, 2010.
The traditional ceremony is the culmination of the working year of the Austrian Academy of Sciences: Prominent representatives from academia, politics, culture and business are introduced to the activities of the Academy.

Mariana Belgiu is an outstanding PhD student at the Salzburg Geoinformatics PhD Programme and works currently at ÖAW-GIScience.

She received several awards for her research: e.g. the second place for her thesis on "Making Geographic Resources Discoverable – an Approach towards a Streamlined Metadata Generation Process". This award from the Austrian Umbrella Organization for Geographic Information (AGEO) aims to acknowledge outstanding final thesis research in Geographic Information. Mariana has also been chosen as the top Salzburg ESRI Development Center student for 2009 due to her outstanding achievements and contributions.

esri Development Center

Salzburg GIScience PhD Programme

evolving into FWF DOCTORAL COLLEGE

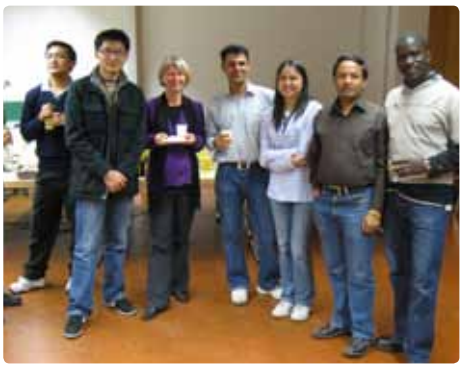
FWF
Der Wissenschaftsfonds.

A new long term GIScience DOCTORAL COLLEGE was awarded to the University of Salzburg under the prestigious and highly competitive ‚DK' framework of Austria's National Science Fund (FWF). The program titled „Geographic Information Science. Integrating interdisciplinary concepts and methods" will select an initial set of fully funded PhD candidates in mid 2011.

» *Prof. Dr. Thomas Blaschke, lead PI and speaker of the successful bid, comments: „This is a key achievement towards establishing the University of Salzburg as a leader in Geoinformatics and GIScience: building on our successes in GIScience research and Masters' programs, this award recognizes our PhD program on a leading international level and will facilitate research-driven career development for top-notch candidates".*

The University of Salzburg is offering an international, English language PhD programme with a clear focus on Geoinformatics and its foundations in Geographic Information Science. This includes research in Remote Sensing, Spatial Analysis, Digital Cartography, Spatial Thinking, Spatial Statistics, Location Based Services and related methods and technologies.

This programme is built around the Salzburg 'Research Cluster' in Geographic Information Sciences and Geoinformatics, and is open to students fulfilling admission requirements, having secured their funding, and willing to work on a topic suiting the programme's research agenda with a high level of motivation and ready to meet expectations of excellence.



Geoinformatics Colloquia

The 'Geoinformatics Colloquium' series links students with visiting scientists and provides a forum for exchanging ideas and stimulating discussion. T he colloquia are jointly organized by Z_GIS, the Research Studio iSPACE, Salzburg Research and the ÖAW Institute for Geographic Information Science.
The events take place at the Techno-Z Salzburg.

PhD projects at the ÖAW-GIScience Institute

As one partner in the Salzburg multi-institution doctoral programme in GIScience, we are contributing to the advancement of science and the qualification of junior scientists through highly innovative PhD projects integrated with the GIScience research programme.

GIScience Research Cluster Salzburg

Prof. Dr. Josef Strobl, Director, ÖAW-GIScience

» *Between the Centre for Geoinformatics (Z_GIS) at the University of Salzburg, the Research Studio iSPACE and the Institute for GIScience of the Austrian Academy of Sciences numerous cooperations and joint projects are contributing towards a critical mass of about eighty Geographic Information Science researchers at the Salzburg hub for GIScience.*

In Salzburg, three research institutions with a core focus on Geographic Information Science (GIScience) are collaborating to advance innovation and develop new concepts and methods:

- the Institute for **GIScience** of the Austrian Academy of Sciences,
- the Research Studio **iSPACE** and
- the Centre for Geoinformatics (**Z_GIS**) at the University of Salzburg.

Geoportal applications serve as communication mechanism between the geographic resource providers and the potential users, enabling effective and efficient usage of Geographic Information in a distributed computing environment.

The MISSION of the GIScience Research Cluster Salzburg is to initiate and foster scientific collaboration across partner institutions with the objective to achieve internationally recognized research outcomes, support innovative GIS applications and to provide a creative environment for highly motivated young scientists.

http://www.giscience-research.org

SDI INITIATIVE:

Spatial Data Infrastructures (SDI) are currently a major topic in Geoinformatics practice and GIScience research. As this is an extremely broad area requiring knowledge and skills from numerous facets of ICT, geospatial concepts, standardisation, systems architectures and application perspectives, progress only can be achieved through collaboration among strong teams with diverse expertise.
SDI thus has been the first area where researchers from all cluster institutions are working together on internal, national and international projects:

Have a look into our workshop:
> http://geoportal.researchstudio.at
> http://geoportal.aca-giscience.org

National Geoportal Prototype AGEOportal

Geoportal applications serve as communication mechanism between the geographic resource providers and the potential users, enabling effective and efficient usage of Geographic Information in a distributed computing environment.

Mariana Belgiu (ÖAW-GIScience) & Manfred Mittlböck (Research Studio iSPACE)

Summary of Activities

2009 – 2010

2009

2009 was the second full year of operations for the Institute of GIScience. The research team and new staff members, who joined GIScience funded by EC or national grant projects, have been developing joint research initiatives guided by the overall research programme.

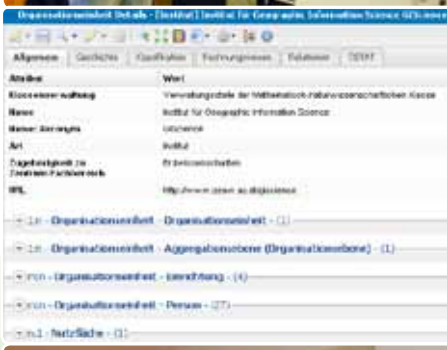
Work continued in the FP7 NatureSDI Project with work packages coordinated by the Institute, whilst the Sparkling Science project 'Schools on Ice' was successfully completed. Based on the broad range of expertise and research experience by GIScience staff, several externally funded co-operative research projects were successfully acquired. We have been awarded an Austrian Federal Ministry of Science and Research funded Sparkling Science project "Geovisualisation and communication in participatory decision processes" and a project funded by the Austrian Federal Ministry for Transport, Innovation and Technology. Austrian Aeronautics Research and Technology Programme TAKE OFF: "SEESAM - Geo-Spatially Enhanced Situational Awareness for Airport Management". Work got under way for proposal submission under both EC and national programmes in early 2010.

Of particular value is the integration of researchers from highly diverse backgrounds, reaching across social and natural sciences, integrating technical and fundamental science research methods and traditions with common research themes from generic spatial domains. This multidisciplinarity has proven to be a major creative asset in our research team, offering innovative approaches and fertilizing scientific development. One focal theme of research activities emphasized in 2009 is the trans-disciplinary work on 3D models, structures and analyses across several scalar orders of magnitude. These range from geological features to petrographic-lithological objects, and explore the human-biological domain in order to add temporal dynamics as a fourth dimension. Here, analogies across scales facilitate the development of generalized concepts, particularly for multidimensional analyses.

A major new initiative was launched in the area of object-based image analysis "OBIA – 3D and 4D modelling using object-based image analysis". Due to recent developments in hardware and software, 3D and 4D object based image analysis (OBIA) became technically possible. In conjunction with these new possibilities, new theoretical and methodological research questions arise. One of the theoretical questions in this context is the integration of formal space-(time-) concepts in the development of OBIA rule sets. Successful paper submissions from this initiative in high quality journals indicate the current interest in this research field.

Communicating research results, enabling international exchange of ideas, and initiating new contacts and collaboration again was important for increasing the international visibility and recognition of GIScience as a new research institute:

- Leading the programme development of the Geoinformatics Forum, Computer-Oriented Geology and Learning with Geoinformation conferences.
- Contribution to public-access-to-science events like GIS Day, Lange Nacht der Forschung and digital:earth:at as well as in-service teacher training initiatives.



- Taking the lead in curriculum development and mobility programs across the CEE region has helped with building a dense network of intensive collaborations in GIScience.
- Welcoming and hosting numerous visitors and delegations from a range of countries and presenting highlights from current research and starting new research initiatives
- Welcoming and hosting numerous visitors and delegations from a range of countries and presenting highlights from current research and starting new research initiatives.

2010

In 2010, work continued within the third party funded projects FP 7 Nature SDI, SESAAM, and GEOKOM-PEP, while fundamental research was furthered through both results from the above projects and collective projects within the GIScience research program.

A major development has been the formation of the GIScience Research Cluster Initiative comprising the Institute for GIScience, Z_GIS (University of Salzburg) and Research Studio iSPACE to foster joint project applications. The first successful initiatives have been the establishment of the Doctoral Program on “Geographic Information Science” funded by the FWF and partly staffed by GIScience senior scientists, and the successful application for a EC COMENIUS network digital:earth:eu, where the Institute acts as a work package leader. The GIScience Institute has been awarded funds through the BM:WF Sparkling Science project “I am Here” as well as “raum:planen”, funded by the Salzburg State government.

Research outcomes have been prominently published in international SCI journals from the field of Object Based Image Analysis (OBIA). Here, a new and innovative method for measuring the robustness of OBIA rule sets has been designed and tested by a team of the Salzburg GIScience Research Cluster. The GeoMS, GeoNT and GeoSMT projects focused on exhaustively sampled natural microstructures, which were subject to OBIA for knowledge based feature extraction, voxel modeling for 3D/4D representation and advanced geostatistical methods for pattern recognition and simulation.

Further efforts have been put in the field of semantic mapping between the ontology classes, formalizing the spatial entities and the field representation of geographic reality in order to produce transferable knowledge. This research contributes to the INSPIRE Directive, as does the development of geoportal prototypes. Specific attention has been given to investigation of sources of uncertainty that may arise in the development of a model that simulates the alpine tree line shift. The outcomes advance research in conceptualization of uncertainty in ontology of spatial dynamics, thus contributing to fundamental spatio-temporal concepts in GIScience.

Research into the social uses and effects of Geo-ICT has been contributing to the development of the concept of spatial citizenship as guideline for the inclusion of GI in secondary education.

The Institute has continued to provide platforms for high-quality international research and outreach activities, while fostering communication and application of research results through conference organization, teaching and training activities and international cooperation. These activities include:

- Chairing the programme committees of the Geoinformatics Forum, Computer-Oriented Geology and Learning with Geoinformation conferences.
- Contributing to raising awareness about geographic information science through participation and organization of popular science events (GIS Day, FDZ-Night, in service teacher training).
- Coordinating curriculum development and mobility programs across the CEE region as well as developing and implementing a module ‘Learning with Geoinformation’ in teacher training.
- Welcoming and hosting numerous visitors and delegations from a range of countries and presenting highlights from current research and starting new research initiatives.

Research Programme

Our research programme is focussed on the advancement of key topics in Geographical Information Science. In close cooperation with international partners we aim at achieving substantial progress in two major areas critical for current and future developments across GIS application domains.

Scientific Advisory Board

Prof. Dr. Doris Dransch (Chair),
Section 1.5: Earth System Modelling, Helmholtz Centre Potsdam, FZ German Research Centre for Geosciences

Dr. Alessandro Annoni,
Spatial Data Infrastructures Unit, Institute for Environment and Sustainability, Joint Research Centre, European Commission

Prof. Dr. Klaus Greve,
University of Bonn, Institute of Geography, AG GIS

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Univ.-Prof. Dr.-Ing. Matthäus Schilcher,
Technical University Munich, Institute for Geodesy, GIS and Land Management

The Institute for GIScience has started with a mid-term research programme providing the required focus and direction for a small research unit, particularly with the given trans-disciplinary approach where researchers from diverse backgrounds need to develop a common vision.
Within the wide framework of Geographic Information Science, the following core areas have been chosen based on their critical importance for progress due to application demand, their potential for significant outcomes on an international level, and their suitability for mixed research teams from a range of different disciplines:

AREA 1:
Spatial Analysis and Modelling

Research questions focus on the extraction of new information from spatial observations through application of advanced analysis methods, through the development and implementation of models and the simulation of different scenarios. Particular topics to be addressed in projects are:

- Segmentation-based information extraction from e.g. RS imagery.
- Multidimensional geostatistics and the modelling of dynamic processes.
- Analysis of mobility patterns and spatial behaviour.

AREA 2:
Spatial Data Infrastructures

Building fully spatially enabled ‚information highways' is a requirement for better management of our societies and environments. Interoperable, services-oriented distributed architectures consist of numerous components working together as an 'infrastructure' supporting multiple uses. Our contributions are aiming at:

- Specification and evaluation of advanced multi-dimensional data models.
- The integration of real-time sensor input.
- Connecting global (change) databases with SDI architectures.

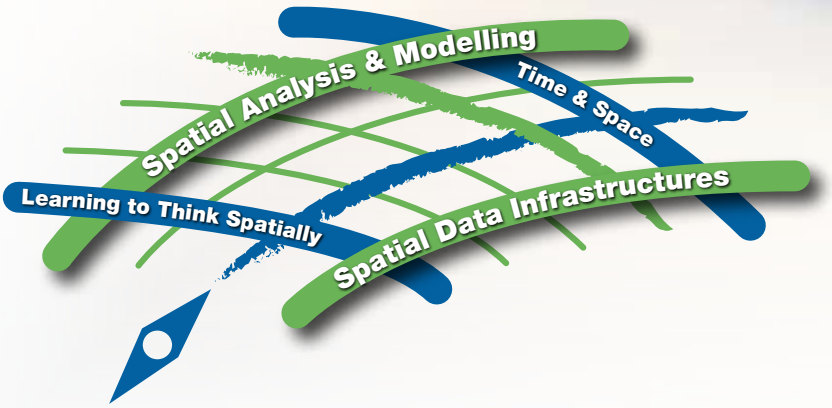
These core research areas are enhanced and complemented by two transversal research themes, designed to facilitate a tighter integration on the level of individual projects which are required to contribute to at least one research area plus one transversal theme:

Time & Space

Traditionally, these meta-dimensions have not been treated from integrated perspectives. Full temporal enabling of data models and analytical strategies is indispensable for spatial monitoring, analysis of mobility and the rapidly changing dynamics in natural and social spaces.

Learning to Think Spatially

Successful communication of spatial knowledge is required across all segments of society. Starting from cognitive aspects, facets of situated learning and interaction with visual stimuli lead to research questions important for a (Geo-) Information Society.



Spatial Analysis and Modelling

Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the modelling of dynamic processes. Methods for flexible regionalisation, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

Spatial Data Infrastructures

Building spatially enabled 'information highways' is a requirement for better management of our societies and environments. Our contributions aim at the specification of advanced multi-dimensional data models, the integration of real-time sensor input and open interfacing across system architectures.

Time and Space

Traditionally, these meta-dimensions have not been treated from integrated perspectives. Full temporal enabling of data models and analytical strategies is indispensable for spatial monitoring, analysis of mobility and the rapidly changing dynamics in natural and social spaces.

Learning to Think Spatially

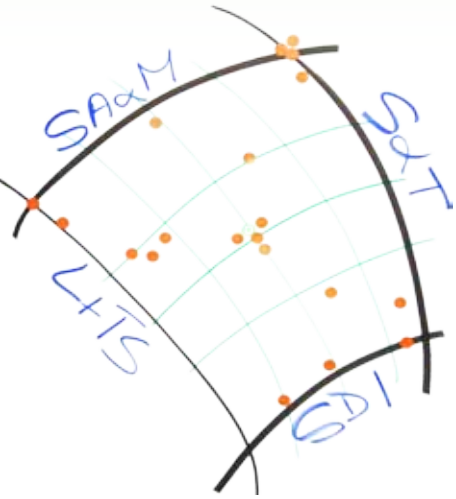
Successful communication of spatial knowledge is required across all segments of society. Starting from cognitive aspects, facets of situated learning and interaction with visual stimuli lead to research questions important for a (Geo-) Information Society.

Definition of Geographic Information Science

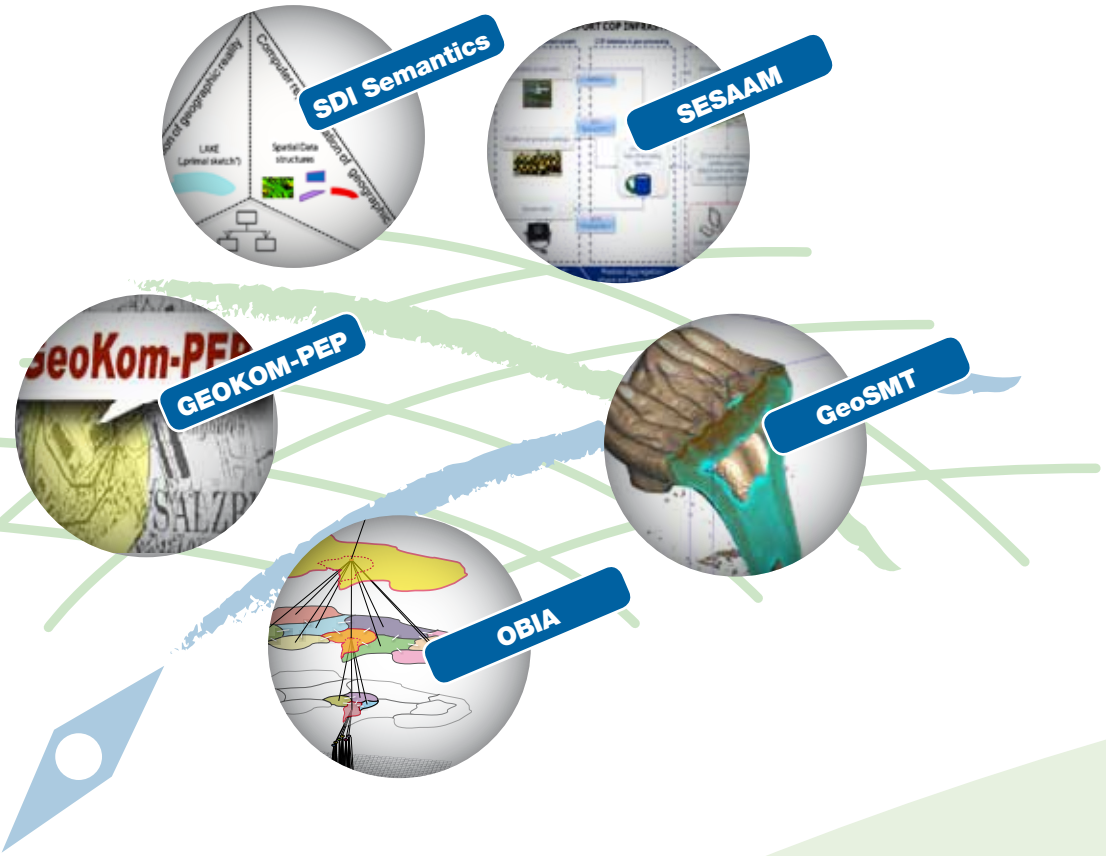
by David M. Mark, University at Buffalo, National Center for Geographic Information and Analysis

» *Geographic Information Science (GI Science) may be defined as the basic research field that seeks to redefine geographic concepts and their use in the context of Geographic Information Systems (GIS).*
GI Science also examines the impacts of GIS on individuals and society, and the influences of society on GIS. GI Science re-examines some of the most fundamental themes in traditional spatially-oriented fields such as Geography, Cartography, and Geodesy, while incorporating more recent developments in Cognitive and Information Science. GI Science also overlaps with and draws from more specialized research fields such as Computer Science, Statistics, Mathematics, and Psychology, and contributes to progress in those fields. It supports research in Political Science and Anthropology, and draws on those fields in studies of Geographic Information and society.

> www.ncgia.buffalo.edu/giscidefn.html



On the following pages current projects are highlighted. Each project emphasises its position within the research programme and offers a brief summary with research focus and selected publications.



Project Highlights

Time & Space

Space and Time in GIScience ■
Global Change ■
Modelling Mobility ■

Spatial Data Infrastructures

European SDI ■
GeoICT & Society ■
Nature SDI*plus* ■
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Spatial Analysis and Modelling

GeoMS ■
GeoNT ■
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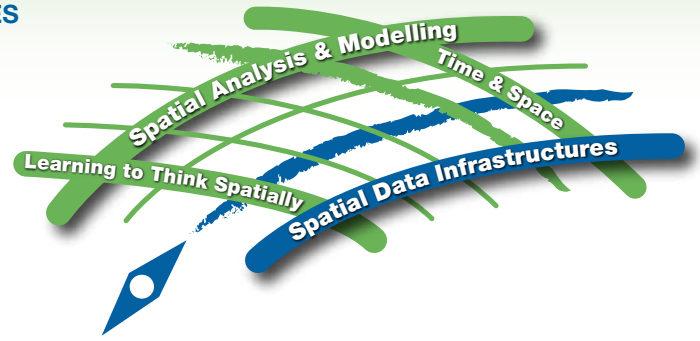
Learning to Think Spatially

CEEPUS ■
GI_EDU ■
GEOKOM-PEP ■ **28**
Schools on Ice ■

GIScience Conferences

GI_Forum ■ **34**
Learning with Geoinformation ■ **34**
IAMG 2011 ■ **35**
COGeo ■ **35**



SDI Semantics

Semantic Enrichment of Geodata: an Approach towards Producing Transferable Knowledge

Position within Research Programme
Spatial Data Infrastructures (SDI) – a new perspective on geospatial information, supporting our societies, environments and economies. Increasingly we work with geo-portals – the user interfaces for spatial data infrastructures. Semantics are indispensable for linking human minds with digital information, and thus a key research topic!

Mariana Belgiu
Cumulative (paper based) PhD at the University of Salzburg

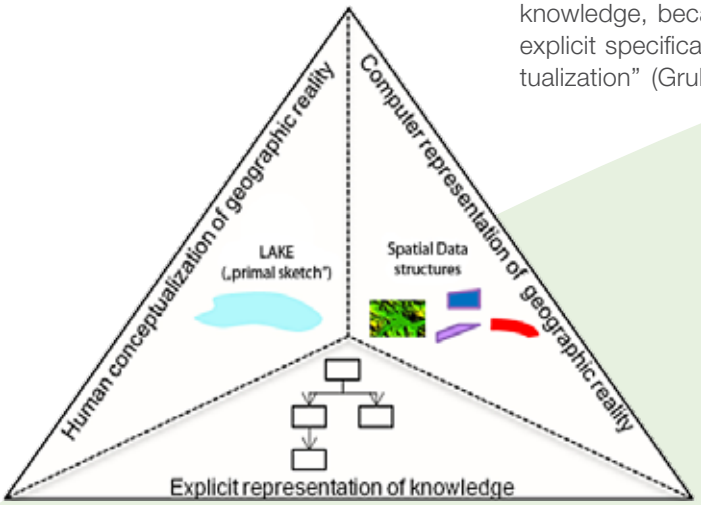
Supervisor
Prof. J. Strobl (University of Salzburg and ÖAW-GIScience)

Research focus

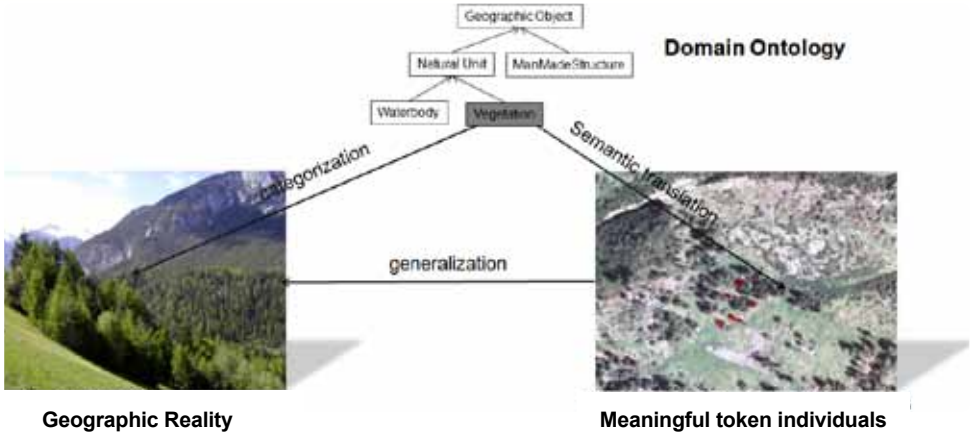
This PhD-project focuses on semantic mapping between the ontology classes formalizing the spatial entities and the field representation of geographic reality in order to produce transferable knowledge. This project is linked to the core area "Spatial Data Infrastructures (SDI)" of the research programme and also into the field of "Object-based Image Analysis (OBIA)".

In the last years, GIS and Remote Sensing made important progress in terms of data gathering, processing and analysis. Yet the ontological status of data sets remains an open issue. This problem prevents both vertical integration and inter-domain translation of information. In digital image interpretation the main challenges are to provide appropriate model for an objects to be found in the image and to make this model transferable. We can understand the information content of an image due to our implicit knowledge. How could we make this implicit knowledge explicit? A robust ontological structure is seen as the solution to formalize domain specific knowledge, because it enables a "formal explicit specification of a shared conceptualization" (Gruber, 1993). Thus, an on-

» Mariana Belgiu, currently in her initial stages of her PhD, is a role model as a dedicated individual as well as a future GIS professional with very high academic standards. She received several awards for her research:
second place for her thesis on "Making Geographic Resources Discoverable – an Approach towards a Streamlined Metadata Generation Process". This award from the Austrian Umbrella Organization for Geographic Information (AGEO) aims to ackknowledge outstanding final thesis research in Geographic Information.
In 2009, Mariana has also been chosen as the top Salzburg ESRI Development Center student for 2009 due to her outstanding achievements and contributions.



Geographic reality: from human conceptualization to computer representation



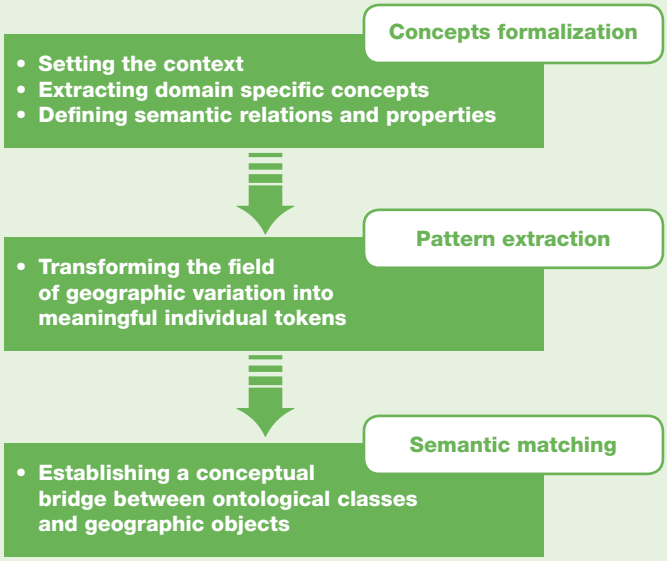
Semantic matching between the formalized categorization and the meaningful individual tokens extracted from field representation of geographic reality

tology enables links between conceptual models and reality, and facilitates projection of domain knowledge onto other conceptualizations.

Approach

This research work is an ontology-driven approach for linking meaningful objects extracted from Earth Observation data with domain specific concepts. The approach starts with the formalization of concepts by defining semantic relations and properties. As the main goal is to develop a transferable model, the consistency and cognitive granularity of the developed ontology has to be considered. The next step consists of transforming the field of geographic variation into meaningful individual tokens. The last task is to establish a conceptual bridge between ontological classes and geographic objects.

The ontology facilitates domain conceptualization by breaking it down into concepts, rules and relations. The concepts of interest can be extracted using Natural Language Processing techniques or making use of the experts' knowledge. Atomic concepts are interrelated into complex entities by means of semantic relations and properties with the help of Protégé Ontology Editor. The resulting "formal classification", representing the consensual knowledge of a domain facilitates knowledge sharing and reuse.



Methodological approach

Selected Publications

MITTLBÖCK M., BELGIU M., 2009, Facing semantic interoperability issues within the geospatial disaster management domain. In: Car A., Griesebner G., J. Strobl (Eds.): Geospatial Crossroads @ GI_Forum _09. Proceedings of the Geoinformatics Forum Salzburg

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BELGIU, M., 2010, Austria's Geographic Data Conforms to INSPIRE, ESRI ArcNews online, summer issue, http://www.esri.com/news/arcnews/summer10articles/austrias-geographic.html.

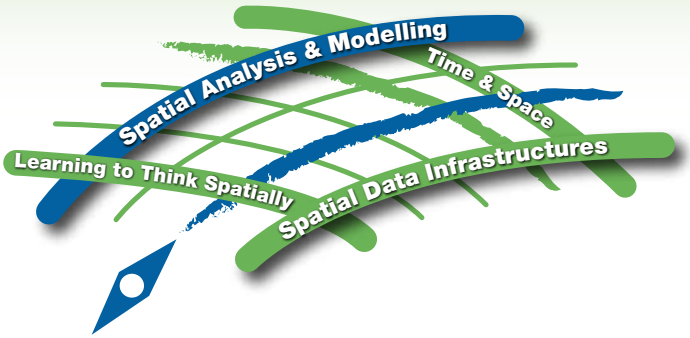
BELGIU, M., 2010, Sharing geographic data in Austria, Vector1 Magazine, http://www.vector1media.com/articles/features/15724-sharing-geographic-data-in-austria

BELGIU, M., MITTLBOECK, M., STROBL, J., 2010, Central Asia Geoportal – An ISO19115 complaint metadata catalogues for geographic information sharing. In: Proceedings of the Fourth Central Asia GIS Conference – GISCA'10, "Water, Risk, Energy and Landuse", Bishkek, Kyrgyzstan, 27-28 may, 2010.

MITTLBOECK, M., BELGIU, M., GRILLMAYER, R., 2010, ON A 2270:2010 von profil.AT zur ÖNORM und der technischen Validierung in einem GDI-Verbund. In: Strobl, J., Blaschke, T., Griesebner, G. (Eds.) (2010) Angewandte Geoinformatik 2010, Wichmann Verlag, Heidelberg, 125-130.

STROBL, J., BELGIU, M., NAZARKULOVA, A., 2010, Building an SDI as a Community Project – Challenges in emerging economies, GSDI 12 World Conference, Singapore, 19-22 October, 2010.

STROBL, J., MITTLBOECK, M., BELGIU, M., 2010, Nationale Geoportale: Metadaten-Standards als Grundlage des Qualitätsmanagements - am Beispiel von AGEOportal, Drei-Länder-Tagung, Wien, 1-3 Juli, 2010.



GeoSMT

Fossil Small Mammal Teeth as anchors in space-time modeling of species dissemination

Position within the Research Programme
From Macro to Micro
Geospatial research is -among others- defined by a 'geographical' range of scales. Spatial information exists beyond this range, and fundamental multidimensional methodologies can be developed by reaching out beyond traditional domains.

Robert Marschallinger
(Project Management)
Peter Hofmann

Cooperation
The research is conducted in cooperation with the University of Texas High Energy Computer Tomography Lab (UTCT) and with the Natural History Museum, Vienna (NHM). UTCT provides state of-the-art 3D scanning facilities and the NHM makes available its big pool of samples as well as the paleontological expertise.

> www.oeaw.ac.at/GIScience/projects

Objectives

Small mammal teeth ("SMT") are widely found in cenozioc sediments world-wide. Because of the good durability of these microfossils, SMT are used as stratigraphic markers as well as for researching the rapid evolution and paleogeographic spreading of small mammals.
One short-term goal of the GeoSMT project has already been accomplished: incorporating paleontological expert knowledge in 3D object based image analysis ("OBIA") to deduce neat SMT volume models from noisy, single-channel microtomography image stacks. This provides researchers with useable high resolution volume models of small mammal teeth and enables paleontologists and functional morphologists to include significant interior structures of SMT in their research. Combining the high precision species classification derived from the 3D models and the places/stratigraphy of discovery, the mid-term goal of the GeoSMT project is to model, with 2D+t geostatistics, the paleogeographical spreading dynamics of selected SMT species.

Research focus

Robust 3D models of small mammal teeth are considered keys in space-time modeling of species evolution and -dissemination as well as for paleo-climate modeling. To date, methods of morphological SMT classification comprise optical microscopy, electron microscope investigation and, increasingly also micro computed tomography ("µCT"), ending up with images and descriptions of the fossils and 3D surface models of their exterior shapes. Recent advances in µCT have drastically improved the spectral and spatial resolution of this non-destructive analysis method, making it a promising data source for 3D volume modeling of SMT. Providing access not only to the outer surfaces, but also to the interior of teeth, we consider the resulting 3D models a novel basis for SMT classification and communication of research results. These models can be shared among the research community via internet technology. Yet, problems existed in robustly and automatically classifying, from the partly noisy µCT image stacks, major tooth components like enamel, bone and pulp cave.

» A work flow has been established for extracting, from µCT data, the most important morphological features in SMT. Making it open to the scientific community, this innovative approach has been published in the renowned Geoinformatics journal "Computers & Geosciences". The digital version of this SCI indexed publication can be downloaded via: http://dx.doi.org/10.1016/j.cageo.2010.07.011. Main components of the published work flow are microtomography, 3D OBIA, and voxel modeling.

Results

µCT is used to scan SMT (overall sizes typically 2-4mm, voxel sizes about 2 microns). The resulting raw voxel models are subject to 3D image processing by OBIA, ending up with 3D volume models of SMT classified by material properties. Complementing the traditional techniques mentioned above, these 3D models can be qualitatively and quantitatively analyzed in an unprecedented manner: they can be viewed and sliced in any direction and peeled by material properties, volumes and surface areas can be extracted while the involved fossils remain in good order.
In figure 1, µCT data of a SMT sample (Vasseuromys Pannonicus) are presented

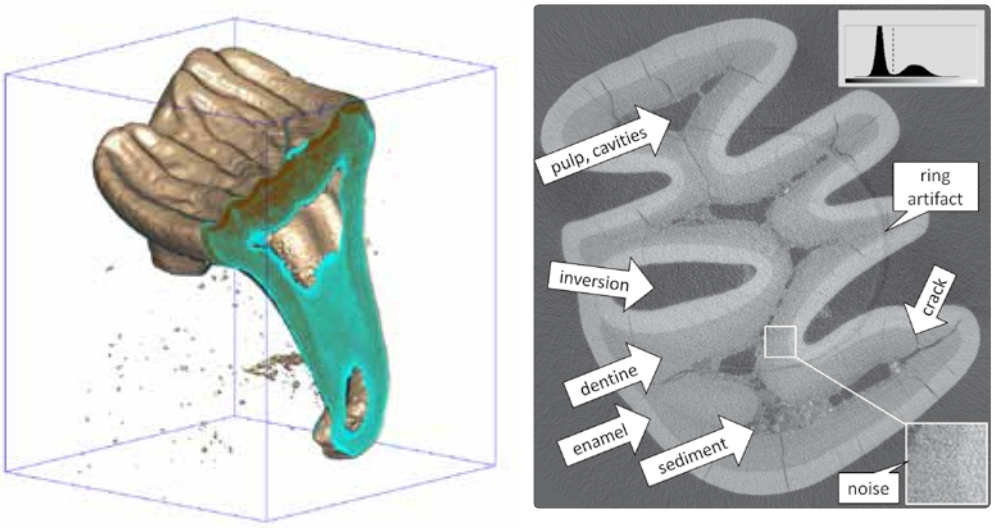


Fig. 1:
a (left) SMT 3D model,
b (right) uCT slice. See text for details

a) (left) vertically sliced SMT 3D model combining non-classified, tooth-internal volume (greenish colors) and tooth surface (brownish colors). While surface modeling (which is currently state-of-art) provides paleontologists with highly sophisticated SMT surface details, volume modeling goes much in enabling the quantitative analysis of the total tooth.
b) (right) one horizontal slice of the same SMT model, portraying the major SMT components enamel, dentine and pulp. Natural degradation and µCT artifacts create substantial noise that prevents a successful classification using traditional, pixel-based image processing. OBIA is successful in generating neat and reliable 3D models of SMT main components.

A robust and automatic classification of dental components from more or less noisy µCT data stacks is imperative for deriving meaningful volume models. Due to natural SMT degradation and µCT signal distortion, the resulting image stacks cannot be adequately classified by pixel-based image processing methods. In contrast, OBIA, by incorporating paleontological expert knowledge on the principal topological arrangement of tooth components, yields stable classification results. The derived voxel models can then be forwarded to domain experts like paleontologists for further analysis of SMT.

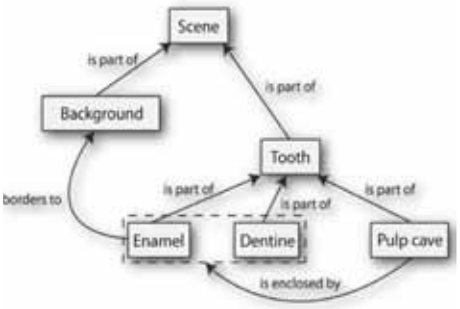


Fig. 2: scene ontology for SMT

Fig. 3 is a schematic graphical representation of the most important morphological features (enamel, dentine and pulp cave) of SMT and their principal spatial relationships. It acts as a general model of SMT and is used to realize OBIA rule sets, that is, to incorporate spatial and scale-dependencies respectively and to determine the general OBIA workflow (from Marschallinger et al., 2010).
The above volume model (a rectangular portion has been removed) comprises the three classes tooth enamel, tooth bone and pulp cave. It provides access to the interior structures of SMT, opening completely new analytical perspectives to paleontologists and functional morphologists.

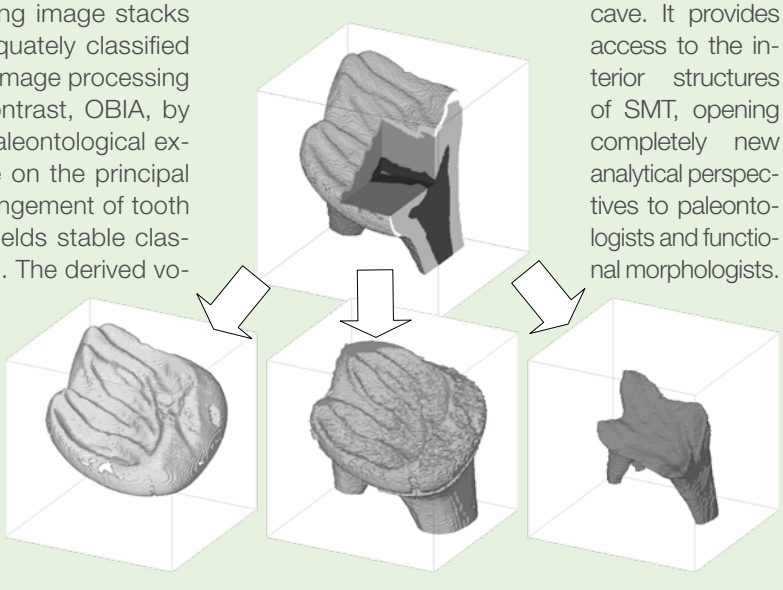


Fig. 3: slicing and peeling the classified SMT 3D model

Selected Publications

HOFMANN, P., MARSCHALLINGER, R., DAXNER-HÖCK, G. (2009) 3D volume modelling of fossil small mammal teeth using micro CT and object based image analysis., Computational Vision and Medical Image Processing VIPIMAGE 2009 (VIPIMAGE 2009, Porto 14.-16.10. 2009), pp 395-399.

MARSCHALLINGER, R.; HÖCK, G. (2009) 3D Rekonstruktion von fossilen Kleinsäugerzähnen mittels Hochenergiecomputertomografie - Methodik und Anwendungsmöglichkeiten. In: Wirbeltierpaläontologie, Arbeitskreis; Gesellschaft, in der Paläontologischen (eds.).

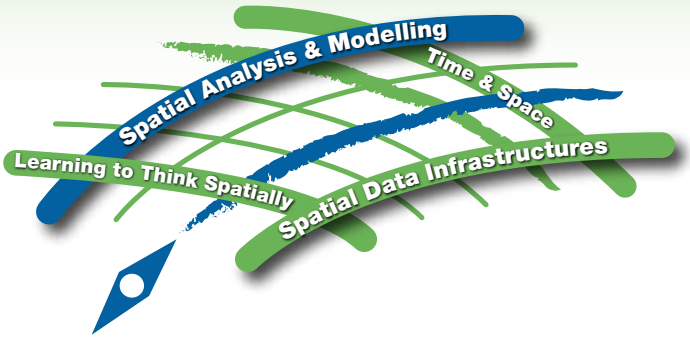
» MARSCHALLINGER, R., HOFMANN, P., DAXNER-HÖCK, G., KETCHAM, R.A. (2010, in press) Solid modeling of fossil small mammal teeth. Computers and Geosciences (Elsevier) doi:10.1016/j.cageo.2010.07.011

Selected Presentations

HOFMANN, P. & R. MARSCHALLINGER (October 15, 2009) 3D volume modelling of fossil small mammal teeth using micro CT and object based image analysis. Lecture: VIPIMAGE 2009, Porto/PORTUGAL.

HOFMANN, P. (September 5, 2009) 3D reconstruction using OBIA. Lecture: THESIS Graduate School Workshop “New tools of recording and quantifying fabrics in geomaterials – a basis for understanding geological processes”, TU Munich/GERMANY.

MARSCHALLINGER, R. (September 5, 2009) 3D reconstruction by precision serial lapping. Lecture: THESIS Graduate School Workshop “New tools of recording and quantifying fabrics in geomaterials – a basis for understanding geological processes”, TU Munich/GERMANY.

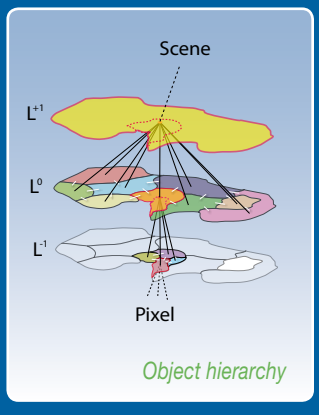


Object Based Image Analysis

3D and 4D modelling using object-based image analysis

Position within the Research Programme
Research questions of Spatial Analysis and Modelling address segmentation-based information extraction from remotely sensed imagery, multidimenional geostatistics and the regionalization of dynamic processes. Methods for flexible regionalization and work with multi-scalar data receive special consideration. Time & Space aspects of object-based change detection and monitoring investigate the temporal behavior of the objects, individually linked via the time axes.

Josef Strobl
Peter Hofmann
(project management)



Object hierarchy

> www.oeaw.ac.at/GIScience/projects

Objectives

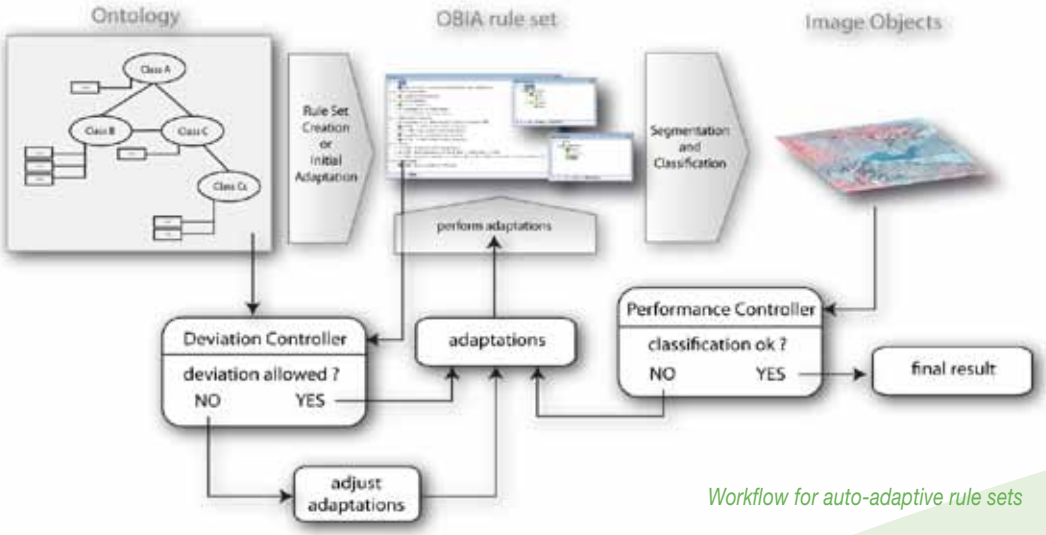
Scientific imaging has emerged as an efficient way to characterizing particular entities, together with their shapes and configurations. In many cases these 'snapshots' of reality can contribute to generate and enhance models and theories used in various disciplines.

In contrast to standard image processing concepts, Object Based Image Analysis (OBIA) allows to take into account spatio-temporal and inter-scale relationships of objects. It enables the incorporation of relevant formalized domain expertise, as well as addressing issues of heterogeneity, scale, connectivity and quasi-equilibriums in landscapes or other complex systems.
Recent research results in several disciplines demonstrate the potential and advantages of OBIA and simultaneously reveal similarities in methodology when applying the principles of OBIA. Nevertheless, a variety of theoretical and methodological research questions arise and are worthwhile to be investigated.

Case Studies

Investigations on the development of robust self-adapting rule sets

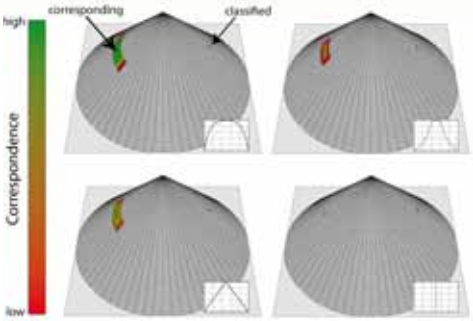
These rule-sets should be capable to react autonomously on unforeseen changes in images. We investigate how principles and methods of agent based paradigms can be used in OBIA to make rule sets more autonomous and flexible.



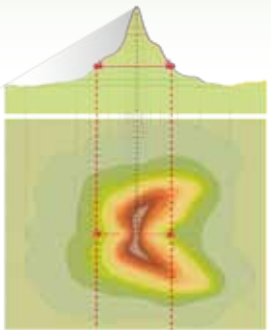
Workflow for auto-adaptive rule sets

Investigations on knowledge-based reconstruction of shaded land cover areas in high mountainous satellite images

In mountainous regions shaded areas can hardly be classified. Existing methods of topographic correction are not satisfying. We have developed and implemented a method which is capable to fill "shaded gaps". It reconstructs land cover types in shaded areas of high mountainous areas using remote sensing data and respective expert knowledge. The current prototype allows assigning shaded objects to the class of their corresponding illuminated object by evaluating their slope, aspect and elevation. Research has been done using ASTER DGMs and LANDSAT TM images of Kyrgyzstan.



Corresponding objects by elevation, aspect and slope through different fuzzy-definitions of „correspondence“



Hypothesis: Objects of same elevation (and slope) belong to the same LuLc-Class if their aspect is different by 180°

Unclassified objects in shaded mountainous areas

Object-based land cover classification for hydrological applications (Kyrgyzstan):

For estimating run-off parameters and doing run-off simulations a variety of hydraulic and non-hydraulic parameters are necessary. Besides the topography of an area under investigation different types of land cover have impact on the run-off model. For this purpose an object based land cover classification in the Alai using ASTER image data has been performed.

Object-based vegetation classification for determination of green spaces in Bishkek (Kyrgyzstan)

When using remote sensing for urban planning purposes, only data of high or very high resolution (VHR) can be used. OBIA avoids the typical effects that come along with a pixel based analysis of VHR data (salt and pepper effects and low classification performance). With OBIA we have demonstrated its advantages for the determination of green spaces and the Green Index in Bishkek by analyzing a subset of a GeoEye-1 scene on a per-object basis. Through a fuzzy classification approach it was possible to estimate the reliability of the underlying classification and to determine the green index.

Landcover classification in rural (left) and urban (right) areas. Left: for hydrological purpose, right for urban planning purpose

Key research questions

Integration of (world-) knowledge in OBIA

How can formal concepts (ontologies) be integrated into OBIA and are these concepts relevant for OBIA? How can formal concepts be “translated“ into OBIA-rule-sets? Are there canonical ontologies and rules, which are image dependent and to what degree? How can space-time-concepts be incorporated in OBIA for monitoring and change detection? How context dependent are formal ontologies and OBIA-rules?

Robust and auto-adaptive rule sets

How far can once-created OBIA-rule-sets be transferred to comparable images with slightly changed imaging conditions? Is it possible to generate rule sets which are capable to adapt themselves to changing imaging conditions? How robust would such auto-adaptive rule sets be? What theories, instruments and methodologies are available in order to realize auto-adaptive rule-sets?

OBIA Highlights 2009/2010

A new and innovative method for measuring the robustness of OBIA rule sets has been developed by a team of the Salzburg GIScience Research Cluster.

This method is essential for evaluating and developing robust rule sets. It has been submitted and accepted to the “International Journal of Remote Sensing” with an impact factor of 1.089. The outcomes of our research in analyzing µCT scans were published in “Computers & Geosciences” with an impact factor of 1.142.

The developed methods for analyzing petrographic micrographs were published in “Microscopy”, a well-known series with state of the art articles about scientific, technological and educational aspects of Microscopy.

Long-term vision

(1) to investigate the integration of formalized spatio-temporal domain expert knowledge in OBIA to enhance monitoring and monitoring results.

(2) to develop methods for creating robust auto-adaptive rule sets to increase the automation of image analysis and enabling to automatically analyze huge image archives reliably.

Selected Publications

HOFMANN, P., T. BLASCHKE, J. STROBL: Quantifying the robustness of fuzzy rule sets in object based image analysis. International Journal of Remote Sensing [http://www.tandf.co.uk/journals/titles/01431161.asp]. (In print, pages pending)

MARSCHALLINGER, R., P. HOFMANN, ST. GOLASZEWSKI, J. KRAUS, M. KRONBICHLER, A. KUNZ (2009): Multiple sclerosis: a multidisciplinary approach to the analysis, 4D modelling and spatiotemporal simulation of lesion pattern evolution. In: Proceedings of SEECCM 2009, 2nd South-East-European Conference on Computational Mechanics. Rhodes, Greece, 22 - 24 June 2009.

MARSCHALLINGER, R, P. HOFMANN, G. DAXNER-HÖCK (2009): 3D reconstruction of small mammal teeth fossils by combining micro CT and object based image analysis. In: Proceedings VipIMAGE2009 - II ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing.

MARSCHALLINGER, R., P. HOFMANN, G. DAXNER-HÖCK, R. A. KETCHAM (2010): Solid modeling of fossil small mammal teeth. In: Computers & Geosciences (Accepted).

MARSCHALLINGER, R., P. HOFMANN (2010): Object based image analysis to petrographic micrographs. In: Microscopy: Science; Technology, Applications and Education. (in print, pages pending).

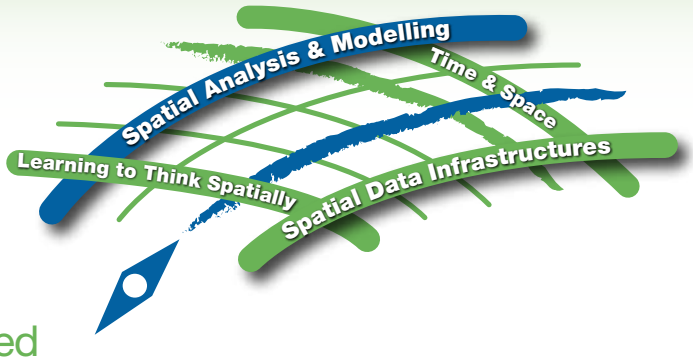
STROBL, J., P. HOFMANN, A. NAZARKULOVA (2010): Green spaces in Bischkek – a satellite perspective. In: A. A. Abdykalykov and Strobl, J. (Eds.): proceedings of the 4th Central Asia GIS Conference – GISCA'10, 27th – 28th May 2010, Bischkek, pp.32 – 41.

HOFMANN, P., J. STROBL , A. NAZARKULOVA, (2011): Mapping green spaces in Bishkek – how reliable can spatial analysis be? In: Proceedings of the IEEE Joint Urban Remote Sensing Event 2010, Munich (submitted, pages pending).

Selected Presentations

HOFMANN, P. & R. MARSCHALLINGER (OCTOBER 15, 2009): 3D volume modelling of fossil small mammal teeth using micro CT and object based image analysis. Lecture: VIPIMAGE 2009, Porto, Portugal.

HOFMANN, P. (NOVEMBER 7, 2009): Erkennen und 3D rekonstruieren von MS Läsionen mittels OBIA aus MRT-Daten. Lange Nacht der Forschung, Salzburg, Austria.



SESAAM

Geo-Spatially Enhanced Situational Awareness for Airport Management

Position within the Research Programme

Within the aim of validating abstract Time & Space concepts the goal of the SESAAM project is to develop and test methods for creating and providing an unambiguous situational awareness among airport actors, based on a complete operational picture (COP).

BREP and NURBS based solid modeling is used real-time visualization and spatiotemporal analysis of aircraft and vehicle motions at an airport.

Moving objects can be interactively tracked and queried and possible interactions can be analysed in a virtual, photorealistic 3D environment in real time.

Fritz Zobl
Mariana Belgiu
Robert Marschallinger

Project Partners

Z_GIS – Centre for Geoinformatics, University of Salzburg (coordinator); Engineering Geodesy Group, Institute of Geodesy and Geophysics, Vienna University of Technology; AviBit; Salzburg Airport

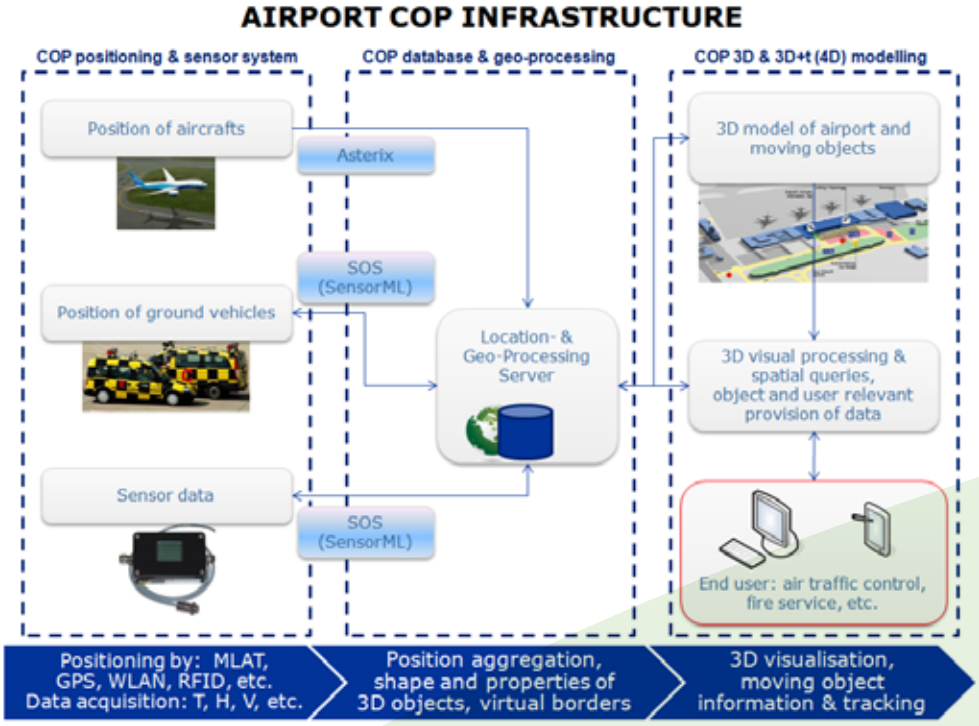
> www.oeaw-giscience.org/projects

Funded Project
FFG0046/SESAAM

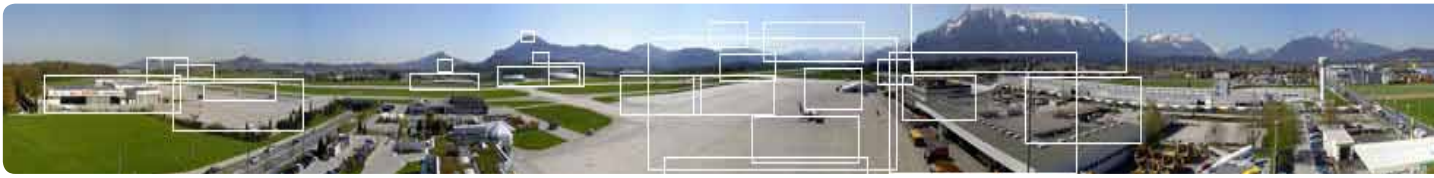
Objectives

The goal of this project is to develop methods for assembling and providing a complete operational picture (COP) for the management of all relevant movements on an airport.

An open system architecture facilitates efficient cooperation between airport management, air traffic control, emergency units, and additional actors in the multimodal setting of an airport. The COP contributes significantly to enhanced operation efficiency and airport ground traffic security as well as to the reduction of delays.



Proposed infrastructure to establish a complete operational picture (COP) on an airport



http://www.salzburg-airport.com/livecam.html

Research focus

The main goal of SESAAM is to research the methods required for establishing a COP on airports. The keys – and the special challenges – are (i) the suitable combination of expensive positioning technology (e.g. multilateration) for safety-critical areas/tasks and low-cost technology (RFID, tightly coupled WLAN/GPS) for others, and (ii) the development of CAD&GIS methods for processing and visualising the COP using an open system architecture but at the same time fulfilling highest requirements regarding completeness, reliability, and low latency. The information contained in the COP (movements, positions, meteorological data, number of persons in an airplane) must be linked using spatial processing methods such that the COP supports airport specific workflows (e.g. fleet management) as well as general ones (e.g. coordination of emergency actions, or time table management).

ÖAW-GIScience research focus will be especially on developing methods for:

- allocating user relevant information efficiently in a 3D virtual environment in order to provide control tower operators, fire services, etc. with all relevant information especially at low visibility conditions or in case of emergency.
- using 3D and 4D (3D+t) technology & methods in an airport environment to facilitate the management of moving objects (aircrafts and vehicles) on an airport.

To visualise and analyse moving objects (planes and vehicles) as well as object information in realtime, a 3D visualisation system will be developed by ÖAW-GIScience. Elements of the COP system are (i) a database containing Object IDs, current position (including accuracy information) and object-properties such as car or plane type, number of passengers, etc.) and (ii) a 3D model of both, the airport and the moving objects. To enable complex spatial queries like collision avoidance warning, headroom analysis for vehicles moving below bridges, into garages or under airplane wings, the 3D model is developed as a solid model. The vehicle track history enables, in retrospect, the visualization and analysis of critical situations in a realistic 3D environment.

Testbed Salzburg Airport

Methodology development, positioning set-up as well as the 3D+t visualisation system will be performed in the testbed salzburg airport. The results of SESAAM will directly contribute to increasing airport operation efficiency and reducing air traffic delays (e.g. due to holding pattern) without compromising safety.

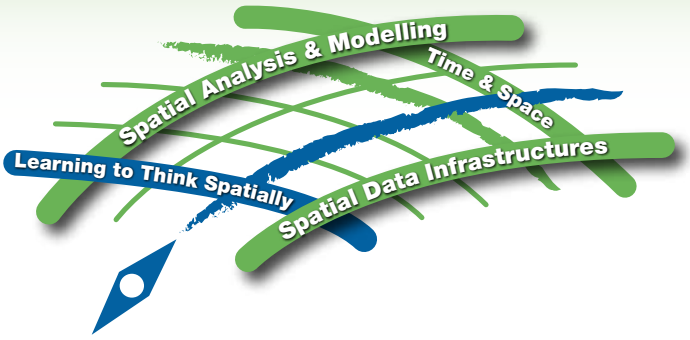
» Austrian Federal Ministry for Transport, Innovation and Technology. Austrian Aeronautics Research and Technology Programme TAKE OFF.

The Austrian Aeronautics Programme TAKE OFF is designed to maintain the competitiveness of the Austrian aeronautical industry and its suppliers by generating specific expertise and networking the relevant industrial, university and non-university actors. The programme supports the establishment of strategic partnerships at national, European and international level and the development of new markets. This approach is designed to increase turnover of the Austrian aeronautical sector, secure high-tech development and production in Austria and create high-quality jobs in the long term.

http://www.ffg.at/content.php?cid=853

TAKE OFF is a programme of the Federal Ministry for Transport, Innovation and Technology (BMVIT) managed by FFG.

Copyright: BMVIT



GEOKOM-PEP

Geovisualisation and communication in participatory decision processes

Position within the Research Programme

Developing and evaluating GI-based, collaborative learning – as well as participatory planning environments is a very recent R&D field. The GIScience Institute at the Austrian Academy of Sciences contributes with a wide range of research activities with a specific focus on supporting learning processes by including GI as a basis for building hypotheses as well as background of decision making. Thinking spatially by using GI here is thought to enhance problem solving capabilities, in both scientific and everyday settings, especially for laypeople. Learning to think spatially by developing a sense of spatial citizenship is a transversal research theme at ÖAW GIScience.

Thomas Jekel
Robert Vogler, Inga Gryl, Sabine Hennig, Gilbert Ahamer, Gudrun Wallentin, Noemi Müller, Lisa Sönser

Project Coordinator
Austrian Academy of Sciences, Institute for Geographic Information Science

> projects.giscience.at/geokom-pep

Funded Project
SPA/02-78/GEOKOM-PEP

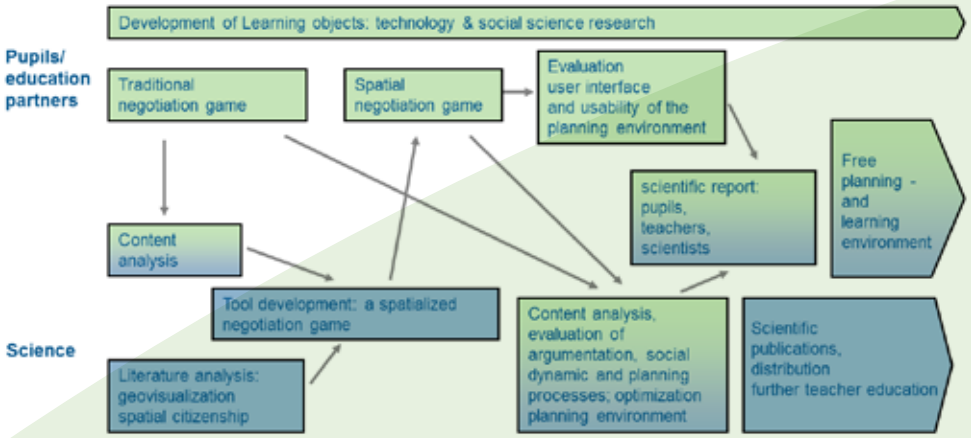
Research focus

» GEOKOM-PEP is a successful research-education-cooperation in a series of funded projects started by the Schools on Ice project in 2007 and financed by the Austrian Federal Ministry of Science and Research under the Sparkling Science programme.

The project „GEOKOM-PEP" develops a free online communication and discussion platform that supports nonexperts in negotiating collaborative and discoursive spatial planning visions. At the core of this platform is the integration of digital geoinformation in planning processes for lay users. We presume that single statements of different interests in a negotiation process can be presented and discussed more precisely and powerful with individual maps. On the other hand, a collaboratively developed spatial planning concept is more meaningful when communicated via a professional map. The platform will serve as a spatial communication forum which supports committed citizens in:

1) adding own ideas in a spatial planning process,
2) discussing these ideas with other participants and
3) finalising a democratically accepted spatial vision.

Furthermore, this tool will be useful as a digital learning platform in the framework of geography education based on the assumption that collaborative spatial planning represents a constructivist learning process. The online availability links to "blended learning" concepts in secondary education. The platform therefore will have a double function as a learning environment as well as a content management system with a spatial dimension.



Project Structure

Pupils working collaboratively in the first project week

GIScience analysis by pupils

Approach

In addition to the technical challenges in the tool development process, the social sequences of the planning procedure have to be conceptualized, tested and adjusted. This is achieved in a multi-level R&D process with pupils from two partner schools engaging in negotiation games. To start with, 40 pupils collaboratively developed a visionary spatial planning concept for Schallmoos (a district of Salzburg) without using digital maps within the discussions. Using the experiences of this planning process and a literature analysis regarding tool development, a concrete requirement specification catalogue for the GI-based platform has been built together with pupils. Based on these foundations, a prototype platform integrating geovisualization in a Wordpress based system was developed. In this step, pupils have been involved intensively and self-dependently in the context of internships at the GIScience institute.

Progress

The platform prototype is currently being tested and adjusted before it will be used in a second spatial negotiation game with about 40 new pupils. The difference between these two negotiation games is the use of this "spatialized" communication platform instead of a conventional online discussion forum. Digital maps will be used in every discussion- and planning step by every participant. This second planning procedure has two purposes. First, the platform prototype finally can be tested and adjusted in regards to conceptual leaks and second, the discussion processes will be recorded, analyzed and compared to discussions without the support of geovisualization, using methods of qualitative content analysis. The a priori assumed surplus value of digital maps in this setting can be tested empirically and, in case of its existence, defined more exactly. In these further steps (platform adjustment and evaluation) pupils will again be involved actively.

» *I was impressed by the possibility to work in a small research and development team at the GIScience Institute in a real research project. I felt like a full team member, a scientist, not just a trainee!*

(Lisa Sönser, 17 years old, student at the BG Salzburg-Nonntal)

Selected Publications

VOGLER, R., AHAMER, G. & JEKEL, T. (2010): GEOKOM-PEP. Pupil led research into the effects of geovisualization. In: Jekel, T., Koller, A., Donert, K. & Vogler, R. (eds.): Learning with Geoinformation V. Heidelberg: Wichmann, pp. 51-60.

JEKEL, T., KOLLER A. & STROBL, J. (in print): Research institutions linking into schools. Cooperations for GI in secondary education. In: Milson, A., Kerski, J. & Demirci, A. (eds.): The world at their fingertips. GIS in secondary education. New York: Springer.

JEKEL, T., GRYL, I. & DONERT, K. (2010): Spatial Citizenship. Beiträge von Geoinformation zu einer mündigen Raumaneignung. In: Geographie & Schule , 32, 186, 39 -45.

GRYL, I., JEKEL, T. & DONERT, K. (2010): GI and Spatial Citizenship. In: Jekel, T., Koller, A., Donert, K. & Vogler, R. (eds.): Learning with Geoinformation V. Heidelberg: Wichmann, pp. 2-11.

Selected Presentations

GRYL, I.: „GI and Spatial Citizenship" - presentation at "Learning with geoinformation V" conference, Salzburg, 2010-07-08.

HENNIG, S.: „User needs & application development. Demands & requirements, gaps & improvements" - presentation at "enviSDI summerschool", Salzburg, 2010-07-01.

JEKEL, T.: „Critical GIS & Spatial Citizenship" - presentation at "Annual Meeting of the Association of American Geographers", Washington, 2010-04-15.

VOGLER, R.: „GEOKOM-PEP. Pupil led research into the effects of geovisualization" - presentation at "Learning with geoinformation V" conference, Salzburg, 2010-07-08.

Funded projects

Current projects in 2009 - 2010

Prof. Dr. Josef Strobl,
Director ÖAW-GIScience

» *Basic research needs validation and verification. Projects funded through national and international programmes provide frameworks for collaborating with partners from science as well as application domains, with the aim of translating research results into practice, and to identify new questions and challenges for research.*

digital:earth:eu
Comenius Network for Teaching with GeoInformation in Schools

Duration: November 2010 – October 2013
European Commission, Lifelong Learning, Comenius Programme
Within the project ÖAW-GIScience leads a WP on the development of classroom pedagogies using GI and contributes in the fields of quality assurance and conference organization.

GEOKOM-PEP
Geovisualisation and Communication in Participatory Decision Processes

Duration: October 2009 – September 2011
Austrian Federal Ministry of Science and Research. Sparkling Science Programme
ÖAW-GIScience is coordinating this project with a focus on spatial citizenship and develops a collaborative and discoursive spatial planning environment based on virtual globes.

SESAAM
Geo-Spatially Enhanced Situational Awareness for Airport Management

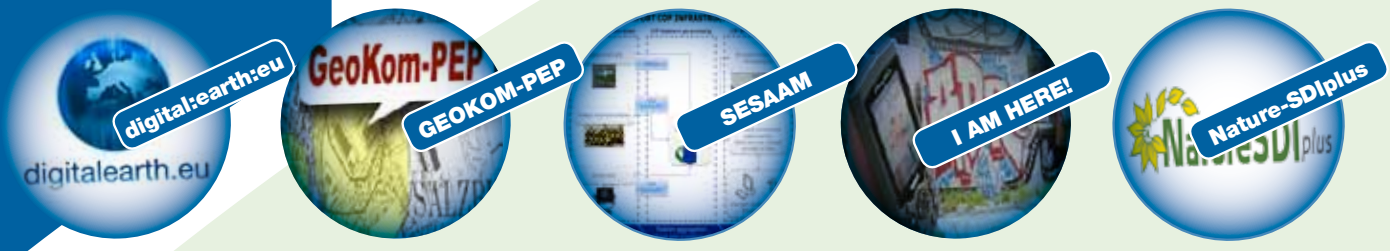
Duration: March 2010 – February 2012
Austrian Federal Ministry for Transport, Innovation and Technology. Austrian Aeronautics Research and Technology Programme TAKE OFF
The ÖAW-GIScience team will contribute its expertise in 3D and 4D modelling, as well as user optimized visualization and analysis. The project is coordinated by the Centre for Geoinformatics (Z_GIS), University of Salzburg.

I AM HERE!
Participative Approaches to Analyze the Spatial Behavior of Adolescents in the City

Duration: September 2010 – July 2012
Austrian Federal Ministry of Science and Research. Sparkling Science Programme
ÖAW-GIScience will bring in its expertise in spatial citizenship and develop the pedagogic concept coordinated by the University of Natural Ressources and Life Sciences, Institute for Landscape Development, Recreation and Conservation Planning.

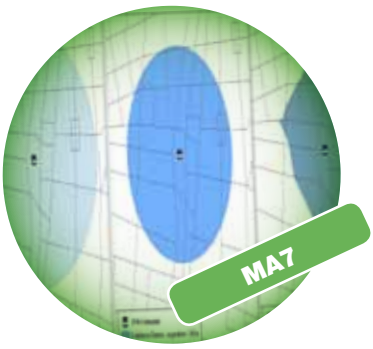
Nature-SDIplus
Best Practice Network for SDI in Nature Conservation

Duration: October 2008 – July 2011
Commission of the European Communities Directorate-General Information Society and Media. eContentplus Programme
The project is coordinated by GISIG. Based on the affordances of nature data users, best practice examples and in close collaboration with INSPIRE, ÖAW-GIScience develops in this project data models and metadata profiles for an SDI on nature conservation in order to harmonise national and sectoral datasets across Europe.



Projects completed in 2009 - 2010

Schools on Ice
„Globaler Wandel
in Polar- und Hochgebirgsgebieten“
Duration: 01.07.2007 - 30.06.2009
Funding Organization: Austrian Federal Ministry of Science and Research. FER-MAP. Franz Josef Land Environment Research, Monitoring and Assessment Programme. Austrian Initiative to the international Polar Year IPY 2007/2008.
Within the ÖAW-GIScience research agenda, ‘Schools on Ice’ is closely linked to the idea of enhancing spatial thinking capabilities, with a focus of communicating spatially explicit information on climate change to a wider public. „Schools on Ice“ was a cooperative project of science and education sectors and a contribution to the International Polar Year (IPY) and also has been a pilot project for the Sparkling Science framework.
The project was awarded special recognition by the Federal Minister of Science and Research Johannes Hahn in 2008. Project outcomes and models have contributed to the successful application of GEOKOM-PEP, a Sparkling Science project, and have been recognized by the inclusion of project staff in a lecture/lab/excursion of the University of Hamburg, Department of Pedagogics in 2010.
> http://www.schoolsonice.oeaw.ac.at



MA7
Modelling Potentials
for Central Facilities in Vienna
Duration: 01.01.2009 - 30.09.2009
(Funding Organization: MA7 Wien)
This project applied the modelling of customer potentials to facilities like public transport stations for a part of the Vienna urban area. The results and cartographic visualizations are the basis for profound assumptions on the quality of service supply and reachability of stations.
> http://www.oeaw-giscience.org/download/Bericht_Potenzialmodelle_fuer_zentrale_Einrichtungen.pdf

GIST-CroHE
GIScience and Technology in Croatian Higher Education
Duration: 01.09.2007 - 30.11.2009
Funding Organization: European Commission. Education and Training. The Tempus Programme.
The main objective of the GIST-CroHE (Geographic Information Science and Technology in Croatian Higher Education) project was to revise the existing but not yet implemented MSc programme in Geographic Information Science & Technology (GISc&T) in accordance with the Bologna Declaration for the Faculty of Geodesy at the University of Zagreb (FG). Project progress to date: The curriculum in MSc in Geoinformatics has been revised and approved by the Board of Education and Faculty Council Of the Faculty of Geodesy at the University of Zagreb, and presented to staff, students and external audience. Please find more information here:
> http://tempus.geoinfo.geof.hr

Networking Activities

International visibility through research cooperation

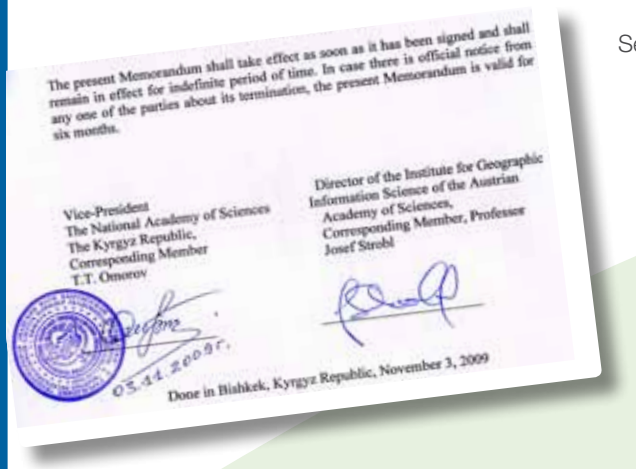
Progress in research today is only achievable when reaching critical mass. Part of this is contributed through exchange within a network of partner institutions sharing common goals and topical orientation. Due to the international orientation and backgrounds of our research team, we intensively work on building up a valuable and strong network of ties to related institutions of interest worldwide.

These partners join ÖAW-GIScience in international projects, through exchange of faculty, offering mutual support in individual projects, or serving as application domain experts for the validation of research outcomes in applied contexts.

Memorandum of Understanding and Formal Agreements

The primary mission of these cooperation agreements is maintenance of favorable conditions for sharing new technology, ideas and information, as well as conducting joint scientific research under mutually beneficial circumstances.

- Bulgarian Academy of Sciences, Institute of Geography
- Chinese Academy of Sciences, Department of Geography and Ecology, Urumqi
- Heidelberg Mobil International
- National Academy of Sciences of the Kyrgyz Republic
- Twinning Project on Water Framework Directive between Slovenia, Germany and Austria


The present Memorandum shall take effect as soon as it has been signed and shall remain in effect for indefinite period of time. In case there is official notice from any one of the parties about its termination, the present Memorandum is valid for six months.

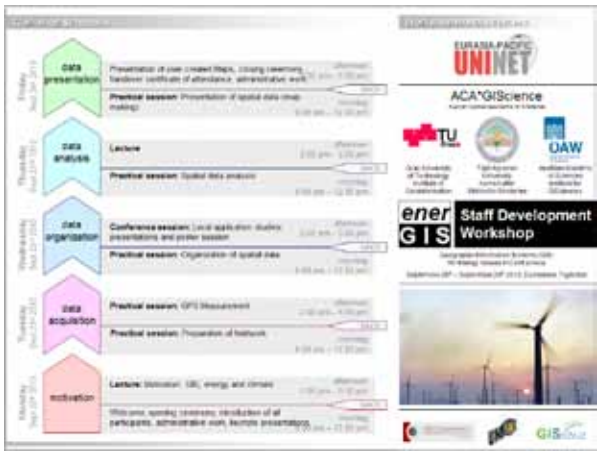
Vice-President
The National Academy of Sciences
The Kyrgyz Republic,
Corresponding Member
T.T. Omorov

Director of the Institute for Geographic Information Science of the Austrian Academy of Sciences,
Corresponding Member, Professor
Josef Strobl

05.11.2009 г.

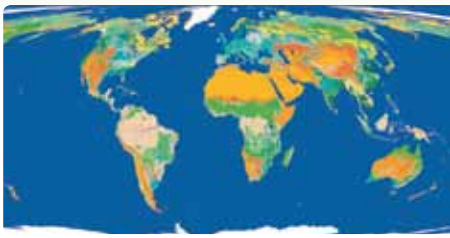
Done in Bishkek, Kyrgyz Republic, November 3, 2009

International Workshop Organization funded by the Eurasia-Pacific Uninet in Central Asian Regions



openSolarCA'09: Bishkek,
August 24 - August 26, 2009

enerGIS'10: Dushanbe,
September 20 - September 24, 2010



http://geography.usgs.gov/gcw/fig7a.jpg

Partners in funded joint projects

- Akademisches Gymnasium
- AviBit
- BG Salzburg-Nonntal
- Danube University Krems
- digital:earth:at - Centre for learning and teaching Geography and Geoinformatics
- Engineering Geodesy Group, Institute of Geodesy and Geophysics, Vienna University of Technology
- Federal Chancellery Austria
- Geographical Information Systems International Group (GISIG)
- INRP Lyon
- International Centre for Integrated Mountain Development (ICIMOD)
- Jagiellonian University, Institute of Geography and Spatial Management
- National Park Berchtesgaden
- Salzburg Airport
- University of Education Salzburg, Department of Secondary Schools
- University of Koblenz, „Lehreinheit Geographie“
- University of Natural Resources and Life Sciences, Institute for Landscape Development, Recreation and Conservation Planning
- University of Salzburg, Z_GIS Centre for Geoinformatics
- University of Zagreb, Faculty of Geodesy
- Vienna University of Technology, Institute of Geodesy and Geophysics

Non-funded cooperation

- Austria-Central Asia Centre for GIScience, Bishkek, Kyrgyzstan
- Christian Doppler Klinik, Neurological Department
- Ludwig-Maximilians University Munich, Department of Geo- and Environmental Sciences
- Middle East Technical University, Department of Geodetic and Geographic Information Technologies
- Natural History Museum Vienna, Department of Geology & Palaeontology
- Research Reactor FRM-II, Technical University Munich, Germany
- Researchstudios Austria - Studio iSPACE
- Statistik Austria
- University of Innsbruck, Department of Ecology
- University of Texas, High-Resolution X-ray Computed Tomography Facility
- University of Vienna, Department of Geography & Regional Science

Memberships

- Applied Geoinformatics - academic mobility network for Central and Eastern Europe (CEEPUS)
  > www.ceepus.info
- digital:earth:at
  > www.digitalearth.at
- GIS-Cluster Salzburg
  > www.giscluster.at
- Herodot Network for Geography in Higher Education
  > www.herodot.net
- „Verband der wissenschaftlichen Geographie Österreich“
  > www.geographieverband.at

Selected joint publications with partner institutions

AHAMER G., STRAUSS, C., PRÜLLER, R., SCHOLZ, J. (2009) Workbook for the International Workshop ”openSolarCA’09 – Open access for success - Solar energy potentials in Central Asia evaluated by GIS methods”, August 24-26, 2009 in Bishkek, Kyrgyzstan, ISBN 978-3-85125-067-1.

AHAMER G., STRAUSS, C., PRÜLLER, R., SCHOLZ, J., LEHNER, C. (2010) Workbook for the International Staff Development Workshop ”enerGIS’10 – Geographic Information Systems (GIS) for Energy Issues in Central Asia”, September 20-24, 2010 in Dushanbe, Tajikistan, ISBN 978-3-85125-124-1.

MARSCHALLINGER, R., HOFMANN, P., DAXNER-HÖCK, G., KETCHAM, R. (2010) Solid modeling of fossil small mammal teeth. In: Computers & Geosciences, : Elsevier. 10.1016/j.cageo.2010.07.011

MARSCHALLINGER, R., GOLASZEWSKI, ST., KRAUS, J., KRONBICHLER, M., KUNZ, A., HOFMANN, P. (2009) Multiple Sclerosis: a Multidisciplinary Approach to the Analysis, 4D Modeling and Spatiotemporal Simulation of Lesion Pattern Evolution. Proceedings of SEECCM 2009, 2nd South-East-European Conference on Computational Mechanics. SEECCM 2009.

WONKA , E. (2010): Regionalstatistik in Österreich auf der räumlichen Bezugsbasis von regionalstatistischen Rastereinheiten. Josef Strobl (ed.), Institut für Geographic Information Science, Österreichische Akademie der Wissenschaften & STATISTIK AUSTRIA.

KAUER, FISCHER, LOSSE (EDS). (2011) Aufbruch in die Geoinformationsgesellschaft mit Microsoft Bing Maps. Leitfaden mit Best-Practice-Beiträgen zur praxisorientierten Entwicklung von Mapping Mash-ups. Wichmann Verlag, Germany.

GIScience Conferences & Workshops

Developing visions for a spatially enabled future


Adrijana Car and Thomas Jekel

» *Annual events of and around GI_Forum/AGIT and Learning with Geoinformation with more than 1000 participants also present a showcase of Salzburg's unique scientific environment in the field of Geoinformatics and GIScience: basic and applied research activities. In such an environment the GI_Forum/AGIT events stimulate creative, new activities resulting in regional, national and international initiatives, new projects, seminars, and research. > www.gi-forum.org*

GI_Forum
SYMPOSIUM and EXHIBIT
Applied Geoinformatics

In 2009 and 2010 the GI_Forum together with the Learning with Geoinformation conference was honored by the presentations of several outstanding keynote speakers. Suchi Gopal from the Boston University spoke about Geosocial Networking, whereas Ed Parsons from Google presented his vision of building an annotated world that goes beyond maps. Claire Jarvis from the University of Leicester and Laxmi Ramasubramanian from the Hunter College at City University New York, both among the leading researchers in GIScience, discussed the issues of spatial literacy, learning and Spatial Citizenship. Together with Arup Dasgupta from GIS Development, Andreas Siebert from Munich Reinsurance Company, and Athina Trakas Open Geospatial Consortium, Inc., all our keynote speakers shared their insights and visions on the future of the respective research fields contributing to GIScience.

Geoinformatics Forum Salzburg (GI_Forum)

The interdisciplinary symposium GI_Forum focuses on an international GIScience audience, communicating in English, and sharing an interest in translating new methods and techniques into a broad range of application domains in geoinformatics. Young researchers as well as established scientists find a vibrant GI community from academia, industry, and government to analyse progress and to explore new research directions. GI_Forum is organized by the Salzburg University Centre for Geoinformatics together with GIScience and co-located with the highly regarded annual German language conference on Applied Geoinformatics (AGIT, www.agit.at).

> www.gi-forum.org
Adrijana Car & Josef Strobl

Learning with Geoinformation

"Learning with Geoinformation" is an annual three day conference within the framework of the AGIT-Symposium and the GI_Forum, organized by the ÖAW-GIScience Institute. It is an increasingly international conference on Geoinformation in education. It addresses both researchers and practitioners in education with a strong focus on secondary education. Through international co-operations, it has developed into a communication platform for senior and young researchers alike, providing links for new research projects in education and so far drawing on presentations by scientists from 15 countries and 3 continents.

> www.gi-forum.org/Learning
Thomas Jekel and Robert Vogler

» *CONFERENCE ANNOUNCEMENT*

Mathematical Geosciences at the Crossroads of Theory and Practice (IAMG 2011)

Following the successful application in 2009, the Austrian Academy of Sciences GIScience Research Institute will organize the IAMG 2011, the Annual Conference of the International Association for Mathematical Geosciences. The meeting will take place in Salzburg from September 5–9, 2011. Besides covering IAMG core topics like geostatistics, reservoir modeling, 3D modeling or geo-process simulation, the IAMG 2011 will address applied mathematical geosciences issues, with a specific reference to alpine regions: simulation and modeling in hydrogeology, engineering geology and geotechnics as well as geohazard modeling. Moreover, as from the close association of GIScience Research Institute and the University of Salzburg Centre for Geoinformatics, recent developments in GIS, remote sensing and image processing with an emphasis on object based image analysis as well as non-destructive 3D reconstruction of rock macro- and microstructures will be highlighted.

> http://iamg2011.at

Robert Marschallinger and Fritz Zobl

Computer Oriented Geology (COGeo)

The annual COGeo conference takes place in Salzburg. Conference topics are computer-based integration, analysis, modeling, simulation and visualization of geological, geotechnical and hydro(geo)logical data. The COGeo meetings address the request for exchanging ideas concerning up-to-date geoscience-software, software application and development trends in a relaxed, interdisciplinary atmosphere.

This year's COGeo saw a marked rise in attendees as well as a trend toward internationalization with about 20% of the 86 participants coming from abroad. Starting this year, conference proceedings have been provided in "go green" style: entirely on an digital basis, extended abstracts and associated 2D, 3D and 3D+t data sets were distributed to conference attendees on USB sticks. Moreover, all data are available on the COGeo website as :doi indexed, open access publications plus data sets.

Co-organizer of the event is the Working Group „Computer Oriented Geology" (COG) of the Austrian Geological Society.

> www.cogeo.at

Robert Marschallinger and Fritz Zobl; Willi Wanker (Civil Engineer)

Austrian Ambassador Mag. Ursula Fahringer at the workshop in Dushanbe

» *International workshops are mainly organized in a train-the-trainer format addressing university faculty and students to exchange knowledge and good practice.*

They are based on multilateral partnerships between international Academies of Sciences and Higher Education Institutions and the ÖAW Institute for Geographic Information Science.

openSolarCA'09

Open access for success - Solar energy potentials in Central Asia evaluated by GIS methods

> http://www.aca-giscience.org/opensolar

enerGIS'10

Geographic Information Systems (GIS) for Energy Issues in Central Asia

> http://energis.tugraz.at

A series of two workshops have been organised by ÖAW-GIScience and financed by Eurasia-Pacific Uninet. These workshops strengthened the existing cooperation with Central Asian scientists and institutions including Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan and a bundle of concrete proposals for energy related projects such as solar heating for Bishkek's heat plant.

While Central Asian scientists applied GIS methods to evaluating potentials of alternative energy sources such as solar, hydro and wind, an interdisciplinary team of European experts introduced to openSolarCS'09 and enerGIS'10 in theoretical lectures: global climate change motivates.

Practical sessions started out with the hands-on collection of data by GPS, their analysis in team work and ended up with the generation of maps assessing the energy potential of the Central Asian home regions of the attendants.

Quality control of scientific achievements included peer-review of presentations and preparatory online studies. Certificates were handed out only after having mastered the workshop tasks, supported by the distributed workbook. Such severe stance triggered positive feedback.

Gilbert Ahamer

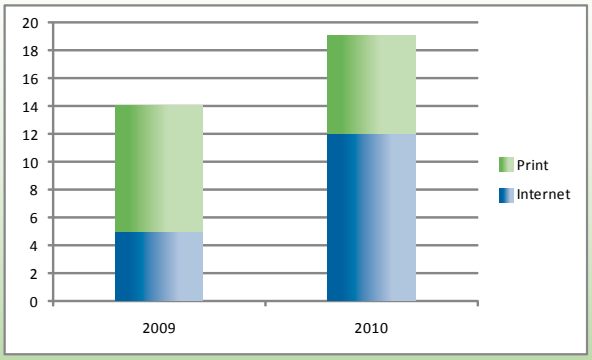
Public Access to Science

Forum Alpbach
GIS Day
GI_Forum
Geoinformatics Colloquia
Science
Sparkling Science
Lange Nacht der Forschung
Salzburg
Media
Public Access
Learning with Geoinformation
COGeo
GIScience BLOG

While the Institute for GIScience research programme is distinctly international in its agenda, ÖAW-GIScience staff is also widely involved with local, regional and national initiatives as well as in consulting for the local government and economy. ÖAW-GIScience research therefore is embedded in explicitly local and regional application domains, and communicated to a general public in target group specific outreach events.

ÖAW-GIScience thus helps both the local economy and education community as well the local GIS-cluster to present itself as one of the most active GIS-hubs in Central Europe.

The Institute for Geographic Information Science in the Media 2009 & 2010



EUROPÄISCHES FORUM ALPBACH

European Forum Alpbach Technology Forum

» *„We shaped a rich and original discussion on a very important topic“*

„The topic discussed lies at the core of all scientific disciplines. The discussion offered a unique chance to make assumptions explicit and looking for mutual understanding and convergence“

Filippo Dal Fiore,
M.I.T. Senseable City Lab

Friday, August 27, 2010
Working Group 7: Digital vs. Real worlds – limits of computer models

Two members of the Institute for GIScience participated in the prestigious European Forum Alpbach in August 2010. Prof. Josef Strobl chaired the working group on “Digital vs. Real worlds – limits of computer models” while Florian Fischer took over the coordination of the programme and speakers. Digital models are a key instrument in research and development today. They establish new virtual realities that represent the real world in a simplified but purposeful manner. Complex structures, potential relationships and processes increasingly are investigated by computer models, which in some cases even tend to take over reality. This raises the question of limitations, constraints, concerns and problems resulting from the use of digital models. The contributions dealt with these relationships between digital and real worlds from the perspectives of Bioinformatics, Geographic Information Science, Human-Computer-Interaction, Telecooperation and Computational Social Science. The workshop revealed that digital models offer a huge potential for an in-depth understanding of real systems. They enable researchers to see more, recognize more, understand more and explain more about real world systems than otherwise would be accessible to the human mind. But science, management, politics and citizens often run the risk of confusing models with reality as the distinction between reality and simulacrum is becoming blurred and hardly distinguishable for the human sensory apparatus. This aspect gains importance insofar as digital models support the understanding of complex structures, but they newly construct some structures as well.

Hofrat Mag. Dr. Gerfried Brandstetter
Head, Department of Science and Research, Provincial Government of Salzburg

» *The ÖAW Institute for GIScience has succeeded with being recognized for its basic research at an international level in a very short time. The active participation at the European Forum Alpbach 2010 was another good opportunity to present the milestones of its work to the international community. Communicating research results, enabling international exchange of ideas, and initiating new contacts and collaboration are essential for increasing international visibility and outreach. One of the institute‘s main goals is developing complex digital models. This kind of research is based on fundamental concepts from Geography intersected with information and communication sciences. The close cooperation between the GIScience Institute and the Paris-Lodron-University of Salzburg contributes to the vision of ÖAW Giscience to serve as common ground for true transdisciplinary fundamental research. The Department of Science and Research of the Provincial Government of Salzburg supports the work of the Institute and appreciates its high potential for remarkable basic research as well as its input for the regional GIS-cluster.*

Outreach to Education

Some Sample Initiatives

Teaching

The courses taught by ÖAW-GIScience staff will lead students to understand the important issues of GIScience as new research field. Besides extensive teaching at University of Salzburg, ÖAW-GIScience staff has taught courses at various universities across Europe and Asia.

Research seminar
at the Humboldt University in Berlin

The Humboldt University in Berlin invited ÖAW-GIScience staff member Florian Fischer to hold a research seminar during the summer term 2009. The seminar brought together young academics in geography to implement short research projects on the everyday use and social implications of geographic information media, such as navigation systems or local search portals.

Research seminar
at the University of Hamburg

Gudrun Wallentin & Thomas Jekel from ÖAW-GIScience have been invited to share their ideas on collaborative mapping in secondary education within the research seminar *excursion didactics and collaborative mapping* at the University

of Hamburg, Germany. The event linked together results of the Schools on Ice and GEOKOM projects and was held on Dachstein in July 2010.

Guest lecturer
at the Faculty of Sciences, Department of Applied Geosciences, German University of Technology, Muscat, Oman

Adrijana Car, senior researcher at ÖAW-GIScience taught at the Faculty of Sciences, Department of Applied Geosciences, German University of Technology, Muscat, Oman, in 2009 and 2010. The module was an introduction to GISystems, methods and tools as used in Geology.

DIGITAL:EARTH:AT
Fachdidaktikzentrum für Geographie und Geoinformatik Salzburg

digital:earth:at

Centre for Learning and Teaching Geography and Geoinformatics

As center of excellence in geography and geoinformatics education, the digital:earth:at initiative has developed into a full fledged research and education team aiming at all target groups of the education process. The initiative, initially supported by the IMST Programme (www.imst.uni-klu.ac.at) of the Austrian Ministry for Education (bmukk) comprises three main partners – the Institute for GIScience, the Centre for Geoinformatics (Z_GIS) at the University of Salzburg and the University of Education Salzburg. Digital:earth:at develops and provides teaching materials, is involved in teacher training and in-service-training activities and works on R&D projects for secondary education. The digital:earth:at initiative has been the model for the successful digital:earth:eu Comenius network application in 2010.
> *http://www.digitalearth.at*

Module 'Learning with GI'

Members of the digital:earth:at initiative have been instrumental in developing and implementing the first cooperative curriculum between Universities and Universities of education in 2010. A 24 ECTS curriculum for GI-based learning across subjects contributes to teacher training and in service training in the state of Salzburg. GIScience staff accounts for both the conception and more than half of the teaching within the module. The module has been dubbed a role model for the integration of teacher training activities for Austria.

BASISMODUL (12 ECTS)	ECTS
Grundlagen der Geoinformationsgesellschaft	4
Lernen mit Geoinformation I - Konzepte, Modelle, Umsetzungsbeispiele	4
Lernen mit Geoinformation II - Erarbeitung von Unterrichtsumgebungen und Lernobjekten	4

AUFBAUMODUL (12 ECTS)	ECTS
Lehrveranstaltungen aus den Geographie-Modulen: Geoinformation und Kartographie Geoinformation und Fernerkundung*	12

* Liste der empfohlenen Lehrveranstaltungen finden Sie auf PLUSonline

4 der 12 ECTS-Punkte können durch Absolvierung der LV *Geoinformation III - Internationale Forschung zu Geoinformation für die Sekundarstufe* abgedeckt werden. Diese LV beinhaltet die aktive Teilnahme an der *AGIT* sowie dem *Wolfgang Sitte Seminar für Geoinformation.*

raum:planen

raum:planen develops a platform to access spatial planning data of the Provincial Government of Salzburg for use in secondary education. The collaborative Z_GIS/GIScience project allows pupils and lay people to easily access locally relevant data and bring spatial planning into schools more prominently. It aims at educating pupils for active citizenship by helping them to participate in public decision making. raum:planen is funded by Provincial Government of Salzburg.

ÖAW-GIScience staff presented their research at three science events in Salzburg

- **Opening of digital:earth:at, November 2009 Centre for Learning and Teaching Geography and Geoinformatics**
  GIScience here contributes to the development, evaluation and dissemination of GI-based learning modules for Austrian Schools.

- **ÖAW-GIScience @ Global GIS Day 2009 and 2010 in Salzburg**
  The digital:earth:at organized GISday events at Techno-Z Salzburg have drawn some 400 pupils from schools from Salzburg, Upper Austria and Bavaria. Presentations and workshops largely relied on staff from all research cluster institutions (Z_GIS, ÖAW-GIScience and iSpace) as well as partners from both public institutions and corporations.

- **Lange Nacht der Forschung, 2009**
  Robert Marschallinger and Peter Hofmann from ÖAW-GIScience and Alexander Kunz and Jörg Kraus from the CDK presented first research results of the GeoMS project at the PMU research path.

Outreach to Professionals

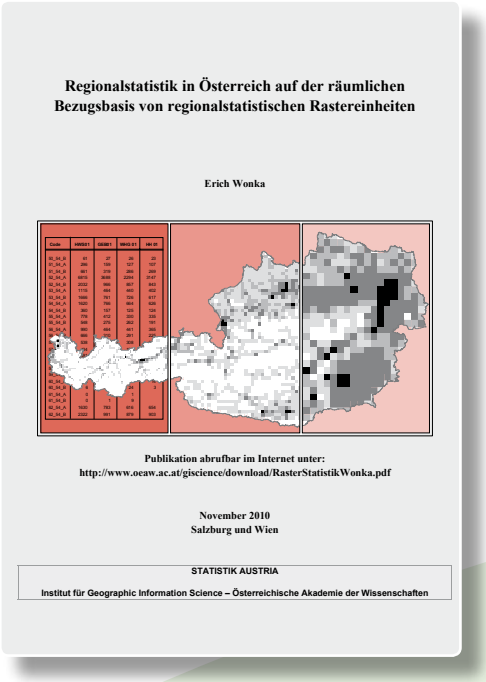
Outreach to GI Professionals includes guides to specific software products, the processing and visualization of statistical data for specific target groups, and providing support to distance education initiatives for GI professionals. These contacts to the professional sphere helps the Institute to ground its research in everyday applications.

Practical Guide to Bing Maps
"Aufbruch in die Geoinformationsgesellschaft mit Microsoft Bing Maps"

Together with Microsoft and Deutsche Post AG, ÖAW-GIScience researcher Florian Fischer publishes a practical guide to the Consumer-SDI Bing Maps in order to ease getting started and stimulate the application of geoinformation technology in the economic sector."
This guide provides an overview of the wide use range of consumer-oriented, business oriented and non-profit geomedia on the basis of 19 best practice contributions to the practical use of Bing Maps. Enriched with an assortment of commented training materials for Bing Maps the book allows the reader a quick introduction to application development and shows the possibilities of the Bing Maps API (Bing maps API).

Joint publication with Statistics Austria

„Erich Wonka (2010): Regionalstatistik in Österreich auf der räumlichen Bezugsbasis von regionalstatistischen Rastereinheiten".


Regionalstatistik in Österreich auf der räumlichen Bezugsbasis von regionalstatistischen Rastereinheiten

Erich Wonka

Publikation abrufbar im Internet unter:
http://www.oeaw.ac.at/giscience/download/RasterStatistikWonka.pdf

November 2010
Salzburg und Wien

STATISTIK AUSTRIA
Institut für Geographic Information Science – Österreichische Akademie der Wissenschaften

This online publication can be downloaded here:
> *www.oeaw.ac.at/giscience/download/RasterStatistikWonka.pdf*

Project Fact Sheets

Time & Space

- Global Change
- Modelling Mobility
- Time & Space

Spatial Data Infrastructures

- European SDI
- GeoICT & Society
- GeoBIM
- Nature-SDIplus
- SDI
- SDI Semantics

Spatial Analysis and Modelling

- GeoMS
- GeoNT
- Geo Objects
- GeoSMT
- Landscape Change Modelling
- OBIA
- SESAAM

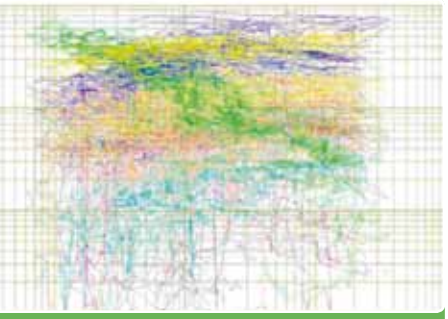
Learning to Think Spatially

- CEE-GIS
- digital:earth:eu
- GEOKOM-PEP
- GI_EDU
- I AM HERE!
- Schools on Ice

Time & Space

Global Change

Mapping Dynamics of Country-level Indicators



Interdisciplinary Project

Duration
2008 – ongoing

Project Group
Gilbert Ahamer
Adrijana Car
Robert Marschallinger
Josef Strobl

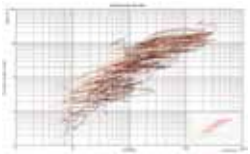
Project Objectives

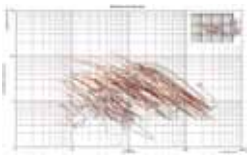
A suitable geo-referenced methodology for depicting global or local dynamic change processes of the techno-socio-economic system should be found. Case studies are the

- global system of food demand and supply (agro-economics)
- global system of energy demand and supply (energy economics).

Geo-referenced drivers for the future development of anthropogenic CO_2 emissions are identified as well as hypotheses for the intrinsic dynamics of global change processes.

Project Description

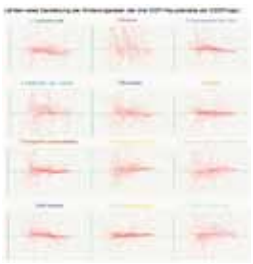




Analysis of the "Global Change Data Base" GCDB allows to look into

- the first derivative (slope of the red trend lines at right) and
- the second derivative (slope of the red trend lines below)

of the state vector of the global techno-socio-economic system. Examples for interesting state variables are energy demand per capita (at right above) or energy demand per economic output (at right centre).



Additional analyses of the economic structures and sectoral distributions (at right below) show an evolution from

- matter-oriented to information-oriented activities
- individual to societal activities
- covering basic needs to meeting higher aims of wellbeing.

An important feature is the quantitative evaluation of saturation limits in global evolution of agriculture and energy economics because these limits govern the overall dynamics of future scenarios for global change and specifically of anthropogenic CO_2 emissions and necessary CO_2 abatement measures.

Results are presented in international journals, in book chapters and at international conferences.

ÖAW – GIScience R&D Programme

SPATIAL DATA INFRASTRUCTURES
Building spatially enabled ‚information highways' is a requirement for better management of our societies and environments. Our contributions aim at the specification of advanced multi-dimensional data models, the integration of realtime sensor input and open interfacing across system architectures.

SPATIAL ANALYSIS AND MODELLING
Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the modelling of dynamic processes. Methods for flexible regionalisation, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

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Modelling Mobility in Nature-based Recreation

Postdoc Research
Monitoring of the modern land use recreation

Duration
2007 – ongoing

Project Group
Sabine Hennig
Josef Strobl

Project Partner
Berchtesgaden National Park, Institute of Geography, FAU Erlangen-Nürnberg

Modelling spatial-temporal behaviour of visitors in recreational and protected areas

This project focuses on the modelling of visitor mobility in recreational and protected areas. It combines knowledge and methods from GIScience and recreational planning and management. The project aims at representing spatial-temporal behaviour of visitors, based on an understanding of nature-based recreation.

Description

Within our modern society recreation is characterised by rising visitor numbers and changing visitor demands. This poses a challenge for recreational planning and visitor management in recreational and protected areas. To meet recreational and ecological demands in a sustainable way, planning and management need a comprehensive database of use vs. resources. Special relevance is given to insights into spatial-temporal behaviour of visitors, particularly their mobility during nature-oriented recreation. The collection of adequate visitor data is not an easy task, given that most recreational and protected areas are remote, have multiple entry and exit points, are crisscrossed by numerous trails and have only few staff present on-site. In this project mobility of nature-oriented recreation is defined using valid and measurable indicators to reflect spatial-temporal visitor patterns. By a case study in Berchtesgaden National Park, methods on how to collect and process data to model recreational mobility are developed.

Methods

The model for recreation mobility consists of two sub-models: The first is a model of recreational infrastructure based on concepts of visitor nodes and recreational routes. The second model is based on a process-oriented approach representing recreational demands and recreational perspectives of visitors. The data is collected by visitor monitoring (e.g. interviews, time-lapse video, acoustic slabs) or made available by stakeholders (e.g. visitor tickets, overnight stays). To use the spatial analysis and animation functionality of ESRI's ArcGIS, the data model is developed in Oracle 10g XE using Oracle Spatial.

Results

The recreational mobility model – not only valid for Berchtesgaden National Park – provides a deeper understanding of the spatial-temporal distribution of visitors and its causal backgrounds. It is the basis for recreational planning, and visitor as well as site management. In addition, results of changing conditions in recreational use can be visualised and discussed.

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Dr. Sabine Hennig

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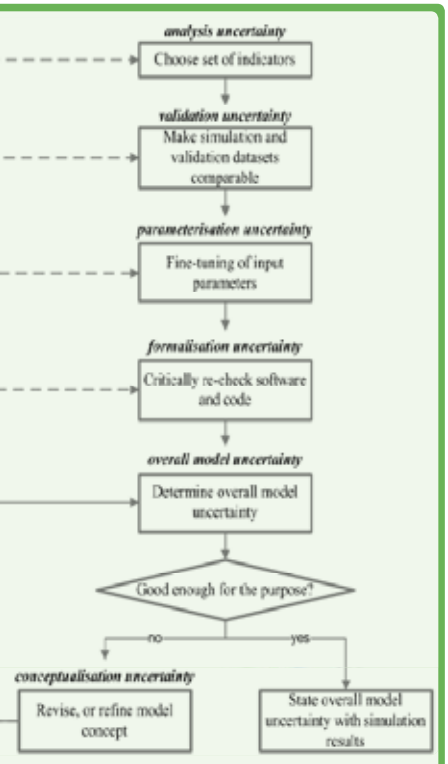
Time & Space

Space and Time in GIScience



Workflow of assessing uncertainty in individual based modelling
G. Wallentin & A. Car

Interdisciplinary Project

Duration
2007 – ongoing

Project Group
Adrijana Car
Gilbert Ahamer
Florian Fischer
Peter Hofmann
Thomas Jekel
Robert Marschallinger
Josef Strobl
Gudrun Wallentin
Fritz Zobl

Central Idea

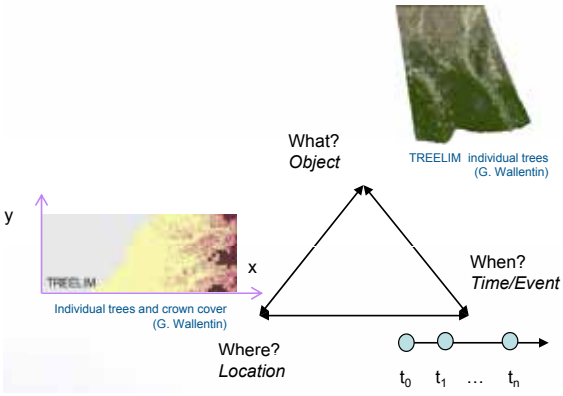
The nature and properties of geographic information (GI) are at the very centre of debate in the GIScience community. A part of the GIScience research unit explores the

- cognitive,
- social and
- operational

aspects of space and time in GIScience. This includes models of both social and physical space and consequences thereof for spatial analysis and spatial data infrastructures.

From Spatial and Temporal Concepts to Spatial and Temporal Formalisations

Traditionally, space and time as meta-dimensions are hardly ever treated from integrated perspectives.
Full temporal enabling of data models and analytical strategies is indispensable for spatial monitoring, analysis of mobility, and rapidly changing dynamics in natural and social spaces.



Approach

We investigate how space and time are conceptualized in these application areas, and how well the existing models of space and time meet their needs.
This investigation is expected to identify gaps. Analysis of these gaps will result in improved and/or new spatio-temporal concepts particularly in support of spatial analysis and spatial data infrastructures.

ÖAW – GIScience R&D Programme

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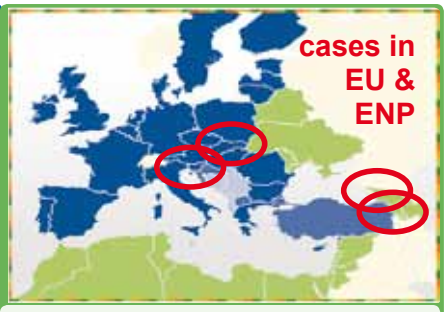
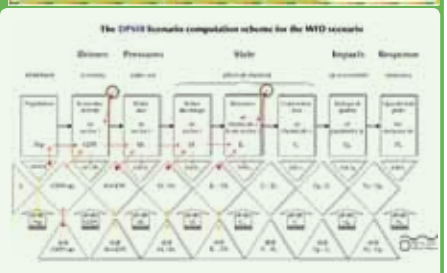
European SDI

Building Blocks and Applications



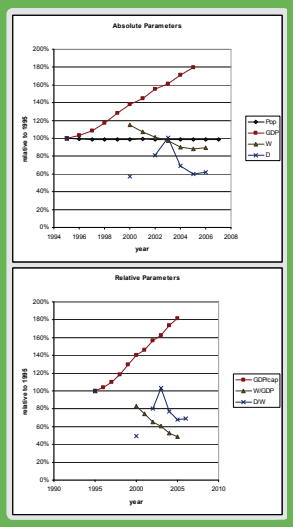


The DPSIR chain of cause and effect.

Interdisciplinary Project

Duration
March 2008 –
December 2009

Project Group
Gilbert Ahamer
Josef Strobl



Project Objectives

The new INSPIRE Directive is highly relevant for GIS: it regulates the general situation on spatial information in Europe. This initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. A Memorandum of Understanding was signed with the "Institute for the Water of Slovenia".

Project Description

This project adds several building blocks to Spatial Data Infrastructures (SDI) from

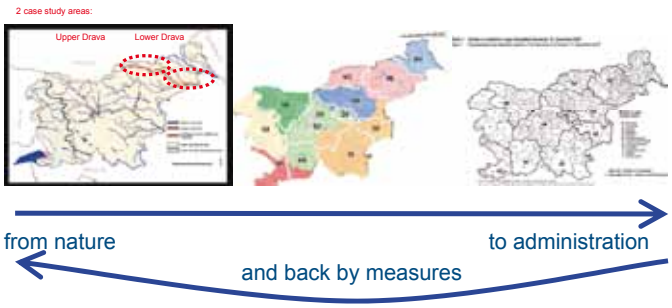
1. EU member states: Slovenia (building on expertise from Slovakia) on the Water and Air Framework Directives
2. European Neighbourhood Policy (ENP) countries: Armenia and Georgia on aviation and aviation safety

Here, the case of "designing geo-referenced scenarios for the requirements of the Water Framework Directive" is highlighted: Matching of river basins with administrative regions (described by the row of 3 maps below) opens the avenue for geo-referencing the entire chain of cause and effect "DPSIR" in water management down to the municipal level:

Drivers – Pressures – State – Impact – Response,

here (implemented for the Drava river basin, see scenarios at left): population ➔ economic level ➔ specific water demand ➔ specific water discharge ➔ emission of pollutants c in economic sector i:

$E_{c,i} = Pop \times GDP/cap \times W_i / GDP_i \times D_i / W_i \times E_{c,i} / D_i$



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GeoICT & Society

Living and Acting in Geo-Mediated Spaces

PhD project
Effects of Geospatial Media on Urban Space
On the Individual Experience of Geo-Mediated Spaces Using a Media-Geography Approach

Duration
July 1, 2007 – June 30, 2011

Supervision
Prof. Dr. J. Strobl, Centre for Geoinformatics, University of Salzburg & ÖAW GIScience | Prof. Dr. A. Koch, Department for Geography and Geology, Salzburg University

Project Partner
University of Salzburg, Department for Geography and Geology

Objectives

The goal of the PhD project is to develop an explorative concept about individual appropriation (including the participatory experience) of geo-enabled media regarding their influence and meaning for everyday urban life. Furthermore insights are anticipated on the individual interpretation and evaluation of geo-contents and the potential for actionable empowerment by geo-enabled media.
This project focuses on fundamental research on the intersection of urban geography and media-science related to the influence of geospatial technology. But the insights also hold practical relevance for the evaluation of mobile content and utilization of mobile marketing concepts. The overall relevance of this topic gains more and more importance as geo-enabled media are widespread and are expected to become a mass-market in the future. Not least by governmental initiatives like SEIS or INSPIRE that explicitly aim on providing useful spatial information to European citizens amongst others.

Project Description

In order to conceptualize urban living I bind it to the term "making of everyday geographies". That is, the processes in which humans interact with their material and social environments that are linked to the notional connection regarding the environments. The subjective entanglements of meaning and material base on the active appropriation and perception of both material and mediated spaces and have been denoted as the "experienced spaces".
The appropriation (reception studies) of certain types of geo-media will be examined to identify different contexts of usage in everyday life. An important aspect is the individual interpretation of geo-media contents as well as the interpretation of urban living on geo-media contents. The theoretical foundation embracing spatial perception, human action and media appropriation accounts for the use of qualitative reception-focused interviews.

ÖAW – GIScience R&D Programme

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Dipl.-Geogr. Florian Fischer

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GIScience
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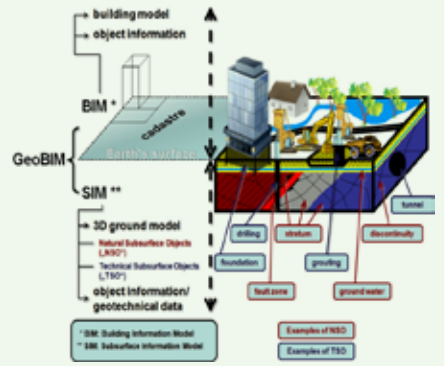
GeoBIM

Geo Building Information Model – combining building and subsurface information models



Geo Building Modelling framework

Joint Research

Duration
June 1, 2008 – ongoing

Project Group
Fritz Zobl,
Robert Marschallinger

Aim & Research Objective

Since the building information modelling ("BIM") approach focuses on building data and underground information systems on subsurface data, a framework for processing and handling all geotechnical project-relevant data is recommendable. Hence, a Geo Building Information Model ("GeoBIM", Zobl & Marschallinger 2008) encompasses BIM elements as well as natural subsurface objects ("NSO") and technical subsurface objects ("TSO") below earth's surface, including a subsurface information model (SIM). In particular, a GeoBIM should contain the "precise" geotagged geometry and attributes of subsurface and above ground objects needed to support both, above and underground constructions in all project phases.

Based on mapping and existing geospatial data, NSO and TSO can be represented by 3D geometrical modelling. As a result, solid models of objects are developed and properties of each object are stored in a database. In order to have a smart and applicable tool for the design and administration of geospatial and geotechnical projects, the shape of geo objects and associated properties need to be available on a platform conforming to open standards.

The scientific impact on this research is on several levels, covering the development of database models and analysis of geo objects, i.e. with focus on information management, data harmonisation and standardisation of natural and technical subsurface objects (geological-, hydrological-, geotechnical objects). Yet another focus of this project is the implementation of (web based) 3D visualization techniques for a user optimized geospatial illustration of the processed data in order to provide a better applicability of huge mounds of structured three-dimensional data.

ÖAW – GIScience R&D Programme

SPATIAL DATA INFRASTRUCTURES
Building spatially enabled ‚information highways' is a requirement for better management of our societies and environments. Our contributions aim at the specification of advanced multi-dimensional data models, the integration of realtime sensor input and open interfacing across system architectures.

SPATIAL ANALYSIS AND MODELLING
Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the modelling of dynamic processes. Methods for flexible regionalisation, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

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Nature-SDI*plus*

Best Practice Network for SDI in Nature Conservation

Funded Project
Commission of the European Communities Directorate-General Information Society and Media. eContentplus Programme
Agreement Number: ECP-2007-GEO-317007

Duration
October 1, 2008 – July 31, 2011

Project Group
Mariana Belgiu
Barbara Brunner-Maresch
Florian Fischer
Sabine Hennig
Hermann Klug
Josef Strobl
Gudrun Wallentin

Coordinator
Geographical Information Systems International Group (GISIG)

Project Website
> www.nature-sdi.eu

The establishment of Natura 2000 and the new transboundary EU approach for protected sites management has enforced the link between nature conservation and geo-information. This has generated the need for interoperable and accessible EU harmonised datasets. The link is also addressed by the INSPIRE Directive which pursues an EU Spatial Data Infrastructure to support environmental policies. The research within the FP7 project „Nature-SDIplus" links to spatial data infrastructures (SDI) as one of the primary fields of research at the GIScience Research Unit. In an interdisciplinary team of domain specialists and data modellers we focus on interoperability and exploitability of distributed spatial datasets in nature conservation. As national coordinator, and WP2 leader for the Nature-SDIplus network in Austria GIScience will build up a network of partners who are involved in nature conservation on all geographical scales. The analysis of users needs and the gap analysis within the first half of 2009 will be a first step in building up the network and is the corner stone of a Spatial Data Infrastructure for nature conservation. Nature-SDIplus Network aims, through state-of-the-art methodologies and best practice examples, to improve harmonisation of national datasets and make them more accessible and exploitable. Therefore, it contributes to the INSPIRE implementation with specific reference to a cluster of data themes on nature conservation (as per the INSPIRE Annexes):

- Protected sites
- Biogeographical regions, Habitats and biotopes, Species distribution.

The main objective of Nature-SDIplus Network is to: involve new stakeholders; share data and best practices; improve and stimulate exploitation and the re-use of information on nature conservation. The project will analyze the usability and accessibility of data. The results of this analysis will be used to propose a new work item for a standard metadata profile and data model compliant with the INSPIRE Directive and in coordination with CEN/TC 287 Geographic information.
Representative datasets will be provided by the partners from many EU Member States. The project will define a common multilingual and multicultural approach for a simpler, standard access to spatial data. A demonstration geoportal, supported by web services, will provide data accessibility for the different stakeholders. This geoportal will then afford a means to actively engage the stakeholders. Through networking activities a Nature-SDIplus Community will be established. This Community will address the relevant themes on a consensus building approach. This Community will also demonstrate the effectiveness of the Nature-GIS thematic SDIC that is already registered with INSPIRE. The project will, through training and dissemination, ensure that widespread awareness is achieved.

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SDI

Competence Centre for Spatial Data Infrastructures

Joint Research
GIScience Research Cluster Salzburg

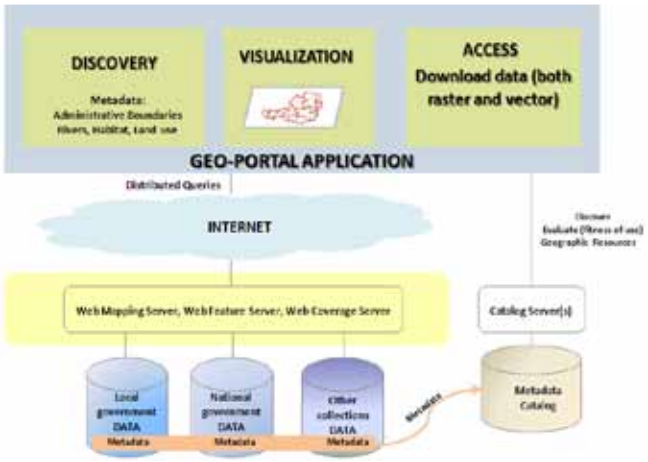
Duration
January 1, 2010 – ongoing

Project Group
Josef Strobl
Mariana Belgiu
Gudrun Wallentin

Project Partners
Research Studio iSPACE | Z_GIS – Centre for Geoinformatics, University of Salzburg

Project Website
http://www.giscience-research.org/initiatives/sdi

Spatial Data Infrastructures (SDI) are currently a major topic in Geoinformatics practice and GIScience research. SDI provides the needed framework for data sharing across applications, enterprise and community boundaries. As this is an extremely broad area requiring knowledge and skills from numerous facets of ICT, geospatial concepts, standardization, systems architectures and application perspectives, progress only can be achieved through collaboration among strong teams with diverse expertise.
Our research contributes to the implementation of interoperable services like metadata catalogue services, harmonization of domain-specific datasets following the INSPIRE specifications and to advanced multi-dimensional data models, the integration of real-time sensor input and open interfacing across systems architectures.



SDI projects – GIScience Research Cluster Salzburg

- NatureSDIplus (eContent+ Programme)
- National Geoportal Prototype: AGEOportal
- Concepts for SAGIS 3.0

Geoportal applications serve as communication mechanism between the geographic resource providers and the potential users, enabling effective and efficient usage of Geographic Information in a distributed computing environment.

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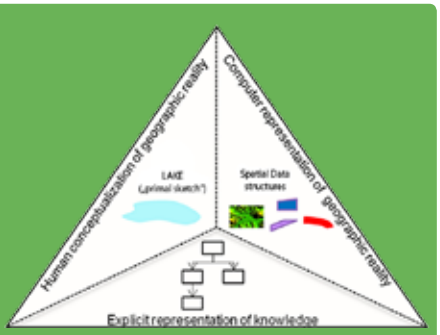
SDI Semantics

Semantic Enrichment of Geodata: an Approach towards Producing Transferable Knowledge



PhD Project
Semantic enrichment of geodata: an approach towards producing transferable knowledge

Duration
April, 2010 – March, 2013

Cumulative (paper based) PhD at the University of Salzburg

Supervision
Prof. Dr. J. Strobl, Centre for Geoinformatics, University of Salzburg & ÖAW GIScience

Project Description

In digital image interpretation field one of the main challenge is to provide the appropriate model for objects to be found in the image and to make this model transferable. A robust ontological structure is seen as the solution to formalize domain specific knowledge, because it enables a "formal explicit specification of a shared conceptualization" (Gruber, 1993).

Objectives

The overall goal is to develop a conceptual framework for semantic mapping between the ontology classes formalizing the spatial entities and the meaningful objects extracted from field representation of geographic reality in order to produce transferable knowledge. The specific focus of this research is threefold:

- To formalize the domain (a priori) knowledge into a set of class objects
- Project the formalized domain-specific knowledge onto other conceptualizations (multiple inheritance issue)
- To align the feature extracted from raw data with ontology classes

Method

Concepts formalization

- **Setting the context**
- **Extracting domain specific concepts**
- **Defining semantic relations and properties**

Pattern extraction

- **Transforming the field of geographic variation into meaningful individual tokens**

Semantic matching

- **Establishing a conceptual bridge between ontological classes and geographic objects**

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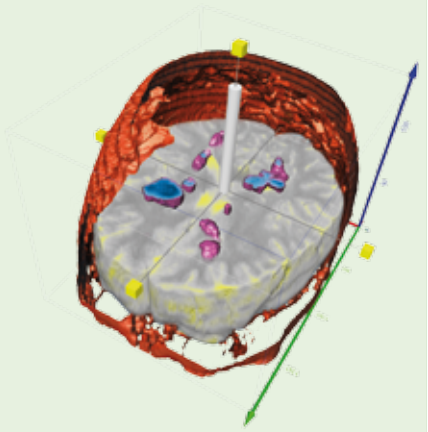
GeoMS

Some spatiotemporal aspects of Multiple Sclerosis: Understanding a potentially debilitating disease in 4D



Joint Research

Duration
February, 2007 – ongoing

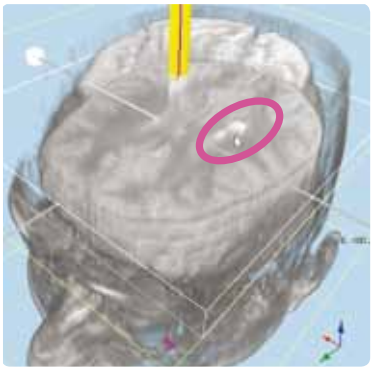
Project Group
Robert Marschallinger
Peter Hofmann

Project Partner
MS center,
Christian Doppler Klinik
(Salzburg)

Geostatistical space-time characterization of Multiple Sclerosis lesion patterns

Multiple sclerosis (MS), the most frequent neurological disease of young adults in Europe and North America, affects the central nervous system (CNS). While the exact illness triggers still remain obscure, it is generally agreed that MS is an autoimmune disease that attacks the myeline sheaths of nerve tissue. In the brain and spinal chord, MS is typically expressed as mm to cm wide demyelinized lesions, where nervous signals are drastically attenuated and slowed. Many dysfunctions of MS patients can be directly related to the locations of lesions in the CNS.

Advances in medical imaging with magnetic resonance imaging (MRI) at the forefront, provide a steadily improving spatiotemporal data base of MS-related cerebral damage.



Today, MRI scans are routinely carried out to document the state and course of disease of MS patients. The resulting stacks of MRI images are evaluated to identify the locations of MS lesions, their number and total volume. However, there is only qualitative knowledge relating to the spatial distribution and topological arrangements of MS lesions (lesion patterns), and little is known about the possible correlation of MS lesion patterns with different MS disease types. Nothing is known about the evolvement of MS lesion patterns in the light of recent breakthroughs in MS medication.

Pooling the heterogeneous knowledge of radiologists, neurologists and geoinformatics scientists, the project aims at developing methods for the 3D reconstruction, spatio-temporal analysis and simulation of MS lesion pattern evolution.

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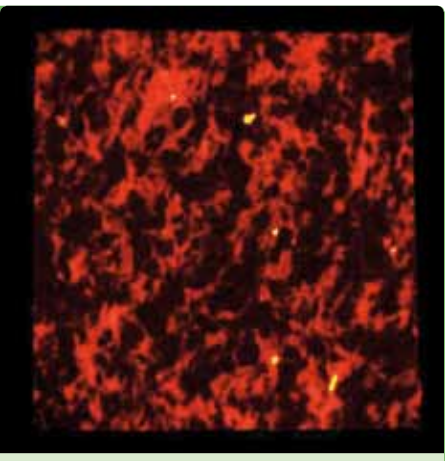
GeoNT

Using High Resolution Neutron Computed Tomography for analyzing the 3D-structures of magmatic rocks



HRNCT derived voxel model of granitic rock

Joint Research

Duration
September, 2008 – ongoing

Project Group
Robert Marschallinger
Peter Hofmann

Project Partner
K.U. Hess (LMU, Earth and Environmental Sciences, Munich, Germany)
J. Kruhl (TU Munich, Fachbereich Tectonic and Material Fabrics, Germany)
B. Schillinger (Research Reactor FRM-II, TU Munich, Germany)

Analyzing 3D-Structures of Syntectonic Magmatic Rocks with Neutron Tomography

High resolution Neutron Computed Tomography (HRNCT) has only recently achieved resolutions comparable to X-ray computed tomography (CT). As compared with CT, HRNCT has the advantages of the higher penetrating power of neutrons. In contrast to X-rays, neutrons interact with the atomic nucleus. Thus, HRNCT is a promising technology for detecting the subtle changes of mean atomic weight of rock-forming minerals found in granitic rocks.

Syntectonic granitoids provide important information about crustal processes, such as formation of large-scale and deep-rooted faults and thrusts, and the compositional and structural re-organization of the continental crust in general. However, emplacement and crystallization of granitoid melts in regional stress fields, though very common processes are not sufficiently understood. Magmatic structures are generally too coarse for thin-section analysis, too diffuse for precise conventional measurements, and often show irregular geometry which does not allow extrapolation from smaller to larger scales and, above all, from 2d to 3d. Neutron tomography offers, to date, the only sufficiently fast and precise method for 3d micrometer resolution of these magmatic structures on the required millimeter- to centimeter-scale. Such data sets form a strong basis for quantification of rock fabrics and, consequently, for comparison of natural, experimentally produced, and simulated fabrics, as well as a deeper understanding of fabric-forming processes.

The prospect of the GeoNT project is to benchmark 3D-models derived from HRNCT with conventional precision serial lapping derived 3D models. 3D referenced, physical slices through the samples, which have been subject to HRNCT before, are related to the HRNCT voxel arrays to study the geometrical and spectral resolution of this novel, destruction free data acquisition method.

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Geo Objects

MultiScale, Spatiotemporal Modelling & Simulation in GeoSciences

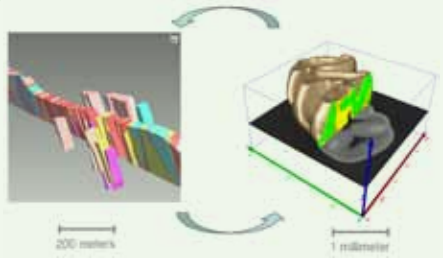

Figure: Crossing scales in geoscience simulation and modelling

Joint Research

Duration
October 2010 – ongoing

Project Group
Peter Hofmann
Robert Marschallinger
Fritz Zobl

Project Partners
High-Resolution X-Ray Computed Tomography Facility, Univ. Texas |
Wirbeltierpaläontologie, Naturhistorisches Museum Wien |
Dept. Engineering Geology, TU München

In the Geoscience realm, Geoinformatics handles volume objects. In Geoscience process modelling and simulation (e.g., hydrology, land-slides) time enters as a fourth dimension: 3D volume objects can exist, appear or disappear or can be modified along the time axis. Within such 4D framework the spatial and temporal scales show a wide variability, generating objects and processes of arbitrary complexity. This is why geoscientific analysis, modelling, simulation and visualization methods need to cover large ranges of object and process scales as well as variable geometry and time precisions and complexities.

In the macro or mega scales, because of the high costs of subsurface data acquisition, only sparse sample data are available. Geostatistics provides a wealth of stochastic-based estimation and simulation methods to populate the macroscopic geoscience modeling universes with reliable estimates of object and process properties.

As opposed to the macro scales, today the micro-scale geoscience modeling universes hold exhaustive sample data: recent advances in destruction-free analysis methods like Micro Computed Tomography (µCT) or Neutron Tomography (NT) make microstructures in geological materials accessible as volume models – paleontological fossil associations, hard rock textures and sediment structures can be portrayed in detail. Object based image analysis in its multidimensional flavor (xd-OBIA) is essential for meaningful object extraction from densely sampled 3D data such as petrographical or paleontological µCT scans.

GeoObjects aims at combining the above-mentioned scale ranges and methods: xd-OBIA in combination with µCT and NT is applied to create precise volume models of geoscientific micro-objects. The spatial variability is quantified by geostatistical methods, so geostatistical interpolation and simulation can be benchmarked in a controlled environment of natural structures. With the well-known paradigm of scale-invariance of geological structures in mind, relevant geostatistical modelling and simulation insights derived from geoscience microstructures are propagated back to the macro- and mega scales to create more precise 3D and 4D geoscience models from sparse sample data.

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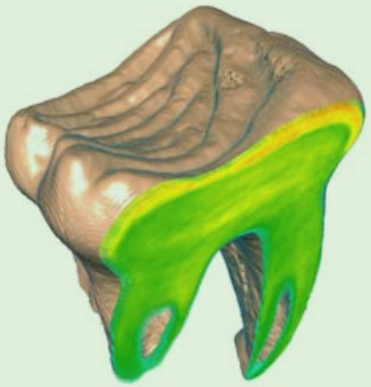
GeoSMT

Small Mammal Teeth as anchors in space-time modelling of species dissemination



Sliced HECT of an SMT classified by materials

Joint Research

Duration
February, 2007 – ongoing

Project Group
Robert Marschallinger
Peter Hofmann

Project Partner
High Energy Computed Tomography Facility University of Texas at Austin, Natural History Museum Vienna

Small mammal teeth ("SMT") are widely found in cenozioc sediments the world-wide. Because of the good durability of these microfossils, SMT are used in stratigraphy as well as for researching the rapid eolution and paleogeographic spreading of small mammals.

To date, methods of morphological SMT classification comprise optical microscopy and electron microscope investigation, ending up with images and descriptions of the fossils. Recent advances in high energy x-ray computed tomography ("HECT") have drastically improved the spectral and spatial resolution of this non-destructive analysis method, making it an ideal data source for 3D modelling SMT.

In the GeoSMT project, HECT is used to scan SMT (overall sizes typically 2-4mm, voxel sizes about 2 microns). The resulting raw voxel models are subject to 3D image processing, ending up with 3D models of SMT classified by material properties. Complementing the traditional techniques mentioned above, these 3D models can be qualitatively and quantitatively analyzed in an unprecedented manner: they can be viewed and sliced in any direction and peeled by material properties, volumes and surface areas can be extracted while the involved fossils remain in good order. Providing access not only to the outer surfaces, but also to the interior of teeth, the resulting 3D models serve as a novel basis for SMT classification and communication of research results, because these models can be shared among palaeontologists via internet technology.

In the GeoSMT project, a first goal is to establish a versatile workflow for extracting, from HECT data, the most important morphological features in SMT. Combining the high precision species classification derived from the 3D models and the places/stratigraphy of discovery, another goal of the GeoSMT project is to model, with 2D+t geostatistics, the paleogeographical spreading dynamics of selected SMT species.

The research is conducted in cooperation with the University of Texas High Energy Computer Tomography Lab (UTCT) and with the Natural History Museum, Vienna (NHM). UTCT provides stateof-the-art 3D scanning facilities and the NHM makes available its big pool of samples as well as the paleontological expertise.

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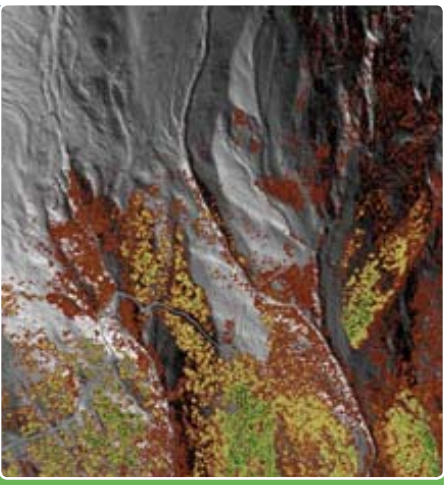
Landscape Change Modelling

Spatiotemporal modelling of natural reforestation



PhD project
Natural reforestation on abandoned alpine pastures – spatio-temporal modeling of plant succession dynamics

Duration
February 1, 2007 – June 30, 2011

Supervision
Dr. U. Tappeiner, Institute for Ecology, University of Innsbruck | Dr. J. Strobl, Centre for Geoinformatics, University of Salzburg & ÖAW GIScience

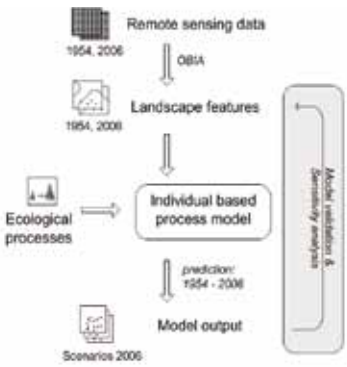
Project Partner
Institute of Ecology, University of Innsbruck, Austria

Modelling alpine tree line dynamics – an individual based model

At the intersection of GI-science and landscape ecology this PhD project focuses on the predictive modelling of natural reforestation. The aim is to gain a deeper understanding of the causal relationships of spatial vegetation patterns on abandoned alpine pastures.

Project Description

The Alps currently witness a substantial natural reforestation along the upper tree line due to land abandonment and climate change (Tasser et al. 2007). This research focuses on predictive modelling of plant succession processes on abandoned alpine pastures. A case study in Längenfeld, Ötztal is used (1) to gain a better understanding of regeneration processes at the tree line in the European Alps and (2) to provide a sound basis for decision making.



Methods

A time series of remote sensing data is analysed with an object based image analysis approach to derive individual trees and land cover information. These spatial data is combined with empirical process parameters of tree dispersal, growth and mortality. The reforestation process at the alpine tree line is implemented in an individual based model in yearly time steps.

Expected results

The developed reforestation model is expected to provide a better understanding of the processes causing spatial reforestation patterns. Research questions refer to the driving ecological process parameters in the emergence of forest patterns and to the role of land use versus climate change responsible for the current reforestation.
Moreover the reforestation model builds the basis for predictions. Scenarios for different climatic and land use conditions can be simulated. The model output can be visualised to facilitate the communication of the results to the public.

ÖAW – GIScience R&D Programme

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OBIA

Object-Based Image Analysis

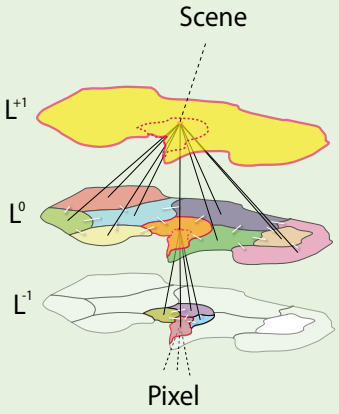

Fig. 1: Object hierarchy

Joint Research
GIScience Research Cluster Salzburg

Duration
February 1, 2007 – ongoing

Project Group
Peter Hofmann
Robert Marschallinger
Josef Strobl

Project Partner
Centre for Geoinformatics – Z_GIS, University of Salzburg, Research Studio iSPACE

Objects versus pixels

In contrast to conventional pixel-based methods of image analysis OBIA uses image objects instead of pixels as the building blocks of analysis. Pixels are aggregated to image objects by arbitrary image segmentation whereas each object is logically connected to its neighbouring objects, its super-object and its sub-objects. This way a hierarchical net of image objects is created (Fig. 1).

Classification

After initial segmentation, the created object primitives are entering an iterative process of classification, stepwise shape enhancement and re-classification until the intended classification results are achieved (Fig. 2: Workflow).
For classifying image objects, a variety of properties far beyond simple spectral features are available: texture, neighbourhoods and other spatial relationships. The desired object classes can be described by formalized domain expert knowledge. Through the classification of objects an interpretational link between image objects and real world objects is established; enabling further control of object enhancements and/or (re-) classifications.
This procedure of stepwise enhancement can be saved and re-applied as a rule set.

OBIA - interdisciplinary perspectives

Although mainly applied in the remote sensing domain, the principles of OBIA can be applied on any kind of images or rasterized measurements, including 3D and 4D images. Analyzing 3D data means either analyzing surface information, such as digital surface models (DSM) or analyzing volumes, such as stacked 2D images (e.g. computer tomography images). Analyzing 4D data means to analyze 3D or 2D image sequences, whereas the image objects of the frames need to be logically linked to their predecessor(s) and/or successor(s). This way it is possible to track and monitor real-world objects and to detect significant changes. Additionally, it is possible to classify objects by their space-temporal behaviour, e.g. by seasonal change in spectral response or alternating shape.

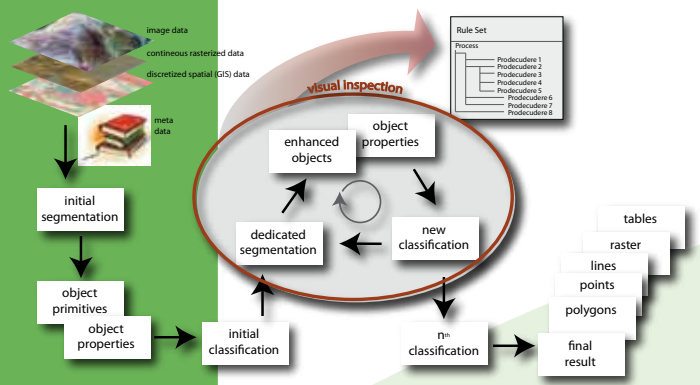

Fig. 2: Workflow

ÖAW – GIScience R&D Programme

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SPATIAL ANALYSIS AND MODELLING
Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the modelling of dynamic processes. Methods for flexible regionalisation, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

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Spatial Analysis

SESAAM

Geo-Spatially Enhanced Situational Awareness for Airport Management

Textbed Salzburg Airport

Funded Project
FFG, TAKE OFF
FFG0046/SESAAM

Duration
March, 2010 –
February, 2012

Project Group
Mariana Belgiu
Robert Marschallinger
Fritz Zobl

Project Partners
Z_GIS – Centre for Geoinformatics, University of Salzburg (coordinator);
Engineering Geodesy Group, Institute of Geodesy and Geophysics, Vienna University of Technology;
AviBit; Salzburg Airport

Project Outline

Due to environmental regulations airports will not be able to meet increased demands solely by expansion. Rather, airport operations need to get more efficient. Accordingly, the goal of this project is to develop and provide a complete operational picture (COP) for the management of all relevant movements on an airport.

Research topics within this project are:

- Determination and analysis of the user requirements
- Development of a low-cost positioning system including methods for reliable position and motion determination of all relevant objects
- Development of a COP infrastructure providing data fusion and COP interfaces
- Development of a 3D visualisation system providing position and relevant properties of planes and vehicles on an airport
- Extended testing of algorithms and systems on Salzburg airport

Objectives ÖAW-GIScience

To visualise and analyse moving objects (planes and vehicles) as well as object information in realtime, a 3D visualisation system is being developed by ÖAW-GIScience. CAD-based solid modelling is used for efficient spatiotemporal analysis of both, aircrafts and vehicles at an airport.

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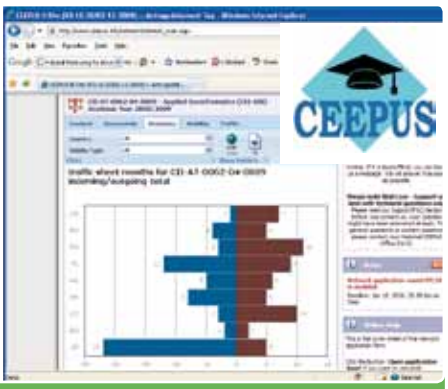
CEE-GIS

Applied Geo-Informatics
CII-AT-0062-04-0809



Funded Project
CEEPUS II - Network Central European Exchange Program For University Studies

Duration
October 1, 2008 – September 30, 2011

Project Group
Adrijana Car & Josef Strobl

Project Partner
University of Salzburg, Z_GIS, Dr. Josef Strobl | Bulgarian Academy of Science, Institute of Geography | Mendel University of Agriculture and Forestry Brno, Department of Geoinformation Technologies | Palacký University, Olomouc, Department of Geoinformatics | University of Zagreb, Faculty of Geodesy, Chair of Geoinformation Science | University of West Hungary, College of Geoinformatics | Jagiellonian University in Cracow, Institute of Geography and Spatial Management, GIS Laboratory | West University of Timisoara, Department of Geography | Belgrade University, Remote Sensing Center, Faculty of Mining and Geology | University of Prishtina, Department of Geodesy

Programme Website
> www.ceepus.info

In 2005 Centre for the Geoinformatics (Z_GIS) at Salzburg University established a network of academic institutions called "Applied Geoinformatics" (CEE-GIS) within the Central European Exchange Program for University Studies (CEEPUS) http://www.ceepus.info. Today this network brings together 10 institutions from Poland, Czech Republic, Hungary, Romania, Bulgaria, Prishtina/Kosovo, Serbia, Croatia and Austria with a common interest in Applied Geoinformatics.
Z_GIS and the Research Unit GIScience have developed intense cooperation. GIScience is interested in expanding networking in the trans-regional scientific community, thus Z_GIS includes the Unit in the CEE-GIS network by sharing hosting activities particularly for PhD and advanced MSc students from the network institutions whose work is in the Unit's field of interest.

The main network activities include:

- full semester undergraduate and graduate exchange focusing on Geoinformatics methodologies, hosting students coming from a transdisciplinary array of institutions
- offering an annual international Summer School
- short intensive courses and research visits by students working on their theses
- teaching visits by faculty, assisting with integrating curricula, working on pedagogical issues and developing eLearning or blended learning strategies for international student bodies
- exploring possibilities for common educational and research projects

In 2008/09 all network partners were awarded a total of 60 months for mobility. This year Z_GIS hosted 10 students for a short and long term stay who conducted their thesis work or attended courses, and 2 teaching staff offering lectures on selected topics in Applied Geoinformatics for students at Salzburg University. In 2007/08 a visiting researcher from the Institute of Geography at the Bulgarian Academy of Sciences (and now Director of the Institute) contributed greatly to signing a framework agreement between the two institutions.
One of the major outcomes of this CEEPUS network cooperation was the submission of a proposal aiming at developing a curriculum for an MSc programme in GIScience under the TEMPUS CARDS program in 2006. The project partners from Salzburg, Cracow and Zagreb were awarded a 2 year grant (http://tempus.geoinfo.geof.hr/). Success in such an initiative has proven a key indicator for advancing the cooperation beyond the networking stage and resulted in establishing institutionalised cooperation on a high level.

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digital: earth:eu

Comenius Network

Funded Project
European Commission,
Lifelong Learning,
Comenius Programme
Project Number:
510010-LLP-1-2010-1-AT-
COMENIUS-CNW

Duration
November 2010 –
October 2013

Project group:
Thomas Jekel
Josef Strobl
Robert Vogler

Coordinator:
Z_GIS Centre for Geoinformatics,
University of Salzburg
The network contains partners from
more than 20 European countries

Project Website
http://www.eurogeography.eu/
digital-earth.html

Project Summary

In February 2010 an application was made to the EC to establish a Comenius European network of schools, teacher training and other educational organisations who are involved in the teaching with GeoInformation. The proposal is based on the establishment of an Austrian Centre of Excellence for learning and teaching with GeoInformation digital:earth:at.

The potential uses of GeoInformation in education has greatly expanded through the development of new technologies. In general these have not been matches by pedagogical or curtriculum developments. However there are many initiatives involving schools and teacher training institutions, publishers, software and data providers, NGOs and other agencies. People involved in these need to have the opportunity to share their innovative activities and to establish new opportunities for further developments. This is the aim of the digitalearth:eu Comenius Network proposal.

Within the project, the Institute of GIScience leads a workpackage on the development of classroom pedagogies using GI and contributes in the fields of quality assurance and conference organization.

digital:earth teacher training activities

digitalearth.eu

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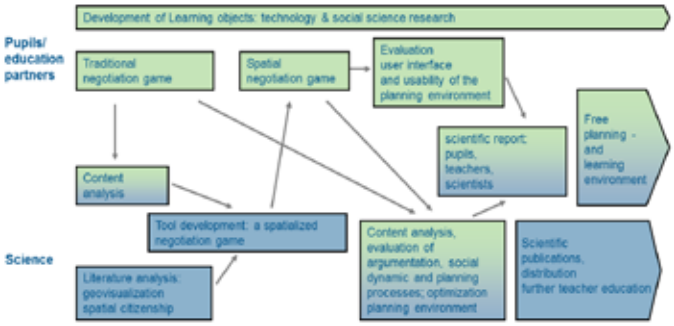
GEOKOM-PEP

Geovisualization and communication in participatory decision making processes

This project develops a collaborative spatial planning environment based on digital maps. It does so by using lab situations that include pupils as developers, and later as evaluators of the platform they have been conceiving. Pupils therefore are participating in all aspects of the R&D process in a continuing and ongoing cooperation between researchers and education partners.

Project Structure



The discussion on participative planning environments so far has developed a wide variety of different planning tools. These are partly based on face2face situations, partly on blended learning principles and partly already use Web2.0 technologies. One of these tools is “Surfing Global Change“ (© G. Ahamer). Here, a democratic and discoursive decision making process will be emphasized. This toolset has been tested in real world planning situations as well as in interdisciplinary teaching and learning situations at universities and schools. Spatial planning here offers a support for learning processes. This conception follows the idea that collaborative spatial planning can be considered as learning process by trading participants’ views on a specific problem.
However, as with most collaborative planning tools, SCG is missing out on (geo-)spatial visualization. GEOKOM-PEP tries to enhance collaborative spatial planning by developing and evaluating a GI-based planning tool that can be used by lay people. At the same time, pupils are involved in developing and evaluating a specific learning environment. It is supposed that the project helps pupils to use tools of e-participation and e-democracy, as well as a sense of spatial citizenship.

Funded Project
Sparkling Science, BMWF
SPA/02-78/GEOKOM-PEP

Duration
October, 2009 –
September, 2011

Project Group
Thomas Jekel
Robert Vogler
Sabine Hennig
Gilbert Ahamer
Gudrun Wallentin

Project Partners
University of Koblenz-Landau,
INRP Lyon,
University of Education Salzburg,
Digital:earth:at,
Danube University Krems,
Centre for Geoinformatics (Z_GIS),
Federal Chancellery Austria,
Akademisches Gymnasium Salzburg,
BG Salzburg-Nonntal

Project Website
http://projects.giscience.at/geokom-pep

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GI_EDU

Collaborative Learning with GI

Interdisciplinary Project

Duration
March, 2007 – July, 2009

Project Group
Thomas Jekel
Gilbert Ahamer
Adrijana Car
Josef Strobl
Robert Vogler

SURFING GLOBAL CHANGE

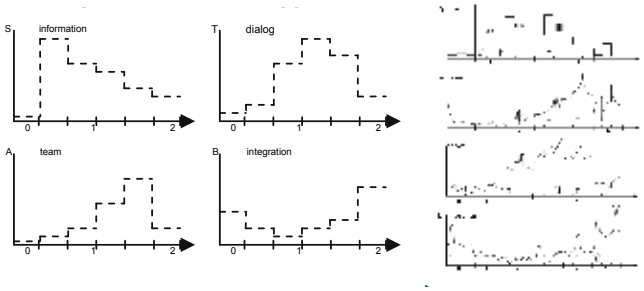
finalist medida prix 2007

Project Objectives

'Collaborative Learning with GI' aims at providing knowledge on collaborative learning environments with a specific emphasis on value added by spatial representation and collaborative visualisation. The project both develops and evaluates learning environments that support active participation in global change and therefore contribute to spatial citizenship.

Project Description

The project combines game-based learning supported by learning management systems (LMS) with an explicitly spatial approach. The web based negotiation procedure "Surfing Global Change" SGC (Award for Excellence 2005 by Emerald Publishers, MEDIDAPRIX-finalist 2007) describes the interwoven social and learning processes as (I) conveying information, (II) building a team, (III) debating with peers and (IV) integrating with competitors. Devising strategies following these steps is suggested to benefit learning effects.



Collaborative Learning with GI explores the added value of geoinformation in the areas of conveying information, debating with peers and integrating strategies with competitors. Integration here is provided by collaborative mapping and visualisation procedures based on digital globes while evaluation is relies on content analyses of contributions and visualisation within the LMS.
Output of the project are guidelines for the construction of GI based collaborative learning environments in both secondary and higher education.

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I AM HERE!

Partizipative approaches to analyze the spatial behavior of adolescents in the city

Funded Project
Sparkling Science, BMWF
SPA/03-97/I am here

Duration
September, 2010 –
July, 2012

Project Group
Robert Vogler
Thomas Jekel

Coordinator
University of Natural Ressources and Life Sciences, Institute for Landscape Development, Recreation and Conservation Planning

Project Website
http://www.sparklingscience.at/en/projekte/479-i-am-here-

Project Outline

It is not possible to be nowhere. But where are we? Why are we there? How do we access these places? How do we organize and form them? And which meanings do they have for us?

The public space in a city is limited and overlapped by competing claims among interest. To young people this space offers the possibilities to escape from parental and academic control. They meet like-minded people and friends, just hang out or use them as container and platform for signs and symbols of their cultural affiliation. Beside this, public space helps adolescents for the integration to an adult society.
Within this project, we collect and analyze the spatial activities of young people in Vienna to deduce proposals and concepts for a city development and open space planning that is suitable for younger persons.

As tools for the data collection we use GPS devices, mobiles as well as digital photo- and video cameras and audio recording devices. For data processing and visualization web-mapping and virtual globe technologies like GoogleMaps, GoogleEarth or OpenStreetMap are used.

Following the principles of transdiciplinary research, the participating pupils are integrated in the project work from the beginning. This means, that they don´t learn only about actual research methods from the field of social geography and geoinformation, but also get involved in the development and design of methods (web programming, questionnaire design, etc.).
The hereby developed tools are also used for artistic forms of expression (GPS Art, GPS Drawing).

The results are then presented and discussed by the pupils within a workshop of the Municipal Department 18 (urban development and planning) together with representatives of the Viennese administration.

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Schools on Ice

Globaler Wandel in Polar- und Hochgebirgsregionen

Funded Project
BMWF FERMAP IPY
2007/2008

Duration
July 1, 2007 – June 30, 2009

Coordinator
ÖAW – GIScience
Josef Strobl
Thomas Jekel
Gudrun Wallentin

Science Partner
Technical University Vienna,
Institute of Geodesy and
Geophysics

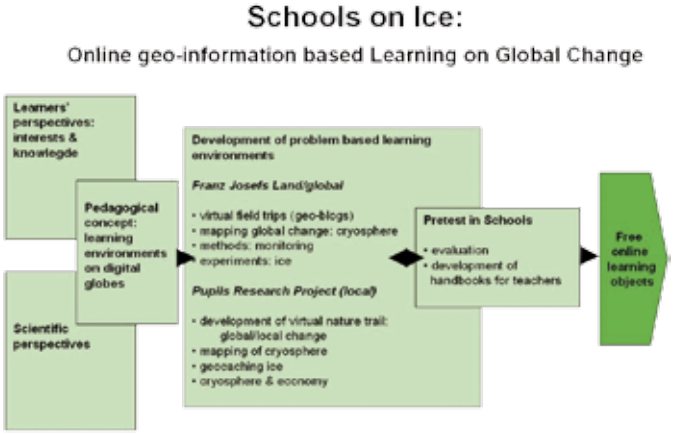
Education Partners
BG Nonntal, Salzburg
BG Traun
BG XXI, Wien

Project Website
> www.schoolsonice.oeaw.ac.at

Geoinformation based Learning on Global Change

While Global Change is presented in different forms of media, it may be considered less tangible than other day to day problems. Schools on Ice (FERMAP.eduglobe) coordinated by GIScience offers possibilities for active learning both in virtual learning environments as well as in the field using mobile geoinformation tools for mapping and teaching. Global Change becomes a tangible phenomenon through direct interaction.

Project Description



The project strongly advocates the inclusion of learners' perspectives and activity in the conceptualisation of learning materials. Based on these foundations, the project develops and evaluates Geoinformation-based learning objects for free use in schools.
Visualisation and collaboration by learners is based on the use of digital Globes, mapping both global and local change of the cryosphere as well as the economic and ecological consequences thereof. Reference areas are Franz-Josefs-Land on a global and polar scale as well as a section of National Park Hohe Tauern, Austria.
The project is open to further education partners and also serves as a geo-communication base for other FERMAP-IPY projects.

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Publications 2009 – 2010

Papers	**128**
ISI Journal Articles	4
Peer-reviewed Publications	61
Edited Books	18
Other Publications	45

For details see following pages

Editorial Board Representations

Josef Strobl
- International Journal for GIS & RS
- Geocarto International
- GIS Science, GIS Business
- International Journal of Geoinformatics
- Journal of Geomatics
- Transactions in GIS
- Österr. Zeitschrift für Vermessung und Geoinformation
- Geospatial World

Gilbert Ahamer
- International Journal of Technology and Educational Marketing
- Cases on Innovations in Educational Marketing: Transnational and Technological Strategies
- Emerald Emerging Markets Case Studies
- Journal für Entwicklungspolitik
- The Open Information Science Journal
- Cases on Innovations in Educational Marketing
- European eLearning Award EureleA 2011

Adrijana Car
- Learning with Geoinformation
- AGIT

Robert Marschallinger
- Computers&Geosciences
- Austrian Journal of Earth Sciences

Thomas Jekel
- Learning with Geoinformation
- GW-Unterricht

Robert Vogler
- Learning with Geoinformation

GIScience Publications 2009 – 2010

ISI Journal Articles

***Marschallinger, R., Hofmann, P.**, Daxner-Höck, G., Ketcham, R. (2010) Solid modeling of fossil small mammal teeth. In: Computers & Geosciences, Elsevier. 10.1016/j.cageo.2010.07.011.*

***Hofmann, P., J. Strobl** and T. Blaschke (2010) Quantifying the robustness of fuzzy rule sets in object based image analysis. In: Int. Journal of Remote Sensing. (pages pending, in print). DOI: 10.1080/01431161.2010.523727.*

*Dragut, L., Schauppenlehner, T., Muhar, A.; **Strobl, J.**, Blaschke, T. (2009) Optimization of scale and parametrization for terrain segmentation: an application in soil-landscape modelling. Computers & Geosciences.*

***Marschallinger, R.**, Eichkitz, Ch., Gruber, H., Heibl, K., Hofmann, R., Schmid, K. (2009) The Gschliefgraben Landslide (Austria): A Remediation Approach involving Torrent and Avalanche Control, Geology, Geophysics, Geotechnics and Geoinformatics. Austrian Journal of Earth Sciences, Bd. 102/2, S. 36-51.*

Peer-reviewed publications in journals 2010

*Abdykalykov, A.A., **Strobl, J.** and S. Jorobekova (2010): Proceedings of the Fourth Central Asia GIS Conference - GISCA'09, "Water: Life, Risk, Energy and Landuse". 122pp. Austria - Central Asia Centre for GIScience. Bishkek.*

***Ahamer, G.** and **Jekel, T.** (2010): "Make a Change by Exchanging Views". In: "Cases on Transnational Learning and Technologically Enabled Environments", Mukerji S. & Tripathi, P. (eds.), pp. 1-30, IGI Global, Hershey, New York, March 2010, http://www.igi-global.com/.*

***Ahamer, G.** and **Strobl, J.** (2010): "Learning across Social Spaces". In: "Cases on Technological Adaptability and Transnational Learning: Challenges and Issues", Mukerji S. & Tripathi, P. (eds.), pp. 1-26, IGI Global, Hershey, New York, March 2010, DOI: 10.4018/978-1-61520-779-4.*

***Ahamer, G., Jekel, T.** and **Vogler, R.** (2010): "Participate when Mapping Realities". Journal of Cases on Information Technology (JCIT), 12(3), 100-125, 2010. An Official Publication of the Information Resources Management Association, http://www.igi-global.com/Bookstore/Article.aspx?TitleId=46042.*

***Ahamer, G.** and **Strobl, J.** (2010): "Information Technologies Socialise Geographies". Journal of Cases on Information Technology (JCIT), 12(3), 1-27, 2010. An Official Publication of the Information Resources Management Association http://www.igi-global.com/Bookstore/Article.aspx?TitleId=46036.*

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***Belgiu, M.**, Mittlboeck, M., **Strobl, J.**, 2010, Central Asia Geoportal – An ISO19115 complaint metadata catalogues for geographic information sharing. In: Proceedings of the Fourth Central Asia GIS Conference – GISCA'10, "Water, Risk, Energy and Landuse", Bishkek, Kyrgyzstan, 27-28 May, 2010.*

*Blaschke T. and **Strobl, J.** (2010): Geographic Information Science Developments. GIS.Science. Zeitschrift für Geoinformatik 23(1), 9-15.*

***Fischer F.** (2010): Wertschöpfung 2.0: Neue Produktions- und Nutzungspraktiken auf dem Geoinformationsmarkt. In: GW-Unterricht,120, pp. 30 - 46.*

***Fischer F.** (2010): What Do We Learn from Augmented-Reality Gaming? In: Thomas Jekel, Alfons Koller, Karl Donert und Robert Vogler (2010): Learning with Geoinformation V - Lernen mit Geoinformation V. Heidelberg. Wichmann.*

***Gryl, I., Jekel, T.** & Donert, K. (2010). GI & Spatial Citizenship. In: Jekel, T., Koller, A. & Donert, K., Vogler, R., Learning with GI V. Berlin & Offenbach: Wichmann, S. 2-11.*

***Hennig, S.** & Pfeifer, J. (submitted): Infrastrukturen und Schutzgebietsmanagement am Beispiel der Eingangssituationen im Nationalpark Berchtesgaden. Natur und Landschaft.*

***Hennig, S. & Möller, M.** (submitted): Applied Visitor Management in Two German National Parks Berchtesgaden & Bavarian Forest. In, Problems in Geography.*

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*Niel, W., **Wallentin, G., Ahamer, G.** (2009) Monitoring-Konzepte für dynamische Strukturveränderungen. Thema des Monats, ÖAW (12).*

*Pfeifer, J., **Hennig, S.** & Opp, C. (2009) Visitor Nodes – Instrument for Visitor Management and Monitoring. (4th Symposium for Research in Protected Areas of the Hohe Tauern National Park); Kaprun.*

*Rosenzweig, T., **Ahamer, G.** (2009) Final report on the preparation of a twinning fiche for Azerbaijan in the field of Vocational Education and Training (VET) in agriculture.*

*Rosenzweig, T., **Ahamer, G.** (2009) Strengthening the Azerbaijani Initial Vocational Education in the Field of Agriculture. Twinning Fiche Nr. AZ10/ ENP-PCA/.*

Presentations 2009 – 2010

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For details see following pages

Chairing Conference Programme Committees

Josef Strobl
- AGIT
- Central Asia GIS Conference
- GI_Forum

Adrijana Car
- GI_Forum

Thomas Jekel
- Learning with Geoinformation
- GI_Forum

Robert Marschallinger
- Computer Oriented Geology (COGeo)
- GI_Forum
- IAMG 2011

Robert Vogler
- Learning with Geoinformation

Fritz Zobl
- Computer Oriented Geology (COGeo)
- IAMG 2011

Keynotes and Invited Lectures 2010

Strobl, J. (19.11.2010) "Delivering SDI and GIS Education Across the Web". Workshop (chair) at GSDI-12 Singapore.

Strobl, J. (15.10.2010) "Geoinformation 2000-2010-2020" Invited keynote: 10th anniversary Geoinformation Program at FH Kärnten.

Strobl, J. (27.08.2010) "Digitale vs. Reale Welten – Grenzen von Computermodellen". Technologiegespräche Alpbach, August 27, 2010.

Strobl, J. (17.06.2010) "Neue Kommunikations- und Beteiligungsformen im digitalen Raum". Festvortrag "150 Jahre Zivilingenieure". Wien.

Strobl, J. (21.01.2010) "Building Capacity for a Geospatial Vision for India". Invited Keynote and Round Table Opening, MapIndia Conference. Gurgaon.

Keynotes and Invited Lectures 2009

Ahamer, G. (24.08.2009) Climate change as global motivation for renewable energy and forecasts of future energy demand. Vortrag: openSolarCA' 09 workshop (Kyrgyz State University of Construction, Transportation and Architecture), Bishkek/KYRGYZSTAN <http://129.27.89.66/opensolar/.

*Ahamer, G. (28.08.2009) A geo-referenced method to project trends into the long future. Vortrag: GISCA'09 - GIScience for Environmental and Emergency Management in Central Asia (Austria-Central Asia Centre for GIScience (ACA*GIS) at the Kyrgyz State University of Construction, Transport and Architecture), Bishkek/KYRGYZSTAN <http://www.aca-giscience.org/gisca09>.*

Jekel, T. (18.06.2009) Geographie, Geoinformation und Politische Bildung. Vortrag: Kompetenzen in der politischen Bildung - 10. Jahrestagung der GPJE/AUSTRIA.

Klug, H., Hennig, S., Wallentin, G. (11.07.2009) Spatial Data Infrastructures (SDI) for soil and nature conservation datasets. Vortrag: GISLERS Summer School 2009 (ZGIS), Salzburg/AUSTRIA.

Strobl, J. (02.06.2009) Distance Education - Visions, Challenges and Reality. Keynote. Vortrag: ISPRS Workshop Commissions VI/1 - VI/2 Tools and Techniques for E-Learning, Potsdam/GERMANY.

Strobl, J. (10.09.2009) Downscaling Climate Data and Change Scenarios for Hydrological and Landcover Modeling in Mountainous Regions. Vortrag: International Workshop devoted to Climatic, Environmental, Land Cover-Land Use Change Studies at High Elevation (Northern Eurasian Earth Science Partnership Initiative), Bishkek/KYRGYZSTAN.

Strobl, J. (18.08.2009) Geospatial Technology Integration. Opening Plenary. Vortrag: MapAsia 2009, Singapore/SINGAPORE.

Strobl, J. (18.09.2009) Salzburg als Digital City: von 2D zu interaktiven 3D/4D. Vortrag: 6. Salzburger Medientag: 'Die 3. Dimension – Konkurrenz fürs flache Fernsehbild?', Salzburg/AUSTRIA.

Strobl, J. (19.06.2009) Building Bridges - The Future of Spatial Data Infrastructures. Keynote. Vortrag: GSDI 11 World Conference, Rotterdam/ NETHERLANDS.

Strobl, J. (20.09.2009) Geokommunikation (Opening Lecture). Vortrag: Deutscher Geographentag 2009, Wien/ AUSTRIA.

Scientific Presentations 2010

Ahamer, G. (2010): "Renewable Energy Strategies in Central Asia". Presentation at the enerGIS'10 Staff Development Workshop, Dushanbe, Tajikistan, pp. 27-38.

Fischer F. (04.11.2010): Verortet.Vernetzt.Vermarktet. Mobile Nutzung von Geoinformation im Alltag. BICCworkshop Mobile Anwendungen und Geodaten, Garching b. München.

Fischer F. (08.07.2010): What do we learn from Augmented-Reality Gaming? Learning with Geoinformation 2010 (GI_Forum), Salzburg.

Fischer F. (07.07.2010): Verortet.Vernetzt.Vermarktet. Aufbruch in die Geoinformationsgesellschaft. GeoTalk 2 - Geodaten als strategischer Rohstoff, Salzburg.

Fischer F. (08.06.2010): Demokratisierung der Geoinformation? Wie Nutzer von lokalen Suchportalen handeln. GI-Kolloquium, Salzburg.

Hennig, S., Vogler, R., Müller, N. & Sönser, L.: (30.08.2010): „Toolentwicklung für partzipative Raumplanung" - Vortrag im Rahmen des Institutskolloquiums des Zentrums für Geoinformatik in Salzburg.

Hennig, S. (06.07.2010): „Develpoment of participatory e-planning tools",Vortrag im Rahmen des Projektworkshops GEOKOM-PEP/Sparkling Science in Salzburg.

Hennig, S. (01.07.2010).: „Spatial Data Infrastructures (SDI) for soil and nature conservation datasets. Examples from the eContenplus projects NatureSDIplus and GS Soil. Vortrag an der enviSDI summerschool, Z_GIS, Universität Salzburg.

Jekel, T. & R. Vogler (07.04.2010), Kritisches Lesen von Karten & Bildern. LehrerInnenbildung Geoinformatik, Salzburg.

Jekel, T. (08.04.2010), Den globalen Wandel erklären. Google Public Data Explorer. LehrerInnenbildung Geoinformatik, Salzburg.

Jekel, T. (08.04.2010), Vorstellung & Entwicklung lehrplanbezogener Unterrichtsbeispiele (gem. m. M. Lindner-Fally). Workshop. LehrerInnenbildung Geoinformatik, Salzburg.

Jekel, T., K. Donert & I. Gryl (14.04.2010), The role of GI in Spatial Citizenship. AAG Annual Meeting, Washington..

Jekel, T. (20.05.2010), Collaborative Mapping & Spatial Citizenship. Universität Hamburg.

Jekel, T. (02.07.2010), Spatial Citizenship & GI(S). Alternative Zieldimensionen und Anwendungsbeispiele von Geomedien im Unterricht. Kolloquium, Universität Jena.

Jekel, T., K. Donert & I. Gryl (05.07.2010) , GI & Spatial Citizenship. Learning with GI, Salzburg.

Jekel, T. (26.11.2010), Die Digital:earth:Revolution. Anwendung, Kleingedrucktes, Schule. FDZ-Night, Wien.

Leitner, Ch., Marschallinger, R. (2010) Pseudomorphosen von Anhydrit nach Steinsalz als Indikatoren eines frühen thermischen Ereignisses in den Nördlichen Kalkalpen. Pangeo 2010, 16.09.2010-19.09.2010, Leoben.

Marschallinger, R. (2010) Raum-zeitliche Betrachtung der Verschiebungsdaten bei Hangrutschungen. Fachvortragsreihe ÖGG. 25.03.2010-25.03.2010. Univ. Wien, Geozentrung Althanstrasse.

Marschallinger, R. (2010) Raum-Zeit Geostatistik bei Hangbewegungen. Geodätisches Praktikum TU München, 11.9.2010, Höfen, Singerhütte.

Marschallinger, R. (2010) Geostatistische Analyse, Simulation und Modellierung von Massenbewegungen im raum-zeitlichen Kontext. Workshop Geotechnologien für instabile Hänge, 21.05.2010, TU München.

Marschallinger, R. (2010) Geostatistical space-time modelling of hydrological data. water scarcity winter school , 01.02.2010-11.02.2010, Univ. Salzburg, Zentrum für Geoinformatik.

Marschallinger, R., Mölk, M. (2010) Geostatistische Raum-Zeit-Analyse der Deformationen am Hornbergl: Entscheidungsgrundlagen für die Abwehr von Schadenszenarien. COGeo 2010, 11.06.2010, Salzburg.

Möller, M. (10/2010), Urban Environmental Monitoring. EnvironInfo, Bonn.

Möller, M. (07/2010), Mythos „Wilder Westen"-Der Südwesten der USA auf einer Geographischen Exkursion. Institut für Geographie, Universität Bamberg.

Möller, M. (07/2010), Umsetzung des „Kerncurriculums Geoinformatik" in der GI-Ausbildung. DGPF - DACH Jahrestagung Wien, Österreich.

Möller, M. (07/2010), THERMOMAP-Mapping Subsurface Thermal Potential for Selected Sites in the EC. AGIT - GIFORUM Salzburg, Österreich.

Möller, M. (06/2010), Thematische Kartengestaltung Online. GIS-AT, GIS Ausbildungstagung. GFZ, Potsdam.

Möller, M. (06/2010), Aspekte der kartographischen (Aus-)Bildung im Informationszeitalter. Kartographentag, Berlin.

Möller, M. (06/2010), Aktuelle Lehre der Geographie zwischen Anspruch & Realität zukünftiger Geographen. VGDH, Kloster Bronnbach.

Möller, M. (01/2010), Schöne neue Geoinformationswelt - Chancen und Risiken der Geoinformation im Informationszeitalter. Institut für Geographie, Universität Bamberg.

Strobl, J. (25.11.2010) AGEO und die Umsetzung von INSPIRE". Österr. GEO/GEOSS Workshop Wien.

Strobl, J. (21.11.2010) "Building an SDI as a Community Project – Challenges in Emerging Economies". Paper presentation at GSDI-12 Singapore.

Strobl, J. (09.09.2010) "Geospatial Competence as Cross-Disciplinary Qualification". Invited Keynote at EUGISES – European GIS Education Seminar. Serres, Greece.

Strobl, J. (27.05.2010) „"Bishkek Greeen Spaces". 4th GIS in Central Asia Conference. Bishkek.

Strobl, J. (25.05.2010) „"GIS - Key to Environmental Monitoring". Workshop "GIS in Environmental Management" at the Kyrgyz National Agrarian University, Bishkek.

Strobl, J. (07.04.2010) "Geomedienkompetenz" Wolfgang Sitte Tagung. Salzburg.

Strobl, J. (08.02.2010) "Lost in Cyberspace? Zukunftstechnologie Geoinformatik". Rosenheimer Initiative zur Förderung der Informations- und Kommunikationstechnik ROSIK e.V. Rosenheim.

Strobl, J. (21.01.2010) "Spatial Visualisation – Cartography as GUI". Centre for the Study of Regional Development,, Jawaharlal Nehru University. New Delhi.

Strobl, J. (18.01.2010) "Realtime Geographies". Presentation at GIS Institute / GIS Development. Noida.

Strobl, J. (16.01.2010) "Managing our Societies – The Importance of Geospatial Technologies"- Public Lecture, Panjab University. Chandigarh.

Vogler, R. (21.01.2010), „GEOKOM-PEP. Geovisualisierung und Kommunikation in partizipativen Entscheidungsprozessen" - Vortrag im Rahmen des Institutskolloquiums des Zentrums für Geoinformatik in Salzburg .

Vogler, R. (19.03.2010), „GEOKOM-PEP. Geovisualisierung und Kommunikation in partizipativen Entscheidungsprozessen" - Inputvortrag am Gemeinsamen Symposium des Hochschulverbands für Geographie und ihre und des Georg-Eckert-Instituts in Braunschweig .

Vogler, R. (06.04.2010), „Kritisches Lesen von Karten und Bildern" – Vortrag im Rahmen des LehrerInnen-Fortbildungsseminars „GEOINFORMATIK 2010. Von Google Earth zum partizipativen Geo-Web" (Osterseminar) des Fachdidaktikzentrums „digital:earth:at" an der Universität Salzburg.

Vogler, R. (05.07.2010), „Geovisualization and Communication in participatory decision making processes" - Vortrag im Rahmen des Projektworkshops GeoKom-PEP/Sparkling Science in Salzburg.

Vogler, R. (08.07.2010), „GEOKOM-PEP. Pupil led research into the effects of geovisualization" - Vortrag im Rahmen der Fachtagung "Learning with geoinformation" in Salzburg.

Wallentin, G.(29.09.2010) INSPIRE needs for the nature conservation community. Vortrag: SDI for Nature Conservation, Nature-SDIplus Second Conference, Lissabon/PORTUGAL.

Wallentin, G.(09.04.2010) GPS und Google Earth im Unterricht. Vortrag: Lehrer Osterfortbildung/AUSTRIA.

Wallentin, G.(29.06.2010) State of the art - Nature Conservation SDI. Vortrag: EnviSDI Summer School/AUSTRIA.

Wallentin, G.(07.07.2010) Spatio-Temporal Uncertainty in Individual Based Tree Line Modelling. Vortrag: GI_Forum/AUSTRIA.

Wallentin, G.(29.04.2010) Presentation of the draft DL 2.4 "report assessing the user needs". Vortrag: Nature-SDIplus, 4th Project Meeting/GREECE.

Scientific Presentations 2009

Ahamer, G., Car, A., Marschallinger, R., Wallentin, G., Zobl, G. (03.06.2009) How to map time into space. Vortrag: 4th International Conference on Information Technology (ISIC'09), Amman, Jordan, ISBN 9957-8583-0-0, http://www.alzaytoonah.edu.jo/ICIT/pages/index.aspx (Al-Zaytoonah University of Jordan), Amman/JORDAN <http://www.alzaytoonah.edu.jo/ICIT/documents/conference_program.pdf>.

Ahamer, G. (01.07.2009) Renewable Energy Strategies. Vortrag: ENERegion Summer School 2009 (Z_GIS), Salzburg/AUSTRIA <http://www.eduzgis. net/index.php?option=com_content&task=view&id=281&Itemid=220>.

Ahamer, G. (02.07.2009) Biomass Energy Potentials - the Global Perspective. Vortrag: ENERegion Summer School 2009 (Z_GIS), Salzburg/AUSTRIA <http://www.edu-zgis.net/index.php.

Ahamer, G. (14.05.2009) Die "Global Change Data Base" erzeugt und testet Hypothesen zur globalen strukturellen Evolution. Vortrag: Betriebsausflug der ÖAW nach Salzburg (GIScience), Salzburg/AUSTRIA.

Ahamer, G. (19.03.2009) Mapping Global Dynamics: Transitionen - Räumliche Strukturen und zeitliche Dynamik globaler Landnutzung. Vortrag: Kolloquium (AG Angewandte Geoinformatik und Kartographie, Fachbereich für Geographie und Geologie der Universität Salzburg), Salzburg/ AUSTRIA <http://www.oeaw-giscience.org/images/stories/Poster/kolloquium_g.ahamer_19.3.pdf>.

Belgiu, M. (09.09.2009) Slope failure occurrence in Alpine Space (Tennengebirge Mountain) – Susceptibility assessment using Weights of Evidence method. Poster Presentation: International Young Scientists School on on Environmental Studies at High Elevations, Bishkek/KYRGYZSTAN.

Car, A. (21.11.2009) Time in GIS. Guestlecture Out - Sultan Qaboos University, Muscat/OMAN.

Fischer, Florian (08.07.2009) Learning in Geocommunities. An explorative view on geo-social network communities. Vortrag: Learning with Geoinformation, Salzburg/AUSTRIA.

Fischer, Florian (12.03.2009) The location aware city - Geoinformation in der Stadt von Morgen. Vortrag: 14. Münchner Fortbildungsseminar Geoinformationssysteme, München/GERMANY.

Fischer, Florian (18.11.2009) GeoVZ und Placebook. Vortrag: GIS Day 2009, Salzburg/AUSTRIA.

Fischer, Florian (21.09.2009) Volunteered Geographic Information - Baustein zukünftiger Geoinformationsinfrastrukturen?. Vortrag: Deutscher Geographentag 2009, Wien/AUSTRIA.

Fischer, Florian (22.09.2009) Mediengeographien des GeoWeb. Vortrag: Deutscher Geographentag 2009, Wien/AUSTRIA.

Hennig, S. (01.10.2009) Nature-SDIplus: Best pratice network for SDI in Nature Conservation. Vortrag: 3. Anwendertreffen GIS in Nationalen Naturlandschaften/ 2. Workshop GIS within the network of alpine protected areas (Schweizer Nationalpark), Zernetz/SWITZERLAND.

Hennig, S. (24.09.2009) Aspects about Nature Conservation in Central Europe. Vortrag: Exkursion Mitteleuropa, Geogr. Insititut, Ryerson University, Berchtesgaden/GERMANY.

Hofmann, P. & Marschallinger, R. (15.10.2009): 3D volume modelling of fossil small mammal teeth using micro CT and object based image analysis. Lecture: VIPIMAGE 2009, Porto, Portugal.

Jekel, T. & Jekel A. (10.11.2009) Actively mapping the Global. Vortrag: Ringvorlesung Globales Lernen, Salzburg/AUSTRIA.

Jekel, T. (16.04.2009) Kollaboratives Lernen mit Geoinformation: Empirische Befunde. Vortrag: Wolfgang Sitte Seminar: Geoinformatik 2009, Salzburg/AUSTRIA.

Jekel, T. (22.01.2009) Sozialen Raum Kommunizieren? Unterrichtskonzeptionen und Praxiserfahrungen im Bereich Lernen mit Geoinformation. Vortrag: Geographiedidaktisches Kolloquium/GERMANY.

Marschallinger, R. (29.06.2009) Geostatistische Simulation der Progression Multipler Sklerose basierend auf Kernspintomographie Daten. Vortrag: Computeranwendungen in Wirtschaft und Technik (Dept. Computer Sciences, Univ. Salzburg), Salzburg/AUSTRIA.

Marschallinger, R. (29.06.2009) Multiple Sklerose: _pathologische Prozesse durch _die 4D-Brille des Geoinformatikers. Vortrag: ÖAW Betriebsausflug 2009 (ÖAW GIScience Institut), Salzburg/AUSTRIA.

Möller, Matthias (09.07.2009) Innovationen in der Fernerkundung. Vortrag: AGIT (Universität Salzburg), Salzburg/AUSTRIA.

Möller, Matthias (10.03.2009) Aerial Image Time Series Analysis in Virtual Globes - A School Teaching Example. Vortrag: ASPRS Annual Conference (ASPRS), Baltimore/UNITED STATES.

Möller, Matthias (19.06.2009) Geoinformation Lehren Lernen; GI Ausbildung für Lehramt-Studierende der Geographie. Vortrag: GISAusbildungstagung (GFZ Potsdam), Potsdam/GERMANY.

Möller, Matthias (22.09.2009) Wasser in Grenzregionen - Kartographische Erfassung einer limitierten Ressource aus Satellitenbilddaten. Vortrag: Deutscher Geographentag 2009 (Universität Wien), Wien/AUSTRIA.

Strobl, J. (02.06.2009) Education for GSDI. Vortrag: 12th AGILE International Conference on Geographic Information Science - Advances in GIScience - (AGILE), Hannover/GERMANY.

Strobl, J. (03.06.2009) UNIGIS – Concepts, Achievements and Challenges. Vortrag: United Nations international UN-SPIDER workshop: building capacities to reduce disasters, Wien/AUSTRIA.

Strobl, J. (22.09.2009) Kartographie als Benutzerschnittstelle für Kartographie. Vortrag: Deutscher Geographentag 2009, Wien/AUSTRIA.

Strobl, J. (23.09.2009) Neogeography - globale, verteilte, kollaborative raumbezogene Information als neue Herausforderung für die geographische Forschung. Vortrag: Deutscher Geographentag 2009, Wien/AUSTRIA.

Strobl, J. (25.05.2009) Geo-Dienste: Infrastruktur für Wirtschaft, Öffentlichkeit und Verwaltung - ? Eine Geodaten-Infrastruktur für Salzburg. Vortrag: GIS Cluster Workshop (GIS Cluster Salzburg), Salzburg/AUSTRIA.

Strobl, J. (27.08.2009) Places along the Information Highway: the Long Path towards Spatial Data Infrastructures. Vortrag: 3rd GIS in Central Asia Conference, Bishkek/KYRGYZSTAN.

Wallentin, G.; Hennig, S. (07.10.2009) Nature-SDI in Europe User Needs. Vortrag: Nature-SDIplus Conference, Montpellier/FRANCE.

Wallentin, G.(23.04.2009) Task 2.1 user needs - state of the project and outlook. Vortrag: Nature-SDIplus 1st Technical Workshop (GISIG), Pamplona/SPAIN.

Wallentin, G.(25.11.2009) Nature-SDI in Europe User Needs. Vortrag: Nature-SDIplus Review Meeting (GISIG), Turin/ITALY.

Wallentin, G.(27.03.2009) Schools on Ice Polarforschung mit digitalen Globen. Vortrag: 3tes Österreichisches Polarsymposium, Wien/ AUSTRIA.

Zobl, F. (08.07.2009) Herausforderung der geologischen Erkundung und der Untergrundmodellierung für die geotechnische Analyse. Vortrag: Fachtagung Computerorientierte Geologie/AUSTRIA.

Zobl, F. (08.07.2009) 3D geotechnische Untergrundmodelle für den Tunnelbau: Aktuelle Entwicklungen im Rahmen des Forschungsprojektes TUNCONSTRUCT. Vortrag: Fachtagung Computerorientierte Geologie/AUSTRIA.

Other Presentations 2010

Car, A. (15.10.2010). GI-Education: 2000-2010 and beyond. Presentation at "10 Jahre Geoinformation".Studienbereich Geoinformation, FH Kaernten, Villach.

Strobl, J. (07.05.2010) „"Bilder -vom Boden, aus der Luft und aus dem All- als zentrale Quelle für Geoinformation". Bildungstag des Vereins der Grundkatasterführer Österreichs. Salzburg.

Strobl, J. (27.04.2010) "Herausforderungen an die Ausbildung im GIS-Bereich". 16. ESRI Anwenderkonferenz Darmstadt.

Strobl, J. (09.04.2010) "Wirtschaftsinformatik – Anwendungsfeld Geoinformatik". Fachhochschule Kufstein.

Wallentin, G.(15.11.2010) Uncertainty in simulation modelling: how valid is a model?. Vortrag: Brown Bag Seminar/AUSTRIA.

Wallentin, G.(19.11.2010) Modelle in der Ökologie. Vortrag: GIS Day 2010/AUSTRIA.

Zobl, F. (19.11.2010): Computerbasierte 3D Modelle. GISDay 2010/AUSTRIA.

Other Presentations 2009

Ahamer, G. (13.11.2009) The negotiation game "Surfing Global Change" and its potential use for schools. Vortrag: Kick-off meeting GeoKom-PEP (GIScience), Salzburg/AUSTRIA <http://projects.giscience.at/geokom-pep/aktivitaeten>.

Car, A. (27.02.2009) Continuing Professional Education via Distance Learning - Success Factors and Challenges. Vortrag: Navigating the Future of Surveying Education - Workshop on Educational Management and Marketing, Vienna/AUSTRIA <http://www.fig.net/commission2/vienna_2009_proc/papers/14_strobl_car.pdf.

Fischer, F., Hennig, S., Wallentin, G. (20.03.2009) NatureSDIplus - Best Practice Network for SDI in Nature Conservation. Vortrag: Geoinformatik-Kolloquium 2009 (OEAW GIScience), Salzburg/AUSTRIA.

Fischer, F., Zobl, F. (14.05.2009) Geomedien im urbanen Raum. Neue Stadterfahrung durch Location-Based Gaming. Vortrag: Betriebsausflug der ÖAW nach Salzburg/AUSTRIA.

Fischer, Florian (05.06.2009) Geo-social networking - The multiple uses of Plazes.com. Vortrag: Geoinformatik-Round Table, Salzburg/AUSTRIA.

Gryl, I. (08.07.2009) Karten als Konstruktion verstehen. Vortrag: Lernen mit Geoinformation (ÖAW-GIScience Institut), Salzburg/AUSTRIA.

Hennig, S (01.12.2009) Spatial Data Infrastructure & Nature Conservation: Examples from & Experience in Central Europe. Vortrag: INSPIRE Directive in Nature Conservation - Bulgarian Case (URSIT), Sofia/BULGARIA.

Hennig, S. & 3 students (29.04.2009) Design & Development of (cartographic) applications: Concept & Results. Vortrag: Seminar at the Institute of Geography, BAS, Sofia/BULGARIA.

Hennig, S. (24.04.2009) Applying Integrated Management: Visitor Management and Monitoring on Winter Recreation Focusing Grouse species in Berchtesgaden National Park. Vortrag: International Conference Identifying the Research Basis for Sustainable Development of the Mountain Regions in Southeastern Europe (Institute of Geography, BAN), Borovetz/BULGARIA.

Hennig, S. (24.04.2009) Nature-SDI plus .. is asking for your contribution. Vortrag: International Conference Identifying the Research Basis for Sustainable Development of the Mountain Regions in Southeastern Europe (Institute of Geography, BAN), Borovetz/BULGARIA.

Hennig, S. (29.04.2009) NaturesSDIplus: An introduction. Vortrag: Seminar at the Institute of Geography, BAN, Sofia/BULGARIA.

Hennig, S. (31.10.2009) Target Groups in Nature-Based Recreation. By the example of the German National Parks Berchtesgaden & Bavarian Forest. Vortrag: International Conference Alternative Tourism, Theory and Practice, Varna/BULGARIA.

Hofmann, P. & R. Marschallinger (15.10.2009) 3D volume modelling of fossil small mammal teeth using micro CT and object based image analysis. Vortrag: VIPIMAGE 2009, Porto/PORTUGAL.

Hofmann, P. (05.09.2009) 3D reconstruction using OBIA. Vortrag: THESIS Graduate School Workshop "New tools of recording and quantifying fabrics in geomaterials – a basis for understanding geological processes", TU Munich/GERMANY.

Hofmann, P. (07.11.2009) Erkennen und 3D rekonstruieren von MS Läsionen mittels OBIA aus MRT-Daten. Vortrag: Lange Nacht der Forschung, Salzburg/AUSTRIA.

Jekel, T. & Klug, H. (18.11.2009) Geoinformatik und globale Veränderungen. Vortrag: GISDay, Salzburg/AUSTRIA.

Jekel, T. (12.02.2009) Target group oriented postsecondary education in GIS. Vortrag: MapWorld, Hyderabad/INDIA.

Jekel, T. (15.04.2009) Schools on Ice. Projektunterricht. Vortrag: Wolfgang Sitte Seminar: Geoinformatik 2009, Salzburg/AUSTRIA.

Jekel, T. (17.04.2009) Unterrichtsbeispiel Stadt. Kleinprojekt. Vortrag: Wolfgang Sitte Seminar/AUSTRIA.

Jekel, T. (17.11.2009) Gemeinsam Lehren und Lernen mit Geoinformation. Vortrag: Vorstellung digital:earth:at, Salzburg/AUSTRIA.

Jekel, T., Pichler, H., Dobler, K. (21.09.2009) kind:macht:raum - wie GW-Didaktik neu konstruieren?. Vortrag: Deutscher Geographentag, Wien/ AUSTRIA.

Klug, Hermann (11.09.2009) Datenbezogene Benutzeranforderungen im Natur- und Umweltschutz: Das Beispiel für naturschutzfachliche und bodenkundliche Daten aus den Projekten NatureSDIplus und GS Soil. Vortrag: 17. Fachtagung Geographische Informationssysteme (GIS) im Natur - und Umweltschutz der Alfred Töpfer Akademie für Naturschutz, Schneverdingen/GERMANY.

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