

Dissertations in Geographic Information Science - GISDISS

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Dissertations in Geographic Information Science, ISSN 1868-4160 Aims and Scope

The GISDISS series of dissertations in Geographic Information Science provides access in printed archival form to doctoral research on geospatial information. It collects high quality PhD theses contributing to the global scientific exchange in the field as well as to a better understanding of the human environment and better decisions about it. It addresses readers interested in the frontiers of research on topics ranging from the acquisition through the modeling and processing to the communication and use of spatio-temporal information.

The subject of Geographic Information Science (considered synonymous here with Geoinformatics and Geomatics) implies crossdisciplinary research, combining methods from such fields as geography and the geosciences, engineering, computer and information science, psychology, philosophy, economics, and mathematics. There are no a priori restrictions with regard to possible disciplines or topics, as long as the dissertations deal with problems posed by information referenced to the earth. The editors welcome doctoral theses in the form of collections of peer reviewed publications as well as monographs, in English or German.

GISDISS 012 **NEW** Auriol Degbelo: **Spatial and Temporal Resolution of Sensor Observations**. 2015. xviii, 188 pp. Softcover. € 50,00. ISBN 978-89838-704-0

This work proposes a theory of spatial and temporal resolution of sensor observations, applicable to both technical sensors (e.g. a camera), and human sensors. The consistency of the theory is tested using the functional language Haskell, and its applicability to existing observations is illustrated using the image hosting website Flickr.

GISDISS 011 Simon Jirka: **Discovery Mechanisms for the Sensor Web**. 2013. xviii, 207 pp. Softcover. € 50,00. ISBN 978-3-89838-684-5 (ifgiPrints 47)

This book deals with the topic of discovery in the Sensor Web. Based on the Sensor Web Enablement (SWE) standards of the OGC guidance is provided how sensors, sensor data and Sensor Web services

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can be made discoverable. Topics such as discovery interfaces, metadata models, metadata collection and handling semantics in sensor discovery processes are discussed.

GISDISS 010

Giorgio De Felice: **Reasoning with Mixed Qualitative-Quantitative Representations of Spatial Knowledge**. 2013. xx, 239 pp. Softcover. € 50,00. ISBN 978-3-89838-683-8

Real time spatial knowledge integration is essential in all those situations, such as the rescue phase following an extreme event, in which updated information is necessary to complete some particular tasks. A reasoning system able to derive new spatial information starting a mixed description of the space that makes use of qualitative, quantitative and semantic information has been developed. The hybrid reasoning system integrates and extends reasoning approaches developed separately for the three different kinds of spatial knowledge.

GISDISS 009

Paolo Fogliaroni: **Qualitative Spatial Configuration Queries**. 2013, xxxii, 185 pp. Softcover. € 50,00. ISBN 978-3-89838-682-1

Natural human-GIS interaction is an old challenge that acquired new relevance today because of VGI projects. In my book I describe grounding methods and techniques to allow for interaction via natural language (Qualitative Spatial Configuration Queries). The main focus is on the development of Spatial Access Methods for efficiently handling and accessing qualitative spatial information.

GISDISS 008

Patrick Maué: **Places in the Long Tail**. 2013. xiv, 174 pp. Softcover. € 50,00. ISBN 978-3-89838-681-4 (ifgiPrints 46)

Place names appear frequently in free-text descriptions on the Web. Local variations of these names, typically not supported by spatial applications such as navigation systems, are less often used. They reside in the long tail. This thesis presents a method to discover these place names in user-generated content such as tags for photos.

GISDISS 007

Anusuriya Devaraju: **Representing and Reasoning about Geographic Occurrences in the Sensor Web**. 2012. xvii, 183 pp. Softcover. € 50,00. ISBN 978-3-89838-673-9 (ifgiPrints 45)

Observations are fed into the Sensor Web through a growing number of environmental sensors, including technical and human observers. While a wealth of observations is now accessible, there is still a gap between low-level observations and the high-level descriptive information they reflect. For example, we may ask what the measurements mean when a weather buoy provides a temperature time series. The challenge is not to gather a vast number of observations, but rather to make sense of them in environmental monitoring and decision making. In order to infer meaningful information about geographic occurrences from observations, a description of how one gets from the former to information about the latter must be expressed. Here, questions that call for clarification are: How can geographic occurrences be formally modeled with respect to properties observed by sensors? How can the formal model be used to infer knowledge about geographic occurrences from sensor observations? This book delivers a formal model to answer these ontological questions. The model is used to infer information about blizzards from time series produced by a weather station.

GISDISS 006

Bernd Resch: **Live Geography. Standardised Geo-Sensor Webs for Real-time Monitoring in Urban Environments**. 2012. xvi, 168 pp. Softcover. € 50,00. ISBN 978-3-89838-664-7 (ifgiPrints 45)

Real-time monitoring of urban dynamics, which is widely unexplored, has recently received a lot of attention due to the fast rise of inexpensive pervasive sensor technologies. Following the comprehensive vision of a "digital skin for planet Earth" by Neil Gross (1999), it can be presumed that geo-sensor web deployments will experience a considerable boost within the coming years, as pervasive sensing has recently become feasible and affordable. This enriches knowledge about our environment with uncharted real-time information layers.

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This book focuses on pervasive sensing in urban environments, which poses very particular challenges – as well technical and technological ones, as socio-political and privacy-related ones. The Live Geography approach presented in this book seeks to tackle these challenges with an open sensing infrastructure for urban monitoring applications. The system makes extensive use of open (geospatial) standards throughout the entire process chain – from sensor fusion to data analysis, Complex Event Processing (CEP), alerting, and finally visualisation.

The thesis discusses the implemented technical infrastructure as well as how the methodology can potentially influence the city and its inhabitants by “making the abstract real”. In other words, the thesis illustrates how pervasive monitoring infrastructures can change urban social interactions and people’s short-term behaviour, and which issues are related to establishing such systems.

GISDISS 005

Bastian Schäffer: **Dynamic Rights Management in Cross-Domain Geoprocessing Workflows** 2012. xx, 353 pp. Softcover. € 55,00. ISBN 978-3-89838-660-9 (ifgiPrints 43)

Spatial Data Infrastructures have evolved from concepts into reality in the last decade. However, they are still focused on data retrieval and visualization. To proceed in the direction of a true Spatial Information Infrastructure, it is evident to process geodata to geoinformation. This book goes beyond chaining freely available Geoprocessing Web Services and assumes that not all services are freely available. Specific functionalities of these distributed Geoprocessing Web Services might be secured and need to be accessed in an on-demand fashion. A concept is presented which allows the dynamic access to and chaining of secured Geoprocessing Web Services without a priori established rights or direct trust relationships in contradiction to the classical Role-Based Access Control scheme.

The three different workflow patterns—Transparent, Translucent and Opaque—are analyzed on the basis of a real-world scenario. A static model, a trust model and a dynamic model are developed for each of the three workflow patterns.

In general, the concepts presented in this thesis can be seen as enablers for mapping full business processes in Spatial Information Infrastructures across enterprise borders. This aspect forms an important step towards commercial applications in Spatial Information Infrastructures.

GISDISS 004

Stephan Mäs: **On the Consistency of Spatial Semantic Integrity Constraints**. 2011. xvii, 123 pp. Softcover. € 50,00. ISBN 978-3-89838-645-6 (ifgiPrints 41)

This book intends to contribute to the development of meaningful and machine-interpretable quality descriptions of geographical information. It focuses on spatio-temporal semantic integrity constraints. The developed formalisation and reasoning methodology allows for the detection of conflicting and redundant constraints. Possible application areas are quality assurance of geodata, geodata integration and harmonisation, data modelling and ontology engineering, semantic similarity measurement and usability evaluation.

GISDISS 003

Carsten Keßler: **Context-aware Semantics-based Information Retrieval**. 2010. xviii, 131 pp. Softcover. € 50,00. ISBN 978-3-89838-642-5 (ifgiPrints 39)

This book deals with the identification and processing of relevant contextual information for semantics-based information retrieval. It introduces a cognitive approach for measuring the relevance of contextual aspects and demonstrates how contextual information from the Sensor Web can be processed using standard semantic technologies.

GISDISS 002

Alexander C. Walkowski: **Modellbasierte Optimierung mobiler Geosensornetzwerke für raumzeitvariante Phänomene**. 2010. xxxiv, 264 pp. Softcover. € 50,00. ISBN 978-3-89838-631-9 (ifgiPrints 37)

Die vorliegende Arbeit befasst sich mit der Konzeption eines Verfahrens zur Optimierung mobiler Geosensornetzwerke (GSN) für die Erfassung raumzeitvarianter Phänomene. Defizite bestehender Ansätze zur Optimierung von GSN sind, dass entweder das Phänomen nicht oder aber nur in Form der lokalen Ausprägung bei der Optimierung des GSN einbezogen wird und die Einschränkungen der das GSN konstituierenden Geosensorknoten unberücksichtigt bleiben.

Anhand eines Anwendungsfalles aus dem Katastrophenschutz werden Defizite bestehender Verfahren identifiziert und Anforderungen an das zu konzipierende Verfahren formuliert.

Als Kernanforderungen werden die explizite Berücksichtigung der Phänomen- als auch GSN-Eigenschaften und die objektive Nachvollziehbarkeit des Optimierungsverfahrens identifiziert.

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Die abschließende Diskussion zeigt Themen zukünftiger Forschungsarbeiten auf.

GISDISS 001

Sven Schade: **Ontology-Driven Translation of Geospatial Data.**

2010. xx, 160 pp. Softcover. € 50,00. ISBN 978-3-89838-629-6 (ifgiPrints 36)

Current methods for specifying data models lack well-defined descriptions of data model expressions. It is impossible to define computer-tractable translation rules for data models. In this thesis we provide a semantic reference frame for geospatial data. Annotating (or semantically referencing) expressions, which are used to define geospatial data models, with this frame supports computability and allows for selecting appropriate translation rules on the attribute level. Our approach allows for specifying data model semantics and imprecision. A demonstrator is provided as proof of concept. The research is guided by an example of translating information about road width from a national data model (ATKIS road data model) to an international one (INSPIRE Data Specification for Transport Networks).

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