

Preface

The International Symposium on Spatial Data Handling (SDH) is the biennial international research forum for Geographic Information Science (GIScience), co-organized by the Commission on Geographic Information Science and the Commission on Modeling Geographical Systems of the International Geographical Union (IGU). The conference brings together scholars and professionals from a wide range of disciplines, including (but not limited to) geography, computer science, information science, cognitive science, engineering, statistics and geostatistics, as well as from a rich spectrum of application sciences invaluable contributing to the development of the theory of GIScience.

With its beginning in 1984, the conference has a long tradition and evolved in parallel with the ever since developing discipline of GIScience. It still is a leading scientific meeting in the area. After the conference's third appearance in Australasia two years ago (held in Hong Kong, after Sydney 1988 and Beijing 2000), in 2012 SDH returned to Europe. The 2012 conference was held in Bonn, Germany, in conjunction with and prior to the 32nd International Geographical Congress (IGC), the quadrennial meeting of the International Geographical Union (IGU).

As a novelty, the 15th Symposium on Spatial Data Handling—SDH 2012 provided two different submission tracks, honoring different publication cultures: Full papers, approximating 15 pages, presenting in-depth research and short papers with a maximum of 6 pages highlighting current research, late-breaking results, and presenting concept papers. Twenty-eight full papers were submitted out of these 14 papers were selected for publication within this volume, resulting in a 50 % acceptance rate. The papers are ordered alphabetically by the first author. Short papers are published online with www.ceur-ws.org, with the option for extended papers to get published in a special issue of the International Journal of Geographical Information Science.

The research covered by the canon of papers in this volume allows for two interesting observations. First, all four fundamental GIS functions (1. data capture, 2. modeling, storage, and retrieval, 3. manipulation and analysis, and 4. presentation and sharing) keep on producing interesting and relevant contributions to the theory. Second, classic Spatial Data Handling topics (e.g., modeling topological relations, modeling terrain) are complemented with new and emerging challenges (spatio-temporal and mobile GIS, new geodata sources), mirroring the progress of the discipline.

A first cluster of papers explores new forms of capturing geodata. A diverse tool-set is used for searching and structuring geoinformation from a wide range of structured and unstructured data sources, online and offline. The work by Qi and Yeh presents an integrated approach for land-use classification from remote sensing data. The authors combine object-oriented image analysis with decision trees and support vector machines, reviving this spatial data analysis classic with data mining and machine learning techniques. Walter et al. address the important challenge of accessing map data on the web. Their approach combining web crawling with an automatic interpretation of the map type based on artificial neural networks shows promising results for retrieved vector maps. The paper by Tsatcha et al. introduces an algorithm for retrieving semantic information from a corpus of traffic regulations for maritime navigation using geographic information retrieval combined with natural language processing.

A second cluster of papers investigates novel approaches for modeling a dynamic world, revisiting topological relations, and terrain modeling, as well as integrating the fourth, i.e., the temporal dimension. The paper by Stuetzle and Franklin describes a novel operation called the drill, which is able to represent and regenerate terrains. The operation was developed as an alternative to other terrain representations such as TINs and has the advantage that it retains drainage information during encoding. The paper by Guerra-Filho, Medeiros, and de Rezende presents a new model for describing topological relations among geometric objects based on intersection matrices representations (simplicial complexes). This is an extension of the classical boundary/interior/exterior model by expressing and counting the ways in which two geometric objects are spatially related and then storing this information using the third dimension. Putting topology into practice, Wallgrün presents a method for automatically resolving topological inconsistencies between polygons, e.g., fixing a gap between a bridge and the respective shoreline. His approach is based on formalizing the topological constraints and then transforming the formalization into an optimization problem. Breunig et al. present a service-based geo-database architecture designed to handle geospatial and time-dependent data. The potential of their architecture is illustrated through the modeling of complex surface and volume changes in an open-pit mine. Hong et al. develop a location-aware push service that provides timely messages of campus events to students by taking both the spatial and the temporal perspectives into account. The focus in this study is on the constraints on the temporal information as well as on the space–time location of the recipient of a message.

Aiming for a better understanding of our natural and built environment, spatial analysis remains a stronghold of the conference. The volume features innovative techniques and algorithms for structuring space, as well as analyzing biological and socio-economic variables. Buchin et al. investigate the segmentation of movement trajectories. Their segmentation shall divide GPS tracks of migrating geese into semantically homogeneous units, aiming at the identification of animal behaviors such as flying, resting, or foraging. Guerra-Filho and Samet introduce a hybrid shortest path algorithm to perform intra-regional queries used e.g., in moving object databases. Regions are formed by subdividing a single network into smaller regions creating a hierarchy of multilevel networks. The shortest path is determined in each region and then concatenated using their new method. Shannon and Harvey found that the usability of data on food assistance benefits can be increased when using a three-class areal interpolation method to disaggregate the data. They show that their interpolation method and subsequent spatial analysis allows for a more accurate depiction of how residents actually access the food system.

Finally, a fourth group of papers addresses how spatial data could and should be presented and communicated, addressing visualization and cognitive aspects. Suleiman et al. developed a new algorithm for isovist calculation in a 2D and in a 3D environment. The algorithm calculates a 3D isovist in an urban environment based on a DEM. The method allows for the calculation of a higher variety of visibility indices than existing algorithms. Gousie presents a tool for visualizing data quality properties of digital elevation models. The 3D tool set allows the display of the DEM together with its uncertainty and error, keeping both local and global scales in perspective. Klippel et al. evaluate the cognitive adequacy of the DLine-Region calculus by presenting animated icons to participants of a behavioral study. They report that some topological relations form conceptual clusters but these findings do not correspond to assertions in the literature. In general more behavioral studies are needed to prove the claim that qualitative calculi are cognitively more adequate than other calculi.

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