Editorial

GIScience Research at the Thirty-first Annual Esri International User Conference

The nine articles included in this special issue of *Transactions in GIS* were gathered from a call for abstracts and will be presented in three research sessions scheduled for the third day of the Thirty-first Annual Esri International User Conference. A total of 43 abstracts were submitted and 12 were selected by the journal editors for preparation of full journal articles. Each of the manuscripts has been through the usual journal peer review process and the final versions included in this special issue have been revised in light of both the reviewer's and editor's feedback. They cover a wide range of topics and address some of the key concepts and applications of geographic information science from a variety of perspectives. Some address issues of data quality, others describe new methods for spatio-temporal analysis or ways to extend these methods using one or more complementary approaches, still others examine the use of GIS and related spatial data infrastructures to support various kinds of spatial queries, analysis and visualization, and the final article explores the role of intensive writing in promoting geospatial learning.

The first article by Paul A. Zandbergen examines the performance of using high resolution ancillary data in the form of individual address point datasets, which represent the locations of all addressable units within a jurisdiction, to estimate population totals for smaller areal units than those in the source dataset. The performance of address points was compared with several other techniques, including areal weighting, land cover, imperviousness, road density and night-time lights, for 16 Ohio counties reflecting a range of different population densities. The ancillary data sources were employed to estimate census block group population counts using census tracts as source zones, and the results were compared with the known block group population counts. The results indicate that address points perform significantly better than other types of ancillary data, especially for sparsely populated rural counties where traditional dasymetric mapping techniques often perform poorly.

The second article by Diansheng Guo and Hu Wang introduces several improvements to the first author's REDCAP regionalization methods and reports the results of several experiments that were performed with synthetic data to document the capabilities of these new regionalization methods for exploratory spatial analysis. Regionalization methods aggregate small units into relatively larger areas while optimizing homogeneity

and may help with the detection of true patterns in one or more spatial datasets of interest. The work at hand focused on the integration of a local empirical Bayes smoother (EBS) with the existing REDCAP regionalization methods and the results show that the new methods performed significantly better than the original versions and other methods (including the EBS method on its own) in detecting the true patterns in a series of synthetic datasets.

The third article by Molly J. Cohn and Saul P. Jackman covered some of the same issues and tackled the modifiable areal unit problem from a political science perspective. These authors examined how two aspatial and one spatial definition of neighborhood produced different levels of income segregation using an individual-level income dataset for San Mateo County, California. The results showed that the three measures generated different perceived levels of income segregation and how these differences led, in turn, to different inferences when used to predict individual voter turnout.

The fourth article by Paul Torrens, Xun Li, and William Griffin describes a novel scheme for automatically deriving synthetic walking (locomotion) and movement (steering and avoidance) behavior in simulation from simple trajectory samples. Their scheme benchmarks a simulated pedestrian's relative behavioral geography, local physical environment and neighboring agent-pedestrians, and then uses this information to weight, train, and tune likely synthetic movement behavior based on the specific agent, location, time-step, and scenario in play. The results showed how this scheme can be used to generate synthetic, non-sampled, agent-based pedestrian movement in simulated urban environments and the broader discussion points to the ways in which such a scheme might be used to support a variety of spatio-temporal modeling needs.

The fifth article by Leila Hashemi Beni, Sébastien Villeneuve, Denyse I. LeBlanc, and Pascal Delaquis describes a GIS-based approach that was developed to identify the vulnerabilities and measure the risks of contamination of food systems with biological agents. Two contamination scenarios along the farm-to-fork chain were used to illustrate the approach which combined Esri's ArcGIS software suite with the Arena® simulation tool (Rockwell Automation) and relied on a constraint Voronoi data structure to define influence zones, identify those areas at greatest immediate risk over time, and estimate the population affected by individual contamination events.

The sixth article by Yi-Chen E. Yang and Yu-Feng F. Lin describes two decision support plug-ins for Esri's ArcGIS Explorer desktop software. The first plug-in, the ubiquitous Web-GIS Toolkit for Extensive Resources (uWATER), provides GIS query and visualization functions to support decision making and data sharing across a range of natural resources, economics, and agricultural applications. The second plug-in, the uWATER-Pumping Assessment (uWATER-PA) toolkit, extends these capabilities and supports the estimation and visualization of groundwater pumping impacts. The authors used a series of hypothetical scenarios to show how the impact of drawdown on existing wells can be analyzed and mapped through the use of uWATER's spatial query capabilities and the drawdown maps generated by uWATER-PA.

The seventh article by Bastian Baranski, Theodor Foerster, Bastian Schäffer, and Kristof Lange describes a hybrid cloud architecture for matching INSPIRE-related Quality of Service (QoS) requirements by using local as well as external third-party resources on a pay-as-you-go basis. The presented hybrid cloud combines a local IT-infrastructure (i.e. a private cloud) for everyday needs with the computational resources of third-party vendors (i.e. public clouds) to accommodate periods of peak demand. The article concludes by evaluating and benchmarking a proof-of-concept implementation of the proposed Hybrid Cloud approach with respect to INSPIRE-related QoS requirements.

The eighth article by Alberto Giordano and Tim Cole examined the process of ghettoization of Budapest during the course of 1944 and the various ways in which social and spatial networks were needed to characterize the patterns of Jewish concentration and dispersion and to simulate the potential daily spatial interactions between the Jewish and non-Jewish populations in the Budapest ghetto. The results remind us not only of the value of spatial analysis, but also the need to think about distance in many more ways than simply the physical conceptualization of distance when endeavoring to understand and explain human behavior.

The ninth and final article by Christine M. Erlien examined the student knowledge gained through a series of writing-intensive vs. methods-oriented geographic information science courses that were organized around geographic information system, remote sensing and global positioning system technologies. The exploratory study reported in this article relied on a pre- and post-test strategy to measure gains in student knowledge. The results showed that student learning was accomplished in both types of courses and the ensuing discussion points to the need for further studies exploring the relative efficacy of these as well as other student learning pathways.

These nine articles, taken as a whole, illustrate the breadth and depth of geographic information science scholarship and best practices across a variety of collaborative disciplines (e.g. computer science, geography, geology, history, political science) and application domains (e.g. education, groundwater contamination, risk assessment, social justice, spatial analysis). Special thanks are owed to the authors and especially those who provided the peer reviews for helping to move these articles from concept (i.e. extended abstracts) to reality in just a few short months. I trust that all involved will see how these contributions bore fruit when you read the final versions of the articles in this fourth special issue organized around three research sessions that are hosted by Esri and given a prominent place in its International User Conference program.

John P. Wilson
Editor