

GIScience Research at the 2014 Esri International User Conference

The first eight articles in this 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 2014 Esri International User Conference to be held in San Diego, California. A total of 16 abstracts were submitted and nine were selected by the journal editors for preparation as full journal articles. Each of the manuscripts has been through the usual journal peer review process and the final versions of the eight research articles included in this special issue have been revised in light of both the reviewer's and the editor's feedback.

The eight articles selected for publication cover a wide range of topics and address some of the key concepts and applications of geographic information science from a variety of perspectives. Three of the articles explore some of the ways in which geographic information systems can be combined with sensors, mobile devices and social media to learn more about and/or to guide human behavior, one describes user interaction patterns within online systems for public participation transportation planning, another describes how spatial analysis tools and ArcMarine can be customized to visualize and analyze genetic records for cetaceans and other marine megafauna, one explores how hierarchical clustering can help with the mapping of large flow data, and the final two articles propose new GIS frameworks for analyzing spatial access to healthcare services on the one hand and the likely economic and environmental consequences of expanding sugarcane cropping in Brazil on the other hand. All eight articles highlight, in one way or another, the value of spatio-temporal analysis and the role of geographic information science as an enabling science in a wide range of multi-disciplinary settings and applications.

The first article, by Dorothy Dick, Shaun Walbridge, Dawn Wright, John Calambokidis, Erin Falcone, Debbie Steel, Tomas Follett, Jason Holmberg, and Scott Baker, describes *geneGIS*, a suite of GIS tools and a customized Arc Marine data model to facilitate visual exploration and spatial analyses of individual-based records from DNA profiles and photo-identification records of cetaceans and other marine megafauna. The development of these new tools and their inclusion in a new ArcGIS Python Add-in are detailed in this article and the utility of this new suite of GIS tools is then demonstrated using an integrated database containing more than 18,000 records of humpback whales (*Megaptera novaeangliae*) in the North Pacific.

The second article, by Anastasia Petrenko, Anton Sizo, Qian Winchel, Dylan Knowles, Amin Tavassolian, Kevin Stanley, and Scott Bell, builds on the authors' previous work and describes a new methodology that utilizes indoor wireless networking and sensor-based systems to improve the collection of human movement and behavior data. The authors present the results of an experiment in which they tracked the mobility of a series of participants on the University of Saskatchewan campus over the course of several days, to demonstrate how the participant's movement behavior can be successfully documented with their proposed method.

The third article, by Diansheng Guo and Chao Chen, proposes a methodology for extracting Twitter user characteristics based on the geographic, graph-based and content-based features of tweets, constructing a training dataset by manually inspecting and labeling a large

sample of Twitter users, and deriving reliable rules and knowledge for detecting non-personal users with supervised classification methods. The problems caused by non-personal accounts, spam users and junk tweets, which threaten the usefulness of online social networks such as Twitter as important data sources for scientists conducting geosocial network research, provide the motivation for this work. The results reported in this article show how the features identified with this new method can all help with the detection of non-personal accounts and spam users: not only the geographic features, such as the average speed and frequency of county changes, but also several non-spatial characteristics, including the percentage of tweets with a high human index factor, the percentage of tweets with URLs and the percentage of tweets with mentioned and/or replied users.

The fourth article, by Francisco Ramos, Aida Monfort, and Joaquin Huerta, describes a native mobile application for the iPhone and iPad platforms that supports geospatial queries based on the user's location and offers, at the same time, access to all of the data provided by the climate data sensor network and from direct users. The application uses ArcGIS SDK for iOS and a series of ArcGIS webmaps to publish and make use of a Web 2.0 network of climate data, where content is user-collected by means of meteorological stations, then exposes this as available information to the virtual community. Users were also given the opportunity to directly inform the system with different climate measures; and this means that the mobile application can provide climate-related data tailored to both specific contexts and geographical locations.

The fifth article, by Martin Swobodzinski and Piotr Jankowski, reports on a rigorous assessment of the performance of decision-support systems based on human-computer interaction of users of a web-based, public-participation, transportation-planning decision support system. Through hierarchical cluster analysis the authors divided the participants into three groups, with below-average, average, and above-average interaction duration, and used logistic regression analysis to determine the significance and strength of statistical associations between duration of interaction and a host of individual-level variables for each of the clusters. The results point to the need to build adaptable participatory spatial decision support systems which accommodate heterogeneity in terms of both the user interface and the pathways used to shape the decision-making process.

The sixth article, by Xi Zhu and Diansheng Guo, proposes a new flow clustering method for mapping large spatial flow data which extracts clusters of similar flows to avoid the problems of occlusion and cluttered display, reveals abstracted flow patterns, and preserves data resolution as much as possible. To achieve these results, the new method extends the traditional hierarchical clustering method to aggregate and map large flow data, considers both origins and destinations in determining the similarity of two or more flows, generalizes the flows to different hierarchical levels, and supports multi-resolution mapping. A case study using 243,850 taxi trips in Shenzhen, China, is used to demonstrate the efficacy of the new method and to assess the quality and fidelity of the computed flow clusters and flow maps.

The seventh article, by Jun Luo, combines the Huff model with the floating catchment area (FCA) method to simulate the impact of population selection on the sufficiency of healthcare services. Using this approach, the population demand on healthcare services is adjusted by a Huff model-based selection probability that reflects the impacts of both distance impedance and service site capacity; the FCA method is then used to match the population with healthcare facilities. A case study of spatial access to primary care in Springfield, Missouri, is used to show how this method can effectively moderate the population demand on service sites and therefore generate more realistic and reliable spatial access measures for health resource planning.

The final article, by Leticia de Barros Viana Hissa and Britaldo Silveira Soares Filho, proposes a new framework for modeling spatial-economic surfaces to represent the potential rent variation and then uses this framework to evaluate the possible direct and indirect effects of the sugarcane crop's expansion (to satisfy the increasing demand for biofuels) on natural vegetation cover in Brazil. The proposed framework incorporates two modules built on top of the Dinamica EGO modeling platform. The first simulates sugarcane's growth, calculating the daily response of the crop to environmental conditions during the various stages of the plant's development, and the second module estimates rents for sugarcane cultivation, identifying areas where this activity would bring higher economic return, after modeling simulated productivity, production costs and selling prices, in a spatially explicit way across Brazil. The results show how the new framework can successfully identify profitable and non-profitable areas, and regions where high expected economic returns would overlap with endangered ecosystems.

These eight 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. climatology, computer science, economics, geography, healthcare management, information science, marine ecology, transportation and urban planning) and application domains (e.g. data capture, data management, data quality, geovisualization, human computer interactions, spatial analysis and spatial decision support). Special thanks are owed to the authors and especially to those who provided the peer reviews that helped to move eight of the nine articles sent out for peer review from 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 seventh issue of *Transactions in GIS* 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