Geotechnologies and the Environment

Volume 18

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Citizen Empowered Mapping

Springer

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An Introduction to Citizen Empowered Mapping

Michael Leitner and Jamal Jokar Arsanjani

Introduction

This book on *Citizen Empowered Mapping* is a follow-up publication of the Special Content Issue (SCI) on *Crowdsourced Mapping* published in the *Cartography and Geographic Information Science (CaGIS)* journal in 2017 (Jokar Arsanjani et al. 2017). In order to understand how the idea to edit this book started, we have to go back more than 2 years ago. On 7 October 2014, a first solicitation of a manuscript proposal submission for a SCI on *Crowdsourced Mapping* to be published in the *CaGIS* journal was sent out. This solicitation was distributed to members of different list servers, including those from the University Consortium of Geographic Information Science (UCGIS), Cartography and Geographic Information Society (CaGIS), and four different Specialty Groups of the AAG (Applied Geography, Cartography, Geographic Information Science and Systems, and Spatial Analysis and Modeling). The solicitation welcomed submissions from the academic, public, and private sectors. Topics appropriate for the SCI were plenty and broadly defined. They included (1) volunteered geographic information (VGI); (2) citizen science; (3) humans as sensors (sensor-enabled humans); (4) mapping user-generated geographic information from the crowd, e.g., social media (Flickr, Instagram, Panoramio, etc.), telecommunication services, social networks (Facebook, Twitter, etc.), and sensor networks; (5) uncertainty mapping; (6) data/information quality visualization; (7) spatial/temporal visualization of crowd analysis; (8) indicators for volunteered geographic information and citizen science; (9) (re)mapping unmapped features from the crowd; (10) collaborative mapping and governments; (11) data mining and fusion of crowd-based data/information with authoritative data; (12) metadata production; (13) mapping costs and benefits; (14) crowd-based data/information for diverse applications, e.g., cities/environmental monitoring, disaster management, landscape analysis, land use/cover monitoring, social science, ecology, etc.; (15) emerging topics and datasets generated from/by the crowd; (16) big geo(data); (17) OpenStreetMap; (18) geospatial analysis and Internet of Things (IoT); and (19) digital divide and (geo)information dissemination.

By 30 November 2014, the deadline for manuscript proposal submission, a total of 54 proposals was submitted. One month later, the vast majority of corresponding authors of these 54 proposals were subsequently invited to submit a full manuscript. This decision was made solely by the guest editors. By the end of September 2015, a total of 33 manuscripts was received. Each manuscript was subsequently reviewed (double-blind) by at least two expert reviewers, following standard *CaGIS* review guidelines. Overall, the innovative aspect and the scientific quality of the research weighted heavily on the decision whether or not a manuscript was accepted or rejected. Altogether, 11 of the 33 manuscripts were finally accepted for publication in *CaGIS*. Of these 11 articles, six are included in the SCI on *Crowdsourced Mapping*, and the remaining five articles appear in the sixth volume of 2017 and in the first volume of 2018 of the *CaGIS* journal. The main reason is that similar to a regular issue of *CaGIS*, the SCI on *Crowdsourced Mapping* had 96 pages allocated to it. This page count was already exhausted with six of the 11 papers. We also contacted the corresponding authors from the 22 of the originally 33 received manuscripts that were not selected to be published in the *CaGIS* journal. We asked them whether they would be interested to have their research, pending necessary revisions, included as a book chapter in an edited book to be published by Springer entitled *Citizen Empowered Mapping*. We received a positive feedback from authors from 12 of the 22 manuscripts. These 12 manuscripts were revised according to the original reviewers' comments and suggestions by the book editors and represent the main chapters in this publication.

The book on *Citizen Empowered Mapping* organizes the 12 book chapters into three parts that include *Data Acquisition and Modeling*, *Data Quality and Reliability*, and *Environmental Monitoring and Perception*. This is completed by an *Introductory Chapter* written by the editors and an *Outlook Chapter* written by Giles Foody. Thirty-eight different authors contributed to the 12 main chapters of this book. This is an average of 3.2 authors per article and similar to the average number of authors (namely, 3.4) contributing to the *CaGIS* SCI of *Crowdsourced Mapping*, confirming the collaborative nature of this research topic. Contributing authors come from the USA (13), France (8), Mexico and the Czech Republic (4 each), Greece and Canada (3 each), Portugal (2), and New Zealand (1). Interestingly, while *Crowdsourced Mapping* seems to be a very popular research topic in Europe and in North America, with all but one contributing author coming from these two regions, it may not be of much interest in China and India (not a single author comes from these two populous countries). This supports a similar trend that was already observed for the SCI on *Crowdsourced Mapping*. It is also noticeable that almost 80% (30 out of 38) of all authors have an academic affiliation, with the remaining eight working in a governmental position. No author has a private sector affiliation. Eight of the 30 authors with an academic affiliation have their home department in geography, geographic analysis, geomatics, or geoinformatics. The second strongest group of authors from academia come from spatial planning or regional planning (five in total), followed by environmental science, computer/information science, and development studies (four each). Overall, it is clear that *Citizen Empowered Mapping* is a highly interdisciplinary topic that is of great research interest across

a number of departments and colleges. Similar to the *CaGIS* SCI on *Crowdsourced Mapping*, geography, in general, and geographic information science, in particular, seem to play a leading role in this research effort.

In the following, the main research focus of each of the 12 chapters published in this book will be briefly introduced. Starting off the *Data Acquisition and Modeling* section is the chapter by **Touya and Baley**, in which the authors explore the automatic harmonization of OpenStreetMap data for large scale maps, with a process that transforms rough objects to make them consistent with detailed objects. In the second book chapter, **Gomez et al.** define new urban soundscape indicators to be depicted in noise maps that offer the possibility of several interpretations depending on the users' personal and cultural characteristics. The next chapter by **Lewis et al.** evaluates and compares Geospatial Software as a Service (GSaaS) platforms oriented toward providing basic mapping capabilities to non-GIS experts. The main goal of the book chapter by **Stylianidis et al.** is to initiate distributed and parallel techniques in mapping systems by implementing efficient map updating algorithms based on road network extraction methodology on satellite/aerial images. The fifth and final chapter in this section by **Sabino and Rodrigues** presents a productive network representation model, designed to discover indirect keywords and locations. The spatial dimension of the model enables indirect location discovery methods through the interpretation of the network as a graph, solely relying on keywords and locations that categorize or describe productive items.

The first book chapter in Part II titled *Data Quality and Reliability* by **Korris et al.** reports (1) on the implementation of a new crowdsourcing project to provide accurate and authoritative spatial data for The National Map (TNM) of the US Geological Survey (USGS) National Geospatial Program and explores (2) the quality of the volunteered geographic information (VGI) within the TNM by assessing horizontal positional errors, attribute errors, and errors of commission. The next article by **Shaker et al.** addresses the question whether routes computed using crowdsourced points of interests (POIs) are reliable between origin and destination locations. To address this question, the authors conducted experiments where routes (shortest and fastest) computed using crowdsourced POIs (e.g., through OpenStreetMap) were compared with routes computed using POIs obtained from professional and commercial sources. The final book chapter in Part II by **Craun and Hung** compares volunteer-provided data in OpenStreetMap (OSM) to Topologically Integrated Geographic Encoding and Referencing (TIGER) data from the US Census Bureau in order to evaluate the usability of these data as part of an authoritative dataset.

Part III in this book on *Environmental Monitoring and Perception* includes four chapters. The first chapter by **Leung et al.** critically assesses the use of social media as an observation network to identify rare phenomena, such as frostquakes, including the possibility of false positives and population bias. The next chapter by **Brandeis and Nyerges** tests the effectiveness of using a spatial decision unit (SDU) and compares the usability of free-form volunteered geographic information (VGI) and highly structured VGI. The main purpose of the next chapter in this section by **Martinez-Viveros et al.** is to help consolidate a Mexico City neighborhood

(Consejo Vecinal Roma) as a policy community by means of integrating a territorial vision of *The Roma's* problems and opportunities, as perceived by the citizens involved in the process. The research presented in the final chapter by **Pánek et al.** involves the integration of Gould-style mental maps with Participatory GIS technologies. It describes the testing and implementation of the web-based crowd-sourcing tool PocitoveMapy.cz that is used for the collection of and visualization in maps of people's perceptions of environmental deprivation.

At the end of this introductory chapter, the editors would like to thank all 38 authors for contributing their research to this edited book, since without you this book would not have been possible.

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