

Preface

This book offers a collection of peer-reviewed front-end research articles related to Location-Based Services (LBS). As an overview this book includes an introductory essay by Jukka Krisp and Liqiu Meng and two invited essays from Harvey Miller and Georg Gartner exploring what LBS will be like in the year 2030. The contributed articles document research activities from various fields. Therefore this book is divided into five sections.

Part I investigates progress in *Spatiotemporal Data Acquisition, Processing, and Analysis*. This part includes a contribution from Eva Hauthal and Dirk Burghardt on the *Extraction of Location-Based Emotions from Photo Platforms*, in which the distribution of emotions within the valence-arousal-space represents the kinds of emotions occurring in the study area of Dresden. Chun Liu and Zhiwei Jian contribute a paper on Combining Float Car Data and Multispectral Satellite Images to Extract Road Features and Networks, which presents an automatic methodology for the extraction of spatial road features and networks from floating car data (FCD) that was integrated with multispectral remote sensing images in metropolitan areas. Christian E. Murphy documents the *Space–Time Mapping of Mass Event Data*, in which conventional cartographic symbolization meets the space–time cube to create a holistic three-dimensional spatiotemporal visualization model. The two-dimensional proportional symbol mapping technique is adopted and extruded into the third dimension to model the temporal factor. Yeran Sun, Hongchao Fan, Marco Helbich, and Alexander Zipf provide a *Study on Analyzing Spatiotemporal Tourism Activities Using Volunteered Geographic Information*, which uses Flickr photos as an example to explore the possibilities of Volunteered Geographic Information (VGI) to analyze spatiotemporal patterns of tourists' accommodation in Vienna. A paper by Claire Ellul, Suneeta Gupta, Mordechai Haklay, Kevin Bryson investigate *A Platform for Location-Based App Development for Citizen Science and Community Mapping*, providing a description of the development of a LBS App platform. Colin Kuntzsch and Alexander Bohn examine *A Framework for On-line Detection of Custom Group Movement Patterns*, describing an approach for custom definition and detection of group patterns in a real-time analysis scenario. Khatereh Polous, Peter Mooney,

Jukka Krisp, and Liqiu Meng study event-related knowledge from OSM to mine hidden patterns of social activities and the interests of contributors to share event-related knowledge within OSM community as one of the most prominent examples of user generated spatial data.

Part II contemplates contributions on *Positioning and Indoor Positioning*. Khuong Nguyen and Zhiyuan Luo evaluate *Bluetooth Properties for Indoor Localization*, in which Bluetooth properties are related to indoor localization are investigated from a statistical perspective. Michailas Romanovas, Vadim Goridko, Lasse Klingbeil, Mohamed Bourouah, Ahmed Al-Jawad, Martin Traechtler, and Yiannos Manoli investigate *Pedestrian Indoor Localization Using Foot Mounted Inertial Sensors in Combination with a Magnetometer, a Barometer, and RFID*. The work presents a custom sensor system development, describes the developed algorithms and evaluates several methods to reduce the drift, which usually comes with the integration of low-cost sensors. Thomas Hillebrandt, Heiko Will, and Marcel Kyas document a *Quantitative and Spatial Evaluation of Distance-Based Localization Algorithms* and present a detailed investigation on the error distribution and the real world behavior of these algorithms. Andreas Bilke and Jürgen Sieck use the *Magnetic Field for Indoor Localization on a Mobile Phone*. This paper presents a locating system which is based on identifying geomagnetic field disturbances and ambient light.

Part III includes contributions on *Way-finding/Navigation (indoor/outdoor) and Smart Mobile Phone Navigation Related to LBS Technologies*. Marcus Goetz and Alexander Zipf investigate *Indoor Route Planning with Volunteered Geographic Information (VGI) on a Web-Based Platform*. They present an application for indoor environments, by providing indoor maps and route planning services with indoor OSM data, and demonstrate the possibilities arising from VGI. Jussi Nikander, Juha Järvi, Muhammad Usman, Kirsi Virrantaus examine an *Indoor and Outdoor Mobile Navigation by Using a Combination of Floor Plans and Street Maps* and introduces a prototype for combined indoor and outdoor mobile navigation system for a university campus. Padraig Corcoran, Peter Mooney, Michela Bertolotto, Basel Magableh offer a paper on *Augmented Maps with Route Sketches*. They propose a representation for route descriptions called an Augmented Route Sketch Map (ARSM). In this representation, a route is composed of a sketch-map drawn over a detailed base-map. Horst Steuer investigates *High Precision 3D Indoor Routing on Reduced Visibility Graphs* and shows how the concept of visibility graphs can be applied to indoor routing and how it results in highly accurate shortest paths. Lijuan Zhang, Sagi Dalyot, and Monika Sester explore *Travel-Mode Classification for Optimizing Vehicular Travel Route Planning*. They suggest extracting this information from the navigational behavior of users, which is accessible via an analysis of GPS traces analysis of car commuters in relation to their point of departure and destination by analyzing the walking path they took from and to their parked car in relation to a specific address. Zhiyong Wang and Sisi Zlatanova document a *Taxonomy of Navigation for First Responders*, which introduces a taxonomy of navigation among obstacles,

categorizes navigation cases on basis of type and multiplicity of first responders, destinations, and obstacles.

Part IV comprises papers on interactions, user studies, and evaluations. Alexandra Lorenz, Cornelia Thierbach, Nina Baur, and Thomas H. Kolbe investigate Paper Maps as *Alternative to Electronic Indoor Navigation Aids and Their Empirical Evaluation with Large User Bases*. They focus on media characteristics and users' media preferences and indicate that 11–15-year-old teenagers show a higher tendency toward paper maps than toward smartphone apps. Daniela Richter, Maria Vasardani, Lesley Stirling, Kai-Florian Richter, and Stephan Winter provide the paper, *Zooming In—Zooming Out Hierarchies in Place Descriptions*, in which they analyze place descriptions collected in a mobile game and investigate hierarchies based on a classification of spatial granularity. Peter Mooney and Padraig Corcoran investigate the *Understanding the Roles of Communities in Volunteered Geographic Information Projects*. They examine types of contributors and interactions amongst members of OSM. Their results show that there are very small groups of individuals creating and editing over 85 % of all OSM objects in three case-study cities. Karl Rehrl, Simon Gröchenig, Hartwig Hochmair, Sven Leitinger, Renate Steinmann, and Andreas Wagner explore a *Conceptual Model for Analyzing Contribution Patterns in the Context of VGI*. The conceptual model is based on a set of action and domain concepts, which are combined to a task-model describing typical tasks of volunteered geographic information contribution.

Part V gathers *Innovative LBS Systems and Applications*. Bernd Resch investigates *People as Sensors and Collective Sensing—Contextual Observations that are Complementing Geo-Sensor Network Measurements*. The concept defines a measurement model, in which measurements are not only taken by calibrated hardware sensors, but also in which humans can contribute their individual 'measurements' such as their subjective sensations, current perceptions, or personal observations. Jianwei Zhang, Theo Arentze *Design, and Implement a Daily Activity Scheduler in the Context of a Personal Travel Information System*. They present a prototype based on travel information system, where point of interest (POI) information and travel information have been integrated into an individual agenda service. Min Lu and Masatoshi Arikawa consider a *Map-Based Storytelling Tool for Real-World Walking Tour*. They propose a new framework for supporting walking tours with stories and maps implemented on a smartphone. Andreas Donaubauer, Florian Straub, Nadia Panchaud, Claude Vessaz investigate a *3D Indoor Routing Service with 2D Visualization Based on the Multi-layered Space-Event Model*. They present a draft for a conceptual model for indoor navigation, the multi-layered space-event model (MLSM), is combined with standards for Geo Web Services in order to define a framework for a 3D Indoor Routing with Rule-Based 2D Visualizations. Ming Li, Marcus Goetz, Hongchao Fan, and Alexander Zipf investigate the *Adaptation of OSM-3D to the Mobile World—Challenges and Potentials*. This paper provides a framework and proposal toward context-aware OSM-3D mobile applications.

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