## Contents

### Introduction

**Going Local—Evolution of Location-Based Services** .......................... xxi  
Jukka M. Krisp, Liqiu Meng

**Location Matters: LBS 2030** ................................................. xxv  
Georg Gartner

**Location-Based Services in 2030: From Sharing to Collective Action** .......................... xxix  
Harvey J. Miller

### Part I  Spatio-Temporal Data Acquisition, Processing, and Analysis

**Extraction of Location-Based Emotions from Photo Platforms** .............. 3  
Eva Hauthal and Dirk Burghardt

**Combining Float Car Data and Multispectral Satellite Images to Extract Road Features and Networks** ............................................. 29  
Chun Liu, Zhiwei Jian and Xiaolin Meng

**Space-Time Mapping of Mass Event Data** ............................. 45  
Christian E. Murphy

**Analyzing Human Activities Through Volunteered Geographic Information: Using Flickr to Analyze Spatial and Temporal Pattern of Tourist Accommodation** ............................................. 57  
Yeran Sun, Hongchao Fan, Marco Helbich and Alexander zipf
A Platform for Location-Based App Development for Citizen Science and Community Mapping ........................... 71
Claire Ellul, Suneeta Gupta, Mordechai Muki Haklay and Kevin Bryson

A Framework for On-line Detection of Custom Group Movement Patterns .............................................. 91
Colin Kuntzsch and Alexander Bohn

Mining Event-Related Knowledge from OpenStreetMap ............ 109
Khatereh Polous, Peter Mooney, Jukka M. Krisp and Liqiu Meng

Part II Positioning/Indoor Positioning

Evaluation of Bluetooth Properties for Indoor Localisation ........ 127
Khuong Nguyen and Zhiyuan Luo

Pedestrian Indoor Localization Using Foot Mounted Inertial Sensors in Combination with a Magnetometer, a Barometer and RFID .... 151
Michailas Romanovas, Vadim Goridko, Lasse Klingbeil, Mohamed Bourouah, Ahmed Al-Jawad, Martin Traechtler and Yiannos Manoli

Quantitative and Spatial Evaluation of Distance-Based Localization Algorithms ......................................... 173
Thomas Hillebrandt, Heiko Will and Marcel Kyas

Using the Magnetic Field for Indoor Localisation on a Mobile Phone ......................................................... 195
Andreas Bilke and Jürgen Sieck

Part III Wayfinding/Navigation (Indoor/Outdoor) and Smart Mobile Phone Navigation and LBS Technologies

Indoor Route Planning with Volunteered Geographic Information on a (Mobile) Web-Based Platform ......................... 211
Marcus Goetz and Alexander Zipf

Indoor and Outdoor Mobile Navigation by Using a Combination of Floor Plans and Street Maps ................................. 233
Jussi Nikander, Juha Järvi, Muhammad Usman and Kirsi Virrantaus
Augmented Maps with Route Sketches .................................................. 251
Padraig Corcoran, Peter Mooney, Michela Bertolotto and Basel Magableh

High Precision 3D Indoor Routing on Reduced Visibility Graphs .......................................................... 265
Horst Steuer

Travel-Mode Classification for Optimizing Vehicular Travel Route Planning .......................................................... 277
Lijuan Zhang, Sagi Dalyot and Monika Sester

Taxonomy of Navigation for First Responders ........................................ 297
Zhiyong Wang and Sisi Zlatanova

Part IV Interactions, User Studies and Evaluations

App-Free Zone: Paper Maps as Alternative to Electronic Indoor Navigation Aids and Their Empirical Evaluation with Large User Bases .......................................................... 319
Alexandra Lorenz, Cornelia Thierbach, Nina Baur and Thomas H. Kolbe

Zooming In–Zooming Out Hierarchies in Place Descriptions ........... 339
Daniela Richter, Maria Vasardani, Lesley Stirling, Kai-Florian Richter and Stephan Winter

Understanding the Roles of Communities in Volunteered Geographic Information Projects ........................................ 357
Peter Mooney and Padraig Corcoran

A Conceptual Model for Analyzing Contribution Patterns in the Context of VGI .................................................. 373
Karl Rehrl, Simon Gröechenig, Hartwig Hochmair, Sven Leitinger, Renate Steinmann and Andreas Wagner

Part V Innovative LBS Systems and Applications

People as Sensors and Collective Sensing-Contextual Observations Complementing Geo-Sensor Network Measurements .......................................................... 391
Bernd Resch
Design and Implementation of a Daily Activity Scheduler in the Context of a Personal Travel Information System .................. 407
Jianwei Zhang and Theo Arentze

Map-Based Storytelling Tool for Real-World Walking Tour ........... 435
Min Lu and Masatoshi Arikawa

A 3D Indoor Routing Service with 2D Visualization Based on the Multi-Layered Space-Event Model ................................. 453
Andreas Donaubauer, Florian Straub, Nadia Panchaud and Claude Vessaz

Adapting OSM-3D to the Mobile World: Challenges and Potentials ................................................................. 471
Ming Li, Marcus Goetz, Hongchao Fan and Alexander Zipf