



Adjunct Proceedings of the

15th International Conference
on Location-Based Services

Georg Gartner and Haosheng Huang (Editors)

Vienna, Austria
November 11–13, 2019



ICA Commission on
Location Based Services



Editors

Georg Gartner, georg.gartner@tuwien.ac.at
Department of Geodesy and Geoinformation, Vienna University of
Technology

Haosheng Huang, haosheng.huang@geo.uzh.ch
Department of Geography, University of Zurich

This document contains the adjunct proceedings of the 15th International Conference on Location Based Services (LBS 2019), held on November 11–13, 2019 in Vienna, Austria. All papers have been accepted after a rigor double-blind reviewing process.

The conference was organized by the ICA Commission on Location-Based Services, and the Research Group Cartography at the Vienna University of Technology, with the endorsement of the following organizations: International Cartographic Association (ICA), Association of Geographic Information Laboratories for Europe (AGILE), Deutsche Gesellschaft für Kartographie (DGfK), and ÖAW GIScience Commission.

Additional papers from this conference were published in:

– LBS 2019, Adv. Cartogr. GIScience Int. Cartogr. Assoc, Georg Gartner and Haosheng Huang (eds.) (2019), <https://www.adv-cartogr-giscience-int-cartogr-assoc.net/>.

The editors would like to thank all the scientific committee members of LBS 2019 for reviewing the original submissions, as well as Manuela Schmidt and Francisco Porrás for compiling the whole proceedings.

DOI: 10.34726/lbs2019

© 2019 Research Group Cartography, Vienna University of Technology.
The copyright of each paper within the proceedings is with its authors.
All rights reserved.

Table of Contents

Section I: Mobile Cartography and Augmented Reality

<i>Juliane Cron, Bernhard Jenny, Roar Engell and Zac Lucarelli</i> Head-mounted Augmented Reality Visualisation for Outdoor Pedestrian Navigation.....	1
<i>Laura Schalbetter, Tiffany C.K. Kwok, Peter Kiefer and Martin Raubal</i> Gaze-Based Interaction with Maps and Panoramas	7
<i>Silvia Klettner</i> Small Symbols With Big Effect? – A Cognitive-Affective Perspective on Map Symbolization on Small-Sized Displays.....	13
<i>Chenyu Zuo, Linfang Ding, Edyta Paulina Bogucka and Liqiu Meng</i> Map-based Dashboards versus Storytelling Maps.....	19
<i>Georg Molzer and Florian Ledermann</i> Interactive Web-based 3D Solar Shadow Map.....	25
<i>Itziar Urbietta, Irati Mendikute, Harbil Arregui and Oihana Otaegui</i> Concerns on Design and Performance of a Local and Global Dynamic Map.....	31
<i>Lukáš Herman, Tomáš Řezník, Tomáš Pavelka, Šimon Leitgeb</i> Cartographic Visualisation of Data Measured by Field Harvesters	37

Section II: Navigation and Wayfinding

<i>Marina Georgati and Carsten Kessler</i> A 3D Routing Service for Indoor Environments	45
<i>Laure De Cock, Kristien Ooms, Nico Van de Weghe and Philippe De Maeyer</i> Adapting the Type of Indoor Route Instruction to the Decision Point	51
<i>Nina Vanhaeren, Kristien Ooms and Philippe De Maeyer</i> Developing Cognitively Simple Wayfinding Systems: A Mixed Method Approach	57
<i>Wangshu Wang, Silvia Klettner, Georg Gartner, Tabea Fian, Georg Hauger, Alessandra Angelini, Martin Söllner, Arnd Florack, Michael Skok and Mathias Past</i> Towards a User-Oriented Indoor Navigation System in Railway Stations	63
<i>Champika Ranasinghe and Christian Kray</i> Adapting Navigation Support to Location Information Quality: A Human Centered Approach	71
<i>Eva Nuhn and Sabine Timpf</i> Prediction of Landmarks Using (Personalised) Decision Trees	85
<i>Marcio Schmidt, Luciene Delazari, Amanda Antunes, Caroline Marchis and Rhaissa Sarot</i> Landmark Classification for Navigation In Indoor Environments	99
<i>Marcio Schmidt, Luciene Delazari, Elias Naim and Vinícius Martins</i> Off-Route Virtual Landmarks to Help Pedestrian Indoor Navigation	107

Section III: Mobility and Activity Analytics

Kamil Smolak, Katarzyna Sila-Nowicka and Witold Rohm
**Towards Anonymous Mobility Data Through the
Modelling of Spatiotemporal Circadian Rhythms** 117

Gyözö Gidófalvi
Trajectory and Mobility Based Services: A Research Agenda.... 123

*Anita Graser, Johanna Schmidt, Melitta Dragaschnig and
Peter Widhalm*
**Data-driven Trajectory Prediction and Spatial Variability
of Prediction Performance in Maritime Location Based
Services** 129

Cheng Fu and Robert Weibel
**Cross-scale Spatial Enrichment of Trajectories for
Speeding Up Similarity Computing** 135

Christian Sailer, Henry Martin, Luca Gaia and Martin Raubal
**Analyzing performance in Orienteering from movement
trajectories and contextual information** 141

Jiwon Lee, Jiyoung Kim and Kiyun Yu
**Demand Forecasting of a Public Bike-Sharing System
Reflecting Dynamic Spatial Data** 147

Ben Levy, Jack Haddad and Sagi Dalyot
**Automatic incident detection along freeways using
spatiotemporal Bluetooth data** 153

Minhyuck Lee, Inwoo Jeon and Chulmin Jun
**Time-distance Accessibility of Public Transport considering
In-vehicle Crowding based on Smart card data** 159

Inwoo Jeon, Minhyuck Lee and Chulmin Jun
**A Simulation Method for Adjustment of Public
Transportation Routes using Geotagged Smart Card Data** 165

Anto Aasa, Erki Saluveer, Pilleriine Kamenjuk, Janika Raun and Jan Šimbera
Spatial interpolation of mobile positioning data for population statistics 171

Jan Šimbera and Anto Aasa
Areal interpolation of spatial interaction data..... 177

Section IV: Indoor Modelling and Localization

Seula Park and Kiyun Yu
Automatic Floor Matching for 3D Indoor Spatial Modeling 185

Sun Kwon, Hyun-Jung Kim and Ki-yun Yu
Topology and Semantic based Automatic Indoor Space Subdivision from 2D Floor Plan..... 191

Guenther Retscher, Aizhan Bekenova, Arbër Fazliu, Michael Hallett, Luke Harvey and Jenny Janssen
Dynamic Wi-Fi Reference Point Recognition along Public Transport Routes..... 197

Pasindu Ranasinghe, Thilanta Dammalage and Guenther Retscher
A Low-cost Public Transport Tracking and Information System for Commuters in Sri Lanka 207

Section V: Crowdsourcing and VGI

<i>Carsten Keßler and Grant McKenzie</i> Consistency Across Geosocial Media Platforms	213
<i>Matan Mor, Dafna Fisher Gewirtzman and Sagi Dalyot</i> Using Geotagged Photos to Study Visitors Mobility in Urban Parks during Shadow	219
<i>Andreas Petutschnig, Bernd Resch, Jen Nelles and Laxmi Ramasubramanian</i> L'd Up: Examining the Effects of a New York City Metro Shutdown on Public Discourse Using Twitter Data	225
<i>Kenzo Milleville, Dilawar Ali, Francisco Porras-Bernardez, Steven Verstockt, Nico Van de Weghe and Georg Gartner</i> WordCrowd – A Location-Based Application to Explore the City based on Geo-Social Media and Semantics	231
<i>Pierfrancesco Bellini, Paolo Nesi, Michela Paolucci, Mirco Soderi and Paola Zamperlin</i> Snap4city Platform: Semantic to Improve Location Based Services	237
<i>Tatiane Ferreira Olivatto, Fábio Noel Stanganini and Edson Augusto Melanda</i> Drone Imagery for OpenStreetMap Sidewalk Data Enrichment	243

Section VI: User Issues, Motivation and Applications

<i>Per Ole Uphaus, Oliver Neuper, Björn Beringer, Lukas Hoffmann, Simon Langenmair, Annika Ehlers and Harald Rau</i> Barriers seen by potential local Providers of Applications using Location-Based Services	251
<i>Meenu Mohan and Ana Basiri</i> Usability analysis of 3D Maps for Pedestrian Navigation among different demographic profiles	259
<i>Chenyu Zuo, Bing Liu, Linfang Ding, Edyta Paulina Bogucka and Liqiu Meng</i> Usability Test of Map-based Interactive Dashboards Using Eye Movement Data	265
<i>Mikko Rönneberg, Søren Quist Eliassen, Pyry Kettunen, Christian Koski and Juha Oksanen</i> Designing Access Control of a Spatial Decision Support System for Collaborative Maritime Spatial Planning	271
<i>Jaeyoung Lee, Minhyuck Lee and Chulmin Jun</i> Evacuation Simulation Considering Fire Spread and Occupants Distribution	277
<i>Saeed Mehri and Ali Asghar Alesheikh</i> A location-based service for planning tool	283
<i>Aleyda Rocha Sepulveda, Eveline Wandl-Vogt and Georg Gartner</i> Claiming Space Through Language: Conceptualizing a Location Based Cultural Space Experience	289