A multidimensional model for personalized landmarks

Eva Nuhn, Sabine Timpf

Angaben zur Veröffentlichung / Publication details:

Nuhn, Eva, and Sabine Timpf. 2016. "A multidimensional model for personalized landmarks." In Proceedings of the 13th International Symposium on Location-Based Services (LBS 2016), Vienna, Austria, 14-16 November 2016, edited by Georg Gartner and Haosheng Huang, 4–6. Vienna: Vienna University of Technology. https://doi.org/10.5167/uzh-127276.

LBS 2016
13th Conference on Location-Based Services
Vienna, 14–16 November 2016

Proceedings of the

13th International Conference on Location-Based Services

Georg Gartner and Haosheng Huang (Editors)

Vienna, Austria

November 14–16, 2016

ICA Commission on Location Based Services

Editors

Georg Gartner, georg.gartner@tuwien.ac.at

Research Group Cartography

Vienna University of Technology

Haosheng Huang, haosheng.huang@geo.uzh.ch

Department of Geography

University of Zurich

This document contains the online proceedings of the 13th International Conference on Location-Based Services (LBS 2016), held on November 14–16, 2016 in Vienna, Austria.

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), International Association of Geodesy (IAG), International Federation of Surveyors (FIG), and Deutsche Gesellschaft für Kartographie (DGfK).

Additional papers from this conference were published in:

– Progress in Location-Based Services 2016, Lecture Notes in Geoinformation and Cartography, Georg Gartner and Haosheng Huang (eds.) (2017), Springer-Verlag, Berlin/Heidelberg.

Type setting of the chapters by the authors,
processed by Haosheng Huang.

Think before you print!

ISBN 978-1-907075-02-5

A multidimensional model for personalized landmarks

Eva Nuhn*, Sabine Timpf*

*Geoinformatics Group, Institute for Geography, University of Augsburg, Alter Postweg 118, 86169 Augsburg, {eva.nuhn, sabine.timpf}@geo.uni-augsburg.de

Routing services for pedestrians play an important role in everyday life. Nowadays routing directions are provided mostly on smart phones to support various wayfinding tasks such as exploratory travel in an unknown environment (e.g., as a tourist) as well as travelling towards a novel destination (Wiener et al., 2012). Studies in cognitive psychology have shown that even the shortest routing direction given by humans refers to special objects, i.e. landmarks (Daniel and Denis, 1998; Lovelace et al., 1999). By contrast, today's routing services calculate some optimal route from any start to any destination and guide the user with the help of a sequence of instructions. A few Points of Interest (POIs) currently are included in navigation services (e.g. petrol stations or churches) to provide additional information. However, they are not used as an integral part of the routing instructions, nor do they influence the selection of the route.

In this research we explore the notion of landmarks being integrated into and influencing the computation of the route. Personalized routing instructions require an assessment of the objects in the database for usefulness for a specific person as well as an integration of personal information. Although research on the objective spatial characteristics (e.g. Sorrows and Hirtle, 1999; Raubal and Winter, 2002) of landmarks exists, it is still not clearly defined what exactly a landmark is for a specific person. Persons add salience to geographic objects due to their knowledge, background, interests and preferences. Current approaches and existing frameworks do not incorporate this fact. Although some researchers (Götze and Boye, 2016) propose a personalized salience model they do not incorporate personalization factors within their model, nor do they investigate the integration of personal information into route selection. Hence, the challenge of our research is twofold: the first concern is a formal or standardized model of landmarks taking into account a personalization factor. The second problem is in integrating personalized

LBS 2016
13th Conference on Location-Based Services
Vienna, 14–16 November 2016

Published in "Proceedings of the 13th International Conference on Location-Based Services", edited by Georg Gartner and Haosheng Huang, LBS 2016, 14-16 November 2016, Vienna, Austria.

landmark data for inclusion in the routing algorithm. This paper tackles these challenges by proposing a multidimensional model for landmarks.

In order to determine whether a geographic object is useful for a specific person four dimensions are considered within the model: the established ones proposed by Sorrows and Hirtle (1999), i.e. visual, semantic and structural dimensions and, in addition, a personal dimension of landmarks. For each dimension attributes are defined (e.g. color and façade area for the visual dimension), which determine the usefulness of an object as a landmark.

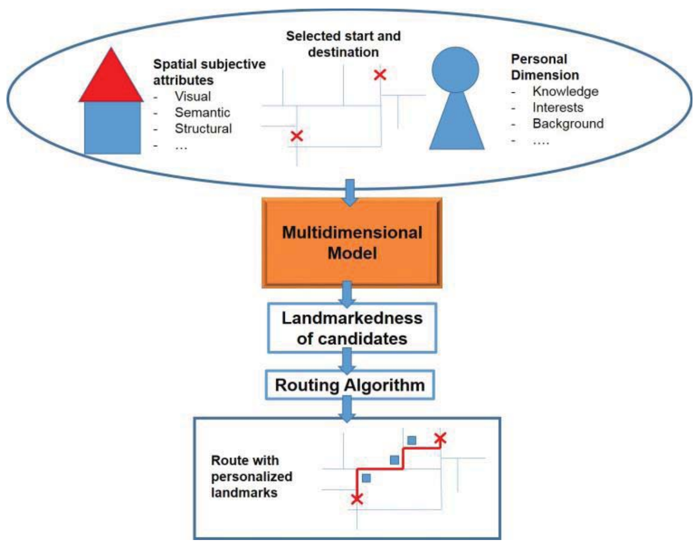

Figure 1. Model configuration.

We propose three different inputs to get the values for the model attributes (see fig. 1): spatial objective attributes of landmark candidates, start and destination of the route and a user profile. The user profile includes the inputs for the attributes of the personal dimension: the spatial knowledge of the user, her interests (e.g. interest in architecture) and her background (i.e., demographic data like gender, age, hometown and education). The model allows for the assessment of the inputs and the determination of their effect on the landmarkedness or salience (Caduff and Timpf 2008) of a landmark candidate. The result of the model is a measure of the personal salience of a landmark candidate for a specific person. The measure can then be integrated in the generation of a route between the defined start and destination, i.e. it can be introduced in a shortest path algorithm. The result of the routing algorithm is an optimal route in terms of personal landmarks.

References

Daniel, M.-P. and Denis, M. (1998): Spatial descriptions as navigational aids: A cognitive analysis of route directions. Kognitionswissenschaft 7(1): 45-52.

Caduff, D. and Timpf, S. (2008): In the assessment of landmark salience for human navigation. Cognitive Processing 9(4): 249-267.

Götze, J. and Boye, J. (2016): Learning Landmark Salience Models from Users' Route Instructions. Journal of Location Based Services 10(1): 47-63.

Lovelace, K. L., Hegarty, M. and Montello, D. R. (1999): Elements of good route directions in familiar and unfamiliar environments. In: Freksa, C. and Mark, D. M. (eds), Spatial information theory. Cognitive and computational foundations of Geographic Information Science. Springer, pp: 65-82.

Raubal, M. and Winter, S. (2002): Enriching wayfinding instructions with local landmarks. In: Egenhofer, M. J. and Mark, D. M. (ed), Geographic information science. Lecture Notes in Computer Science Springer, pp: 243 - 259.

Sorrows, M. E. and Hirtle, S. C. (1999): The nature of landmarks for real and electronic spaces. In: Freksa, C. and Mark, D. M. (eds), Spatial information theory. Cognitive and computational foundations of geographic information science. Springer, pp: 37-50.

Wiener, Jan M, Simon J Büchner, and Christoph Hölscher. 2009. "Taxonomy of Human Wayfinding Tasks: a Knowledge-Based Approach." Spatial Cognition & Computation 9 (2): 152–65.