International Cartographic Association
Association Cartographique Internationale

Optimizing mobile map reading: An adaptive map approach in response to dynamic pedestrian context

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Keywords: mobile cartography, adaptive map, context-awareness, mobile map reading, field-based evaluation

Abstract:

In our contemporary society, the ubiquity of smartphones has revolutionized access to maps. Mobile maps have seamlessly integrated into nearly every aspect of our daily lives. However, mobile map usage often occurs in dynamic environments where contextual changes can lead to potential distractions and might increase cognitive load for users (Reichenbacher, 2004). These inherent characteristics of a mobile environment can affect the effectiveness of information extraction from the map, ultimately directly impacting the decision-making process. Additionally, mobile map users have diverse needs and abilities, and their map requirements vary depending on the situation and activity they pursue. Therefore, there is a need for a mobile map that adapts itself based on the context of the user.

Although a theoretical foundation exists for adaptive maps, and advancements in mobile development facilitate their creation, a significant gap remains in their practical implementation. Hence, the first research objective of this study is to create and evaluate a context-aware mobile map prototype that adapts the amount and type of information visualized, according to the needs of the user pursuing a particular activity. However, to improve the creation of such context-aware maps in the future further research is still needed to understand better how particular context factors affect mobile map users. Thus, this study also aims to investigate the impact of two context factors (movement speed and noise level) on mobile map reading performance. To measure the influence of those contextual factors on mobile map reading and to assess the adaptive map effectiveness in mitigating their potential negative influence, field-based user evaluation is conducted, during which the users have to solve map-related tasks in different scenarios while being exposed to various contextual conditions.

Three scenarios with different noise levels and movement speed conditions are investigated: walking in a park, catching public transport and sightseeing in a city center. For each scenario, the user is presented with one map-related task for different versions of mobile map prototypes: the adaptive and non-adaptive. The adaptive map dynamically filters points of interest based on their relevance to the user's inferred activity in the specific scenario, the non-adaptive map on the other hand doesn't change its content across scenarios. Task completion time and error rates are compared to gather quantitative results to assess the adaptive map's performance. The additional surveys measuring user's confidence, familiarity with the testing area, perceived map relevance and overall satisfaction are embedded within the user evaluation to acquire qualitative results.

Acknowledgments

This research was conducted for a Master's thesis supervised by Prof. Geog Gartner from the Vienna University of Technology and Dr. Tumasch Reichenbacher from the University of Zurich.

References

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https://doi.org/10.5194/ica-abs-7-96-2024 |