

Designing interaction techniques for the comparison of spatial entities in the context of geodashboards

Simon Meißner

August 2023

Abstract

Contents

1	Introduction	4
2	Literature Review	5
3	Methodology	5
4	Results	5
5	Discussion	5
6	Conclusion	5

1 Introduction

The growing usage of dashboards to represent data across a range of different fields suggests a need for research on layout and design features of dashboards and their influence on the user experience [13, 10].

Previous research has shown that there is no one-fits-all solution and it has to be experimented with different design decisions in different scopes and purposes. An interesting approach to narrow down the area of investigation is to classify user interaction in a dashboard application for exploration and/or analysis of the dataset [12]. This doesn't exclude the field of geovisualizations and geodashboards. There are many different perspectives that all reasonably try to define taxonomies and or classification models that all have their application for spatio-temporal data exploration and/or analysis [1, 4].

But Roth has shown that a functional taxonomy of interaction primitives can be empirically derived. He identified general tasks users want to accomplish (objective primitives) [9].

An interaction techniques as broadly defined in the Computer Science Handbook from 2004 is "the fusion of input and output, consisting of all hardware and software elements, that provides a way for the user to accomplish a task." [6]. In the context of geovisualizations and geodashboards interaction techniques have been researched [7, 8, 9, 11]. Roth also describes an interaction technique in the context of geovisualizations as the functionality of an given interface and the procedures of manipulating its visualizations [9].

Instead of dealing with layout and design features directly, this work will focus on interaction techniques as they also imply design decisions. As we have seen it is reasonable to focus on a specific usecase in geodashboards. This work will deal with on the derived objective primitive of *comparison* from Roth's work. But not only Roth speaks about comparison. Wehrend describes *compare* as a seperate operation class in visualization problem [12] and Brehmer et al. speak of comparison as a low level visualization task [2]. In the scope of geovisualizations Crampton identified *compare* as an interactivity task [4] and Gorte and Degbelo argue that *comparison* is a basic task that is relevant in exploratoy and confirmatory analysis [5].

Distingiushes between two dimensions of comparison. Comparisons of variables or projections, and comparison of subset of the data [3].

2 Literature Review

3 Methodology

4 Results

5 Discussion

6 Conclusion

References

- [1] Natalia Andrienko, Gennady Andrienko, and Peter Gatalsky. Exploratory spatio-temporal visualization: an analytical review. 14(6):503–541, 2003. PII: S1045926X03000466.
- [2] Matthew Brehmer and Tamara Munzner. A multi-level typology of abstract visualization tasks. 19(12):2376–2385, 2013. Journal Article Research Support, Non-U.S. Gov’t.
- [3] Andreas Buja, Dianne Cook, and Deborah F. Swayne. Interactive high-dimensional data visualization. 5(1):78–99, 1996.
- [4] Jeremy W. Crampton. Interactivity types in geographic visualization. 29(2):85–89, 2002.
- [5] Viktor Gorte and Auriol Degbelo. Choriented maps: Visualizing sdg data on mobile devices. 59(1):35–54, 2022.
- [6] Ken Hinckley, Robert J. K. Jacob, and Colin Ware. Input/output devices and interaction techniques. In Allen B. Tucker, editor, *Computer Science Handbook*. Chapman and Hall/CRC, 2nd edition, 2004.
- [7] Daniel A. Keim. Chapter 2 - information visualization: Scope, techniques and opportunities for geovisualization. In Jason Dykes, Menno-Jan Kraak, and Alan M. MacEachren, editors, *Exploring Geovisualization*, pages 21–52. 2005.

- [8] María-Jesús Lobo, Emmanuel Pietriga, and Caroline Appert. An evaluation of interactive map comparison techniques. In Bo Begole and Jinwoo Kim, editors, *CHI15: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pages 3573–3582. Association for Computing Machinery, New York, United States, 2015.
- [9] Robert E. Roth. An empirically-derived taxonomy of interaction primitives for interactive cartography and geovisualization. 19(12):2356–2365, 2013. Journal Article.
- [10] Alper Sarikaya, Michael Correll, Lyn Bartram, Melanie Tory, and Danyel Fisher. What do we talk about when we talk about dashboards? 2018. Journal Article.
- [11] Bradley van Tonder and Janet Wesson. Intellitilt: An enhanced tilt interaction technique for mobile map-based applications. In Pedro Campos, Nicholas Graham, Joaquim Jorge, Philippe Palanque, and Marco Winckler, editors, *Human-Computer Interaction – INTERACT 2011*, volume 6947, pages 505–523. Springer Berlin Heidelberg, 2011.
- [12] S. Wehrend and C. Lewis. A problem-oriented classification of visualization techniques. In Arie Kaufman, editor, *Proceedings of the First IEEE Conference on Visualization: Visualization ‘90*, pages 139–143, 1990.
- [13] Ogan M. Yigitbasioglu and Oana Velcu. A review of dashboards in performance management: Implications for design and research. 13(1):41–59, 2012. PII: S1467089511000443.