Developing a Data-Driven Wiki of Spatial-Nonspatial Integration Tools

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ABSTRACT

Visualization and visual analysis are essential components of the tasks associated with problems that mix spatial and nonspatial data — for example in bioinformatics (molecular structures and genetics), in engineering (3D flow and multi-run parameters) or in geospatial analysis (landscapes and epidemics) — and yet, as a field, we know little about the principles underlying the visual integration of spatial and nonspatial data. First, because the visualization community is often split according to data taxonomies, integrative designs are also scattered across these different communities. Second, existing designs are seldom correctly labeled as "spatial and nonspatial integration", they seldom seem aware of each other, and they seldom reference each other: a search on www.keyvis.org[1] indicates that over the past 10 years only three VIS manuscripts list as a keyword "Integrating Spatial and Non-Spatial Data Visualization"; although the reality in the field is clearly different.

The premise of our work is that visual analysis problems requiring spatial and nonspatial data integration are best supported by a solid understanding and analysis of the related work in the field. In this case, the related work spans several hundred integration works in engineering, geospatial analysis, and biology visualization. Since late 2015, we pursue a data-driven approach to construct a model of spatial-nonspatial integration. Through a bottom-up approach, we have identified additional integration patterns aside from overlays and linked views. We have further identified interesting patterns in terms of the data types and users tasks encountered, and divergence in the visual encodings used across different application domains.

In this work, we describe our current efforts at organizing our survey into a public electronic repository. For data analysis we employed a multiple-iteration, three-stage combination of tagging and categorical dimensions—along the application subdomain, user type, data type (Fig. 1), user tasks (Fig. 2), integration paradigm, and visual encodings. For each possible taxonomy dimension, we discussed the tags as a group, then defined super-tag categories, then where appropriate we ranked the different categories in order of perceived complexity. The key contribution of this work is the effective organization of the survey tools into a model which takes into account the user type and their background, and their data and tasks. The result is a catalog and analysis of existing integrative tools, which is organized in electronic form, as a searchable wiki, and which can grow over time.

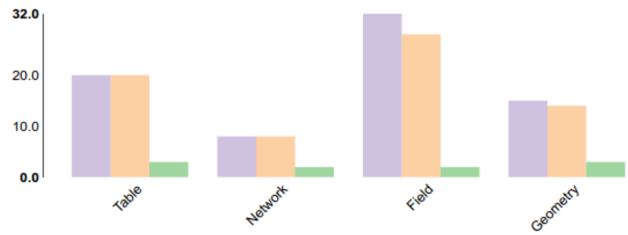

Figure 1: Data types by Engineering subdomain

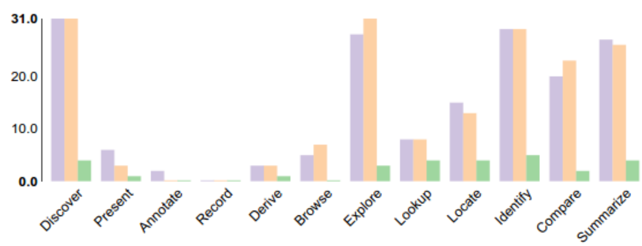

Figure 2: User tasks by Engineering subdomain

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1. REFERENCES

[1] P. Isenberg, T. Isenberg, M. Sedlmair, J. Chen, and T. Möller. Toward a deeper understanding of visualization through keyword analysis. Technical Report RR-8580, INRIA, France, Aug. 2014. Also published on arXiv.org (# 1408.3297).