ICT19-047 - Guidance-Enriched Visual Analytics for Temporal Data (GuidedVA)

Abstract

The GuidedVA project explores how to enrich Visual Analytics (VA)—i.e., approaches that combine interac tive visual interfaces with advanced computational analysis to support human reasoning—with smart guidance mechanisms that help users navigate complex (temporal) patterns. VA plays a crucial role in leveraging both human expertise and machine computational power: while algorithms can process and model vast amounts of data, humans excel at interpretation, contextualization, and decision-making. However, analysts often face difficulties in deciding which techniques to use or how to proceed when encountering uncertainty, which can lead to stagnation in the analysis process. GuidedVA addresses this challenge by researching how to embed guidance into VA systems as a mixed-initiative process: On the one hand, users, such as domain experts, direct and inform the system, while the system, in turn, supports them through recommendations and visual suggestions that indicate how to proceed and complete domain-specific tasks. GuidedVA addresses both theoretical and methodological aspects of this problem (e.g., how to design appropriate forms of guidance [20] and how to integrate them into the VA pipeline [19]), as well as practical aspects, such as implementing guidance in specific scenarios [22] and evaluating the resulting solutions with domain experts to assess their effectiveness in supporting real-world analysis [7]. Concerning this last specific aspect, our main application scenario was the analysis of World War II unexploded bombs (UXOs) in time and space, which we tackled in collaboration with a partner company, Luftbilddatenbank GmbH. Through this collaboration, we created a visual, interactive guidance-enhanced prototype that provides experts with an integrated work pipeline and environment that facilitates (in terms of reducing time while improving effectiveness) the analysis of aerial images to reconstruct specific areas (e.g., parts of Vienna) in time and space and identify possibly unexploded bombs lying in the ground [22]. The results show how our integrated solution provides experts with an environment that facilitates their tasks and improves decision-making. In the short term, our project was able to show how guidance-enhanced approaches have the potential to be helpful in a variety of scenarios, e.g., through our theoretical contributions. In the long term, GuidedVA paved the way to more complex and integrated approaches that could not only provide the necessary support to experts but also extend this support to multiple experts and personas, while dynamically adjusting the degree of support to the specific context and characteristics of the scenario. In this regard, our latest contributions represent the summative outcome of the project and open the way to merging interactive VA prototypes with guidance approaches (e.g., by integrating generative Artificial Intelligence (AI) approaches), opening a wide variety of challenges which we aim to tackle in the future [18], in follow-up projects.

Scientific disciplines:
Human-computer interaction (40%) | Information design (40%) | Information systems (20%)

Keywords:
Visual Analytics, Visualization, Interaction Design, User-Centered Design, Guidance, Time

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Further links to the persons involved and to the project can be found under
https://www.gmbh.wwtf.at/funding/programmes/ict/ICT19-047/