Collaborative and Social Visualization

Tom Erickson is a pioneer in social computing. His work on social translucence is about designing social infrastructures that make collective activity visible. The key message is making social clues visible and persistent helps online groups to govern their activities. More recently, ManyEyes has opened up a whole new area of information visualization. Implications and dynamics of social navigation and exploration through information visualization are expected to raise many theoretical and practical questions about the nature of insight and how one may achieve various goals with and without sharing a potentially diverse range of views offered by a growing social network. Relevant readings in this direction include Refs 68–71 on social clarity.

Future Directions

An increasing number of activities and writings have examined the contemporary information visualization field and looked ahead for motivating problems and enlightening challenges that would lead the field to a high level of development.

In 2004 IEEE Visualization, a panel specifically focused on can we determine the top unresolved problems of visualization? Each panelist subsequently published their own lists of unsolved problems. For example, the top 10 unsolved problems identify the need for new methodologies for empirical evaluations and more attention to a better understanding of elementary perceptual–cognitive tasks. The list of problems also includes a better understanding of the role of prior knowledge of viewers in maintaining an effective dialog between information visualization and its users. Many of the top 10 problems remain to be challenges, such as the intrinsic quality measure problem, the scalability problem, and the causality, visual inference, and prediction problem. Some of the problems identified in the more recent visual analytics are also relevant, for example, integrating information-theoretic views, developing metrics for saliency and novelty, and bridging between macroscopic and microscopic views.

Illuminating the Path is an ambitious research agenda for visual analytics. It addresses many issues relevant to information visualization.

A major reflection by leading researchers in both information visualization and scientific visualization is summarized in the 2006 NIH/NSF/VRC Final Report:
The field of information visualization is interdisciplinary in nature. The field will benefit from interconnections with a wide variety of other fields, for example, developing and adopting some of the most promising algorithms for information visualization purposes. For example, some potentially significant directions include scalable, high-performance algorithms developed by machine learning and complex network analysis for analyzing and visualizing large-scale, multidimensional data, such as scalable community finding algorithms and fast EM clustering algorithms, and algorithms of greater interpretability for dimensionality reduction and automated summarization, such as nonnegative matrix factorization and tensor factorization.

CONCLUSION

We conclude the overview with some recommendations based on emerging trends and the most promising directions for future research. All recommendations are organized in terms of priority areas. Most of them are interdisciplinary in nature.

Theoretical Foundations

- Pursuing the nature of insight should be broadened to incorporate studies of creativity, discovery, and problem solving in other fields and disciplines.
- Theoretical conceptualizations should adapt design and communication frameworks.
- Theory building efforts should integrate information theory and other theories that are capable of defining metrics of information, uncertainty, and interestingness.
- More research should focus on social dimensions of information visualization enabled in social information foraging and social networking.

Metrics

- Information metrics on uncertainty, interestingness, saliency, and rarity.
- Diagnostic and evaluative metrics of information visualization.

Algorithms

- Develop and adopt scalable, high-performance algorithms for analyzing and visualizing large-scale, multidimensional data, such as scalable community finding algorithms and fast EM clustering algorithms.
- Incorporate algorithms of greater interpretability for dimensionality reduction and automated summarization, such as nonnegative matrix factorization and tensor factorization.

Design

- Establish design languages and design patterns.
- Develop conceptual and operational taxonomies and enable mixed-initiative interaction.
- Focus on gulfs of execution and gulfs of evaluation.

Visual thinking, focusing on the big picture, pursuing deep insights, and many other characteristics of information visualization make it a compelling candidate across a wide variety of learning and information processing tasks in a diverse range of application domains. Information visualization needs to maintain an open-minded community and reaches out to other disciplines for motivating challenges as well as adaptable techniques. Information visualization is facing not only a challenging and exciting future, but also an increasing expectation and responsibility for an insightful and enlightening world.

NOTES

REFERENCES


**FURTHER READING**


Ware C. *Visual Thinking for Design*: Morgan Kaufmann; 2008.