Uncertainty Propagation and Trust Building in Visual Analytics

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Knowledge Generation in Visual Analytics

- Visual Analytics aims to generate new valid knowledge also defined as justified belief.
- Uncertainties build up at the system side.
- Humans have to trust the insights gained by using the system.

Uncertainty Awareness

- Do humans really understand all included uncertainties?
- Detect, derive, and visualize these uncertainties in order to improve the awareness of included uncertainties.
- Provide tooltips that show the level of uncertainties or indicate the area of uncertainties via pipeline visualizations. Uncertainty could also be mapped to visual variables in visualizations (e.g., transparency).

Data Provenance (System)

- Uncertainties occur at each component in analysis systems.
- Output is processed by humans and includes all inherited uncertainties.

Analytic Provenance (Human)

- „Lack of trust“ on the human side.
- Confidence builds up and transfers to trust.
- Insufficient trust keeps humans in the loop.

Research Questions

- How to define and aggregate uncertainty and trust measures?
- How to detect human levels of trust or knowledge?
- How to support human knowledge generation without annoying users?
- How to externalize knowledge and involve humans?
- How to capture, store and analyze human behavior in VA systems?

Research Plans

- Survey existing provenance components in VA literature with respect to their goals.
- Describe the role of uncertainty and trust for each concept of the model.
- Develop/integrate provenance functionalities into existing VA-tools.
- Build a note taking environment that enables knowledge externalization and analysis of human thoughts connected to uncertainty measures on the system side.

References


Figure 1: The knowledge generation model for visual analytics defines and relates computer and human concepts [1]