Lessons Learned and Challenges

Tutorial: Interactive Visual Analysis of Scientific Data

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IVA of Scientific Data

- If given data too large and/or complex to be shown all at once

- ➔ IVA is an interactive visualization methodology to facilitate
  - the exploration and/or analysis of data, including
    - hypothesis generation & evaluations
    - sense making
    - knowledge crystallization
  - according to the user's task, e.g., by interactive feature extraction,
  - navigating between overview and details, e.g., to enable interactive information drill-down [Shneiderman]
  - through an iterative & interactive visual dialog

IVA of Scientific Data

- Scientific data lives in physical as well as in attribute space
- Hence, IVA must employ adequate views on the data:
    - from Scientific visualization (volume/surface rendering, …)
    - from Information visualization (parallel coordinates,…) and statistical graphics (histograms, scatter plots,…)
- Views coupled with methods from statistics, data mining,…
- Specific components, such as multiple coordinated views, linking & brushing, F+C visualization,…
- IVA works well for data from various sources
    - Imaging, simulations, sampled models
- and is employed in different application areas
    - Engineering, biology, medicine, climate research

Challenges

- Based on Keim et al.: "Visual Analytics Challenges", Echallenges09
- IVA of heterogeneous data of various types and quality requires an integrated and consistent data basis
- Large, complex data require automatic data analysis, e.g., clustering and classification, to
  - extract valuable information from raw data,
  - focus visualization on valuable information
- IVA of data with references both in space and in time
- Careful design of appropriate human-computer interfaces
- Facilities for capturing analysis process and for reporting analysis results
- Evaluation of IVA solutions