Visualization Tools for Analysis Tasks

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Situation and Obstacles

Analysts need to:
- Establish Baselines
- Identify Trends
- Identify Key Nodes
- Make Connections
- Detect Anomalies
- Identify Cause and Effect

They have to:
- Do more with less
- Deal with contradictory information
- Fulfill complex requests
- Meet tight deadlines
- Handle ambiguity
- Identify denial and deception
- Process increasingly large amounts of traffic
- Manage increasing varieties of data

But...

Proposed Solution

Visualizations and their low level features are tools. The visualizations are analyst’s tools. The low level features are the tools of viz designers. We aim to understand which tools are effective for which tasks in order to enhance analysts’ abilities to make sense of their data. In other words: pick the right tool for the analysis task at hand.

Tools for Tasks

Natural User Interface
Large Wall Display Visualizations

"JobVis" Radial Visualization
Adjacency Matrix

Low Level Features

Graphical Code

Small shapes defined by closed contour, texture, color, shaded solid.
Spatially ordered graphical objects.
Graphical objects in proximity.
Graphical objects having the same shape, color, or texture.
Size of graphical object.
Height of graphical object.
Shapes connected by contour.
Thickness of connecting contour.
Color and texture of connecting contour.
Shapes enclosed by a contour, a common texture, or a common color.
Nested regions, partitioned regions.
Attached shapes.

Semantics

Object, idea, entity, node.
Related information or a sequence in a sequence that left-to-right is consistent with the western convention for written language.
Similar concepts, related information.
Similar concepts, related information.
Magnitude, quantity, importance.
Related entities, path between entities.
Strength of relationship.
Type of relationship.
Contained entities. Related entities.
Hierarchical concepts.
Parts of a conceptual structure.

Large Wall Display

- Useful for collaboration
- Increased "real estate" may allow for showing accurate relative magnitudes
- Increased "real estate" may allow for lower "costs" for tool switching

Adjacency Matrix

- May be useful for anomaly detection
- Reconfiguration less computationally expensive than in node-link diagrams

"JobVis" Radial Visualization

- Originally designed to identify relationships between college majors and jobs
- Can be used to infer cause and effect
- May provide benefit for anticipatory analysis

Low Level Features

- Understanding the semantics of graphical codes can reduce, but not eliminate, inaccurate sensemaking

Why Use Them?

Future Work

- Evaluate effectiveness of visualizations
- Identify idiosyncratic patterns recognized by different:
  - expertise levels;
  - personalities (OCEAN); and
  - cognitive abilities (spatial/verbal/visual working memory)
- Identify more visualization-task pairings
- Create an analyst task taxonomy
- Long term goal is to create an adaptive viz system