Graph Drawing

Graph Visualization and Navigation in Information Visualization: A Survey

Ivan Herman,Guy Melancon and M. Scott Marshall

„Search, Show Context, Expand on Demand“: Supporting Large Graph Exploration with Degree-of Interest

Frank van Ham, Adam Perer

Dana Markovic, VU Visualization SS2014

Overview

- Key issues in Graph Visualization
- Clustering
- Extending DOI to graphs – *Search context*
- *Show and Expand-on-Demand context*
- Implementation example

Key issues in Graph Visualization

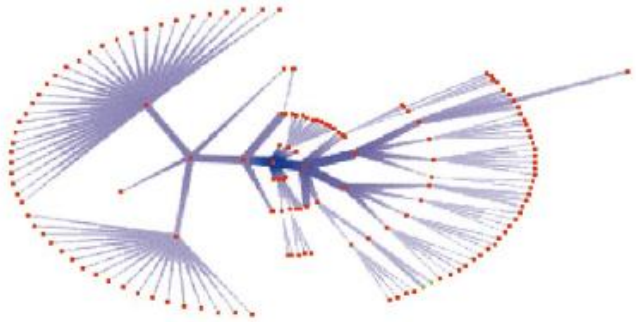
- Size
  - Performance, display limit
  - Viewability and usability
  - Cognitive perspective
- Planarity
  - When dealing with small and sparse graphs
  - Drawing graph without edge crossing
  - Various constraints such as *aesthetic rules*
- Predictability
  - „preserving the mental map of the user“
- Time complexity
  - Real time interaction
  - Updates in very short time intervals

Clustering

- Improves clarity and increases performance,rendering
- Structure-based vs. content-based
- Used for *filter* and *search*
- Layout
  - Representing clusters with glyphs – super nodes
  - Omitting edges
  - Hierarchical
  - Force-directed layout
- Node metrics: measure or quantify an abstract feature
  - Numeric computable function
  - E.g degree of node, Strahler metric, *Degree of Interes*t from Furnas

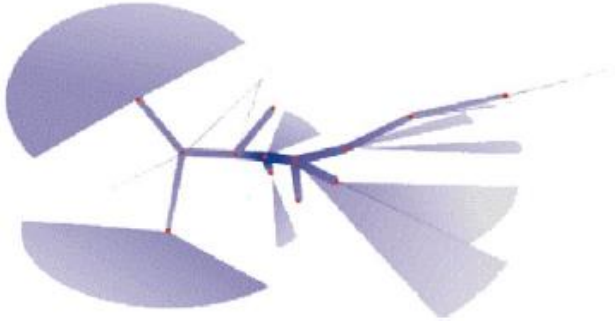
Clustering

- Metrics are used to influence layout
- Kimelman‘s method for representing the unselected nodes
  - *Ghosting, Hiding, Grouping*



Ghosting

Hiding



Grouping

Extending DOI to Graphs

- Furnas‘ DOI function:

$$\mathbf{DOI(x|y)=\alpha\ API(x) + \beta\ D(x,y)}$$

  - A priori interest function *API*, distant function *D, x* location, y current focus

- Additional functions
  - EI (e,x,y) disinterest function → *Search* component
    - Defines path length between two arbitrary nodes in the graph
  - UI (x,z) user interest funct. → Many local maxima
    - Interest information known between the user chooses a focal node
  - N(x) intristic value of the neighbours
    - Interest of node depends on the max. of ist own interest values and a fraction of ist highest interest neighbours

Extending DOI to Graphs

- Final resulting function

$$\mathbf{DOI(x|y,z)=\alpha\ APIdiff(x) + \beta\ UI\ diff\ (x,z) + \gamma\ D(x,y)}$$

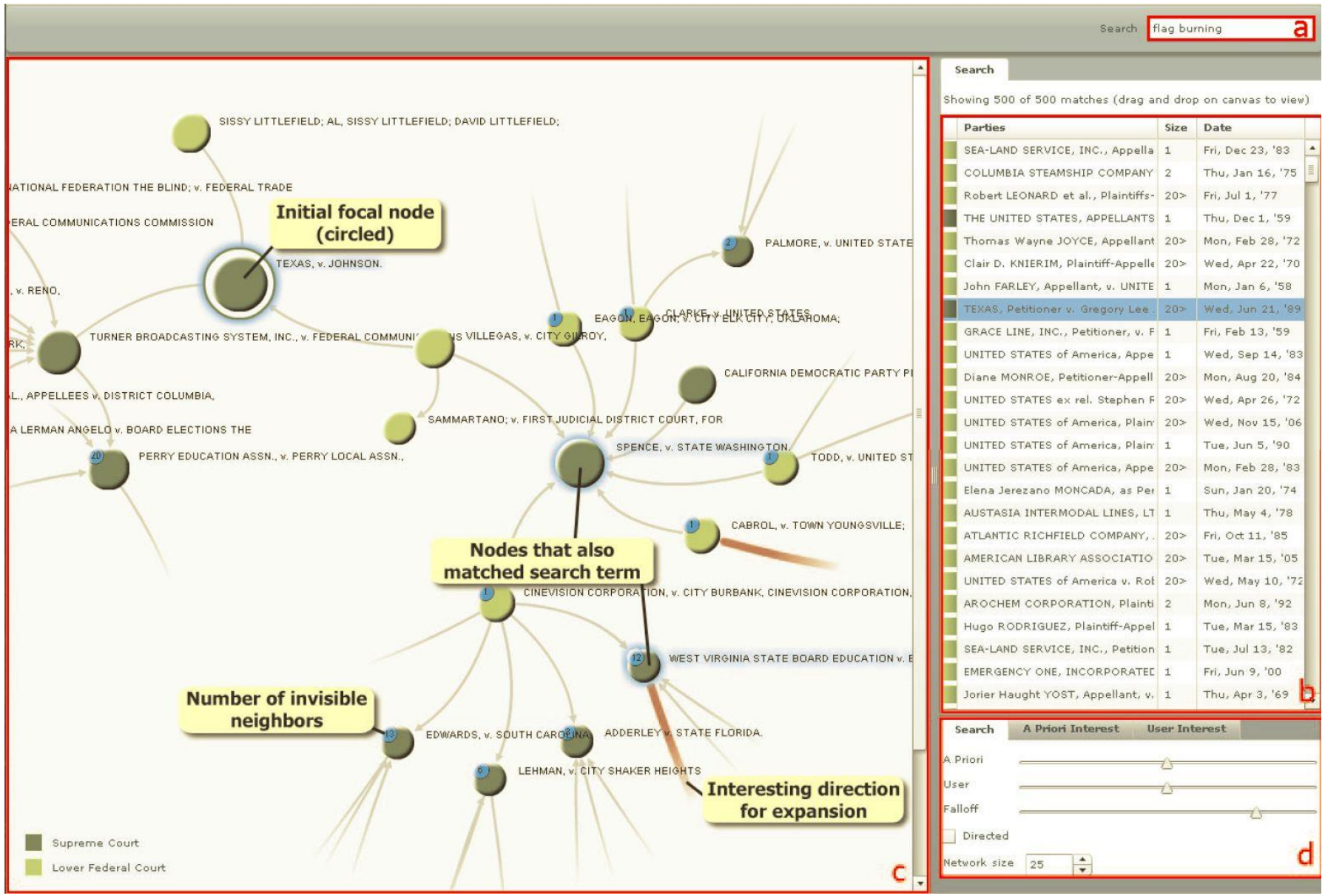
z-search parameter, y focus node

- Diffusing the interest values over the entire graph

Show and Expand-on-Demand Context

- *Show*
  - How to efficiently compute a connected subgraph F with size at most S that contains y and has maximal total interest?
  - → Greedy optimization algorithm
- *Expand-on-Demand*
  - use interest function to define which adjacent nodes are most important
  - Highlight n most interesting directions (n<5)

Implementation



Basic UI layout.
van Ham and Perer

Conclusion

- Thorough description of key issues in first paper
  - Descriptions of techniques
  - Could be organized better
- Second paper presents solution to problems adressed in the first one
  - Implementation and evaluation also described
  - Future work well described
  - Algorithms could be more formal

References

- van Ham, F., Perer, A: „Search, Show Context, Expand od Demand“: Supporting Large Graph Exploration with Degree-of Interest, IEEL Transactions on visualization and Computer Graphics, Vol.15 No.6 (2009)
- Herman, I., Melancon, G., Marshall, M.S.: Graph Visualization and Navigation in Information Visualization: A Survey (2000)