Übung zur Vorlesung
Informationsvisualisierung

Emanuel von Zezschwitz
Ludwig-Maximilians-Universität München
Wintersemester 2012/2013
Graphs and Hierarchies
Terminology

• A **Graph** is an abstract representation of a set of objects where relations between objects are represented by links.

• A **Network** is a directed graph.

• A **Tree** is a (usually) directed graph without cycles. There is usually a designated root.
Node-link versus Matrix

<table>
<thead>
<tr>
<th></th>
<th>v1</th>
<th>v2</th>
<th>v3</th>
<th>v4</th>
</tr>
</thead>
<tbody>
<tr>
<td>v1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>v2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>v3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

VS.
Graph Drawing

Goals [2]:

- Minimize crossing
- Minimize area
- Minimize the sum of the edge lengths
- Obtain a uniform edge length
- Minimize bends

Paradigms [2]:

- Topology – Shape – Metrics
- Hierarchical
- Force – Directed
Graph Drawing

Topology – Shape – Metrics [2][4]:

- Draw orthogonal graphs

Approach:

- Planarization
- Dummy vertices for crossings
- Orthogonalization
- Minimize area
Graph Drawing

Hierarchical [2][4]:

- Draw hierarchical graphs

Approach:

- Layer assignment
- Dummy vertices for skipped layers (e.g. L₁ to L₃)
- Crossing reduction
- X-coordinate assignment
Graph Drawing

Force – Directed (Spring Algorithm) [2][4]:

- Draw self-organizational graphs

Approach:

- Nodes have forces (e.g. electrical repulsion)
- Edges have forces (e.g. gravitational attraction)
- Friction to stop the process
Node-Link vs. Enclosure

- Immediate perception of relations
- Waste of screen real estate

- Space-filling
- Focus on leaf nodes
- Structure gets lost

Source: http://newsmap.jp/
Treemap Algorithms [1]

- Slice-and-Dice
- Cluster
- Sqrarified

- Bewertung durch: Aspect Ratio, Change, Readability
Slice-and-Dice

• Algorithm:
  • Use parallel lines to divide a rectangle representing an item into smaller rectangles representing the item’s children
  • Each child is allocated a size proportional to some property (additional encoding by color)
  • At each level of the hierarchy switch the orientation of the lines (vertical vs. horizontal)
Slice and Dice

- Filesystem:
Slice and Dice

• Solution:

```
root
  Folder 1
    Folder 4
      File (3 mb)
      File (1 mb)
    File (6 mb)
  File (6 mb)
  Folder 2
    File (6 mb)
    File (4 mb)
  Folder 3
    Folder 5
      File (3 mb)
      File (1 mb)
      File (4 mb)
    File (4 mb)
    File (4 mb)
```
Nested Treemap

• Revealing the tree structure (to a certain degree)
Subtree Selection

- Navigate the structure
- Easy access to subtrees
- Still no insights into the overall topology
Time-Based Data
Visualization Basics [6]

Common Questions
- Does a data element exist at a specific time?
- How long is the time span of the data element?
- How often does a data element occur?
- How fast is a data element changing?
- In what order do data elements appear? …

Time Axis Configuration
- Discrete time points vs. Interval time
- Linear time vs. Cyclic time
- Ordinal time vs. Continuous time
Types of Visualization [6]

Static
- Discrete or continuous data
- Visualization does not change over time
- Explore patterns, time steps without temporal limitations

Dynamic
- Discrete or continuous data
- Visualization changes over time
- Conclusion of temporal behavior

Event-based
- Discrete, continuous and event-based data
- Changes in data can not be foreseen
Example: KronoMiner [5]
Example: LastHistory [3]
Project: Barkeeper
Barkeeper: Roadmap

- **Finale Abgabe: 13.12.12 – 12:00 Uhr**
- Zusätzlich Präsentation an einem frei wählbarem Übungstermin oder persönlich bei Emanuel:
  - Es werden keine perfekten Endversionen erwartet.
    - Wer hat was gemacht?
    - Was wurde umgesetzt?
    - Was wurde aus den Daten abgeleitet?

- Notifikation über 5% Notenbonus am 17.12.12 per E-Mail.
- Weiterentwicklung des Projekts in den Wochen nach Weihnachten
  - erneute Chance auf (weitere) 5%
  - Anforderungen (sowie Namen zu Ids ;)) werden noch vor Weihnachten bekannt gegeben
References


