Towards Actionable Visualisation in Software Development

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Background

Why is software visualisation not widely used in software development?

- Out of touch with developer needs

Prior Work

- Taxonomy and surveys
- Framework to assess tools
- Help users understand tools
Approach

- **Map** needs to solutions in a problem domain
- finely-grained **developer needs**

Eg. Where is this method called?

**Question → Problem Domain → Visualisation Tool**
Research Questions

What are the goals of this literature review?

- **RQ1**: What are the characteristics of visualisation techniques that support developer needs?
- **RQ2**: How well are various problem domains supported by visualisation?

Filter 346 → 65 design study papers
Figure 2. Classification of the 273 SOFTVIS/VISSOFT papers by type.
Universe

http://scg.unibe.ch/research/visualisation-review
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Data Extraction

Attributes
Data Extraction

- **Evaluation**: Task, **Need**, Audience, Data Source
- **Implementation**: Representation, **Medium**, Tool

How?

- Frequent terms
- Questions
- Goals
Extraction - Need

75% stated explicit questions (need)

How were needs identified when questions weren’t asked?

How many needs?

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Needs Classification

- Classify questions based on general set
- Filter **needs** (finely-grained) within **domain** (coarsely-grained)
Extraction - Representation

Dense Pixel

- From Keim’s Taxonomy
- Massive sets of data

Dense Pixel Displays: Circle Segments Technique from Keim
Extraction - Representation

Transform

- Node links
- Explore relationships

Fig. 2. Parallel Coordinate Visualization ©IEEE from Keim
Extraction - Representation

Iconic

- Attribute values mapped to icon features

Extraction - Representation

Stacked

- Hierarchical displays
- tree maps

Figure 8. Treemap with 1000 Files

Extraction - Representation

Standard

- Bar charts
- X y plots

Figure 1: The Polaris user interface. Analysts construct table-based displays of relational data by dragging fields from the database schema onto shelves throughout the display. A given configuration of fields on shelves is called a visual specification. The specification unambiguously defines the analysis and visualization operations to be performed by the system to generate the display.

Conclusion

Analysis of Results
Problem Domain Mapping

Space filled (hierarchical)

- **what**: data multiple attribs
- **what**: derived sum of papers
- **how**: encode area marks and containment for hierarchy and visualization category, rectilinear layout
- **how**: reduce aggregate
- **what**: task view distribution RQ1

Figure 6. Mapping type of visualisation used by studies to problem domains.

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Problem Domain Mapping

Double Bar Chart

- **what:** data categorical and quantitative
- **what:** derived sum of papers and needs
- **how:** encode line marks, color
- **how:** reduce aggregate
- **what:** task compare problem domain with needs **RQ2**

![Double Bar Chart](image)

Figure 7. Comparing the degree of importance of developer needs vs. their visualisation support by problem domain.

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Conclusion

Covered:

- History, performance, concurrency, dependencies

Call to action:

- Rationale, Intent, Implementation, Refactoring
- Metaviz (demo at https://www.youtube.com/watch?v=qe5qiS1cmzs)
Critique
Threats to Validity

- Bias in paper selection
- Data extraction

Others not mentioned

- ‘primary contribution’ selection
- single source for developer needs (Latoza)
Questions?