Interacting and Visualizing Ontologies: The VOWL Notation

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Team Behind VOWL

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Ontology Visualization
Ontology Visualization (State-of-the-Art)

- Different types of diagrams (mostly node-link diagrams)
- But: lack in…
  - … OWL completeness / expressiveness
  - … intuitiveness / understandability

KEG Seminar – April 9th 2015
Ontology Visualization (State-of-the-Art)

- UML-based ontology visualization (reusing UML class diagrams)
- Well-defined mappings (e.g. Ontology Definition Metamodel of OMG)
- Several UML-based ontology editors (e.g. OWLGrEd, VOM, TopBraid Composer)
- BUT:
  - UML was not designed for OWL
  - Requires knowledge on UML
  - Limited scalability and manual layout
  - Focus: ontology modeling, not visualization
  - Latter also true for other visual notations (e.g. Graffoo, Concept Diagrams)
And many more...

- http://www.essepuntato.it/graffoo/
- http://protegewiki.stanford.edu/wiki/SOVA
- http://www.ontologyengineering.org/
- http://growl.novasemantics.it/
- http://www.omg.org/spec/ODM/1.0/
- etc.
Visual Notation for OWL Ontologies

VOWL

• Well-specified visual language designed specifically for OWL
• Focus: intuitiveness and user-orientation (casual ontology users)
• Focuses on the visualization of the TBox while it also includes recommendations on how to depict individuals and data values (the ABox)
• http://vowl.visualdataweb.org/index.html
VOWL Evolution

• VOWL 1: Focused on provided on integrated representation of OWL ontologies
  • Conceptual Layer – Represents the classes, properties, and their relationships;
  • Instance Layer – Represents the individuals and their relationships;
  • Integrated Layer – Represents the classes populated with individuals.

• VOWL 2: Updated specification with new elements and interactive features
  • (mayor) design revision
  • interactive features
  • implementation
  • evaluations

• VOWL 3 - work in progress
FOAF vocabulary visualized with VOWL 1 and VOWL 2
VOWL Notation
Graphical primitives and colour scheme used in VOWL

<table>
<thead>
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<th>Primitive</th>
<th>Application</th>
<th>Color</th>
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<td>classes, object properties, disjoint relations</td>
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<td>properties</td>
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<td>indirect highlighting</td>
<td>Indirect Highlighting</td>
<td>subproperties, interactive elements</td>
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VOWL 2: Visual Notation

- Size of circles = number of instances (if any)
- Intuitive symbols (Venn diagrams), not just formal ones
- Adoption of known notations (cardinality, subclass relation)
- Precisely specified at: http://vowl.visualdataweb.org
- Visual elements are combined to a graph (representing the ontology)
A few design decisions

**Element multiplication:**
- improved graph topology
- reduced graph energy

**Element aggregation:**
- less edges
- increased readability

**Force-directed layout:**
- uniform, symmetric edges with few crossings
- highly connected classes = central position

**Deliberate redundancy:**
- colors, shapes, and text
- self-explanatory, colour not required for interpretation

**Static vs. interactive:**
- interactive highlighting
- details on demand

PersonasOnto represented in VOWL
ProtegeVOWL and WebVOWL

Protégé plugin (Java + Prefuse)
http://vowl.visualdataweb.org/protegevowl.html

Web application (Web standards + D3)
http://vowl.visualdataweb.org/webvowl.html
OntoViBe: Ontology Visualisation Benchmark

• “OntoViBe represents a benchmark for testing ontology visualizations. It incorporates a comprehensive set of OWL 2 language constructs and systematic combinations thereof.”

• http://ontovibe.visualdataweb.org/index.html

OntoViBe represented in VOWL
Demo
Challenges and Future (Work)

Thank you!