# Notes for an Ontology Application Framework

Michael Grüninger

Ontology Summit 2011
Making the Case for Ontologies

February 3, 2011

# Approach

Focus on functionality – *how* is the ontology being used?

- Each application of an ontology incorporates one or more of these functionalities.
- Evaluation of the benefits of using the ontology is done with respect to these functionalities.
- This provides the basis for benchmarks and the ability to compare different applications of ontologies.

# Semantic Integration

## Information Integration

- Multiple information resources are combined using ontologies to match concepts with similar meaning
- Examples: web service composition, mashups, information aggregation, data fusion, linked data

## Database Integration

- Queries that require multiple databases are specified using common ontologies and data schema are matched using these ontologies
- Examples: applications of biomedical ontologies

# Semantic Integration

## Software Interoperability

- Software systems exchange sentences that are written using ontologies.
  Each software software uses an ontology (either its own or a set of shared ontology) to translate the exchanged sentences.

## Software Access

- Using ontologies to detach the user vocabulary from the application vocabulary.
- Ontologies provide a uniform conceptual interface to multiple software applications.

# Semantic Augmentation

## Ontology-based Algorithms

- Existing algorithms use classes and relations within ontologies to define search space and specify heuristics to guide search
- Examples: information retrieval, NLP

## Ontology Embedded into Software

- Object-oriented implementation (e.g. Java classes) generated from classes in the ontology
- Design (enterprise or manaufacturing artefact) is specified using the ontology and exported into software.

# Semantic Augmentation

## Ontology-based Standards

- Terminology within a standard is axiomatized by an ontology. Conformance with the standard is evaluated with respect to this axiomatization.
- Examples: Units of Measure, CL axiomatization of UML

# Knowledge Management

## Discovery

- Patterns in data are identified by matching against the classes, relations, and axioms of the ontology
- Examples: gene sequencing

## Categorization of Information Resources

- An ontology is used to organize unstructured information resources by identifying classes and relations within the ontology with terms that appear in the resources.
- Examples: Indexing, data warehouses, semantic annotation

## Knowledge Capture

- Classes in the ontology provide templates for gathering knowledge from subject matter experts.

# Decision Support

## Deduction from Axioms via Theorem Provers

- The axioms of the ontology and domain theories are used to entail queries using a general-purpose automated theorem prover.
- Examples of automated theorem provers: Racer, Prover9

## Deduction from Axioms via Special-Purpose Reasoners

- Special-purpose algorithms are implemented that are sound (and possibly complete) with respect to the set of sentences that are entailed/satisfied by the ontology.
- Examples: temporal reasoners, scheduling algorithms

# Moving Forwards ...

- Identify and extract ontology functionalities from applications discussed in use cases (Track 2).
- How can we evaluate the benefits of ontologies using these functionalities (Track 3)?