



Faculty of Computer Science

Project Proposal

**Building an Ontology of Semantic Web Techniques
Utilizing RDF Schema and OWL 2.0 in Protégé 4.0**

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Introduction:

A formal representation of knowledge as a set of concepts within a domain, and the relationships among those concepts is called an ontology. Ontologies are considered one of the pillars of the Semantic Web and used in Artificial Intelligence, Software Engineering, Semantic Web, Biomedical Informatics and many other fields. It is a structural framework for organizing information as a form of knowledge representation, although they do not have a universally accepted definition but here is one which is often used by Ontologists to define an ontology; *“An Ontology is a formal specification of a shared conceptualization”*[1].

A special form of (Semantic Web) vocabulary can be considered light-weight ontology, or sometimes also merely as a collection of URIs with a usually informally described meaning.

Light-weight ontologies (in particular, the often used subClassOf taxonomies and the occasionally used subPropertyOf taxonomies) can be encoded with RDF Schema (RDFS). Increasingly heavy-weight ontologies can be encoded by adding property-defined classes with increasingly expressive fragments of OWL 2.0.

Our ontology will provide useful information to future students who are interested in CS6795 Semantic Web Techniques course. Students will be able to find information about materials used in this course and the future prospects of the technologies utilized in the course. We will provide an interface of this ontology on the website so students will also be able to query the ontology using a query engine like DL Query and may search through the course material likewise in Protégé.

Summary of our Approach:

We will formalize a domain by defining classes and properties of those classes; we will define individuals and assert properties about them, and reason about these classes and individuals to the degree permitted by the formal semantics of the OWL language.

OWL: OWL (Web Ontology Language) is designed for use by applications that need to process the content of information instead of just presenting the information to humans. OWL facilitates greater machine interpretability of web content that are supported by XML, RDF, and RDF Schema (RDFS) by providing additional expressive power along with a formal semantics.

In this project, we will be describing an ontology for Semantic Web Techniques as covered in the course CS6795 on a high level, which will serve for inferential query and as metadata for finding specific course material. The Semantic Web Techniques ontology will be rooted in the class SemWebTech (level 0) and branch into subclasses FormalKnowledge (refined in “Distributed Semantic Web Knowledge Representation and Inferencing”), Inference, etc. (level 1).

Similar subClassOf branching will continue across several further levels, constituting an RDFS backbone taxonomy in the form of a Directed Acyclic Graph (DAG). Using the course CS 6795 “Mindmap” slide, “Notes and Lecture Schedule 2012” page (plus some of the linked course material) as semi-formal inputs, property-defined classes will be added to build a more heavy-weight OWL 2.0 SemWebTech ontology. This ontology will be populated by sample instances in the form of URLs of actual course material.

Protégé: Protégé is a free, open source ontology editor and knowledge-based framework. It is based on Java, an extensible, platform-independent environment for creating and editing and Ontologies and knowledge bases.

We will be generating all of the encodings by Protégé 4.0 from its visual user input. Protégé 4.0 also permits inferencing with these ontologies employing plugged-in reasoners such as Pellet 1.5 (Pellet is an OWL 2.0 reasoner. It provides standard and cutting-edge reasoning services for OWL 2.0 ontologies. Pellet includes support for OWL 2.0 profiles. It incorporates optimizations for nominals, conjunctive query answering, and incremental reasoning.). We will be using OWLViz as well for graphical representation of our ontology .

OWLviz: OWLViz is designed to be used with the Protege OWL plugin. It enables the class hierarchies in an OWL Ontology to be viewed and incrementally navigated, allowing comparison of the *asserted* class hierarchy and the *inferred* class hierarchy.

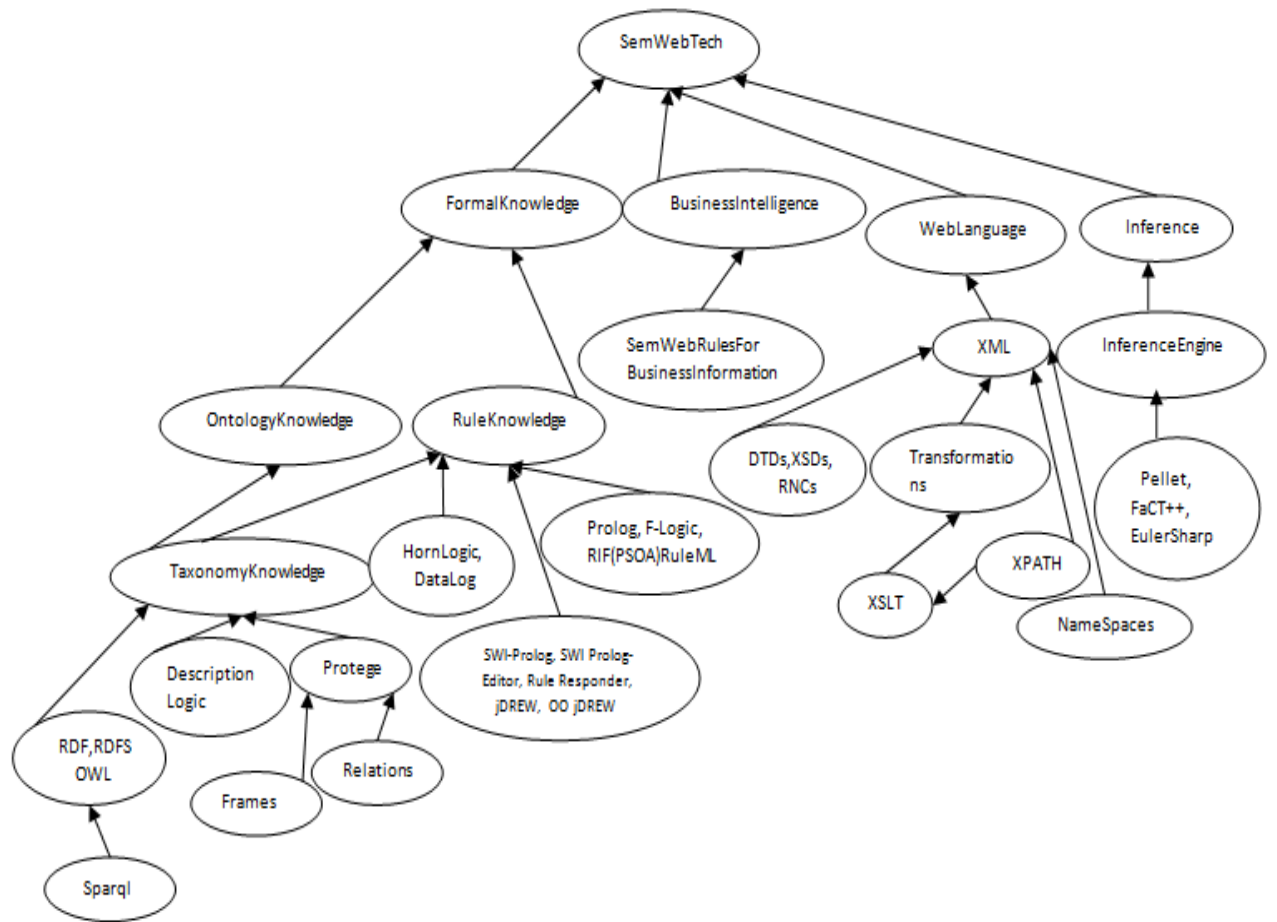


Figure 1: A Directed Acyclic Graph of our Ontology.

Level	Class	Properties	SubClass	Instances
0	SemWebTech	hasFormalKnowledge hasBusinessIntelligence hasWebLanguage hasInference	FormalKnowledge BusinessIntelligence WebLanguage Inference	
1	FormalKnowledge	isPartOf hasOntologyKnowledge hasRuleKnowledge	OntologyKnowledge RuleKnowledge	
1	BusinessIntelligence	isPartOf		SemWebRulesForBusinessInformation
1	WebLanguage	isPartOf hasXML	XML	
1	Inference	isPartOf hasInferenceEngine	InferenceEngine	
2	OntologyKnowledge	isPartOf hasTaxonomyKnowledge	TaxonomyKnowledge	
2	RuleKnowledge	isPartOf hasTaxonomyKnowledge hasFormalLanguage hasEditor	TaxonomyKnowledge	HornLogic DataLog Prolog F-Logic RIF(PSOA) RuleML WI-Prolog SWI Prolog-Editor Rule Responder, jDREW OO jDREW
2	XML	isPartOf hasTransformations hasSchemas hasNameSpaces	Transformations Schemas	NameSpaces XPath
2	InferenceEngine	hasReasoner		Pellet FaCT++ EulerSharp
3	TaxonomyKnowledge	isPartOf hasLanguage hasEditor		RDF RDFS OWL Protégé

				Description Logic
3	Transformations	has		XSLT
3	Schemas	has		DTDs XSDs RNCs

Figure 2: A Table of our Ontology.

Tools and Technologies:

1. RDF Schema
2. OWL 2.0
3. Protégé 4.0 Editor
4. Pellet 1.5 and FacT++ for reasonig
5. DL Query and OWL Viz

Bibliography:

1. Tom Gruber --1992. *"Toward Principles for the Design of Ontologies Used for Knowledge Sharing"*
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3. Mindmap Slide: <http://www.cs.unb.ca/~boley/cs6795swt/cs6795swt-Mindmap.pdf>
4. Distributed SemWeb KR & Inferencing Slides: <http://www.cs.unb.ca/~boley/talks/DistriSemWeb.pdf>
5. Protégé OWL Tutorial: <http://owl.cs.manchester.ac.uk/tutorials/protegeowltutorial/>
6. Protégé Editor: <http://protege.stanford.edu/>
7. Pellet Reasoner: <http://clarkparsia.com/pellet/>
8. Co-ode: <http://www.co-ode.org/downloads/owlviz/OWLvizGuide.pdf>