Chapter 10

ON VISUALIZATION OF OWL ONTOLOGIES

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Abstract: Ontology visualization tools serve the expanding needs of knowledge engineering communities. A number of visualization frameworks for the standard ontology language OWL have already been developed. Considering information visualization in general, we propose the criteria of simplicity and completeness with which to gauge ontology visualization models. After analyzing existing OWL visualization frameworks we propose a simple visualization model for OWL-DL that is optimized according to our criteria. This visualization model is based around the underlying DL semantics of OWL ontologies; it circumvents the perplexities of RDF syntax. It has been implemented in GrOWL- graphical browser and editor for OWL ontologies. We discuss the usage of GrOWL in Ecosystem Services Database.

Key words: OWL, GrOWL, ontology visualization, ontology editing, semantic networks.

1. INTRODUCTION

Ontologies [1] are specifications of conceptualization that facilitate the sharing of information between different agents. In many Semantic Web (SW) projects, ontologies are also set to play the role of an interface between the user and the data. This increasing use of ontologies in the role of an interface makes the problem of ontology visualization highly relevant. Well designed visualization schemes and efficient visualization techniques are important for designing convenient user interfaces that provide means for browsing, editing and querying large ontologies. This chapter discusses the problem of ontology visualization, focusing on the standard ontology language OWL [2].
Ontology languages are primarily designed to represent information about categories of objects and how categories are interrelated. This is the sort of information that ontologies store. Ontology languages can also represent information about the objects themselves---this sort of information is often thought of as data. An ontology language must have a well-defined syntax, well-defined semantics, efficient reasoning support, sufficient expressive power, and convenience of expression. These requirements directed the evolution of a sequence of W3C recommendations and standards for ontology languages: RDF, then DAML+OIL [3], and now OWL [2].

OWL is a product of long evolution in Knowledge Representation techniques. The history and the evolution of ideas that led to the design of OWL are described in Horrocks [4]. There are three versions, or species, of OWL. In the order of increasing expressiveness, OWL Lite was designed to support classification hierarchies and simple constraints. OWL DL is backed by a description logic formalism and so maximizes expressiveness while maintaining computational completeness and decidability of reasoning systems. Finally, OWL Full offers much greater expressive freedom at the expense of giving up the computational guarantees of OWL DL [2].

Various tools for visualization of OWL ontologies have been developed. In an effort to optimize visualization and editing of OWL ontologies we have developed a visual language for OWL-DL and implemented it in GrOWL, a visual editor and browser for OWL ontologies [5,6]. The visual language referred to here as the GrOWL visualization model attempts to accurately visualize the underlying DL semantics of OWL ontologies, without exposing the complex OWL syntax. We intentionally limited our focus to OWL-DL, the most expressive species of OWL that is supported by reasoners. GrOWL has been implemented both as a stand alone application and as an applet. The applet version has been used in publicly available, semantically aware databases such as the Ecosystem Services Database, Figure 10-1, [7,8].