Chapter 13

Recent Advances in the Evaluation of Ontology Quality

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ABSTRACT

Ontology or domain specific vocabulary is indispensable to a semantic web-based application; therefore, its evaluation assumes critical importance for maintaining the quality. A modular ontology is intuitively preferred to as a monolithic ontology. A good quality modular ontology, in turn, promotes reusability. This chapter is directed at summarizing the efforts towards ontology evaluation, besides defining the process of evaluation, various approaches to evaluation and underlying motivation. In particular, a modular ontology’s cohesion and coupling metrics have been discussed in detail as a case study. The authors believe that the body of knowledge in this chapter will serve as a beginning point for ontology quality engineers and at the same time acquaint them with the state-of-art in this field.

INTRODUCTION

Quality is never an accident. It is always the result of intelligent effort. -John Ruskin

Ontology is one of the prominent tools of knowledge representation because of its inherent capability of clear and concise description of the domain knowledge (Gruber, 1995). Ontologies explicitly define domain concepts in a formalized manner in order to facilitate the consensus of understanding among the people and machines. In simpler words, ontologies capture the formal description of a particular domain via relevant concepts (terms) and the relationships between these concepts. Ontologies are the seminal support for the emergence of Semantic Web (Berner-Lee, 2005) as well as other semantically-aware applications (Dou et al., 2005). Ontologies facilitate the interoperability among different web applications of a domain as well as of different domains, hence, establishing the core principle of Semantic Web of breaking the data silos (Maedche & Staab, 2001). Various web languages such Resource Description
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Framework Schema (RDFS) (Brickley, 2000), Web Ontology Language (OWL) (Antoniou & Harmelenn, 2004) and Ontology Inference Layer (OIL) (Fensel et al., 2001), are used to express ontologies. These languages use logic theories to capture the domain knowledge which allows efficient reasoning about the relationships between the objects and concepts.

In Figure 1, a sample ontology for university domain is shown. It comprises of seven classes: Persons, Staff, Students, Faculty, Courses and Subjects, and have five different relations among them. Classes, Staff, and Students are disjoint subclasses of Persons. Similarly, Non-teaching staff and Faculty are the subclasses of Staff class. In Figure 1, only object properties and class hierarchy are shown in an abstract manner.

The OWL code snippet corresponding to Figure 1 is provided below.

```xml
<?xml version= "1.0"?>
<!DOCTYPE Ontology [
    <!ENTITY owl "http://www.w3.org/2002/07/owl#" >
    <!ENTITY xsd "http://www.w3.org/2001/XMLSchema#" >
    <!ENTITY owl2xml "http://www.w3.org/2006/12/owl2-xml#" >
]

Figure 1. University Ontology Example
```