A Practical Approach to the Derivation of a Materialized Ontology View

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ABSTRACT

The success of the semantic web depends largely on how well ontologies can be utilized and formulated. Interoperability between systems using different versions of the same ontology is essential, and this implies the need for a regulated derivation of materialized ontology views (which can be considered a modified version of an ontology). This chapter applies the formalisms for such a derivation process to a practical example, emphasizing the possibility for automation, and also for optimization, to develop a high-quality derived ontology.
INTRODUCTION

In recent years, the unstructured storage of data, especially on the World Wide Web, and the difficulties experienced with retrieving relevant data with the existing search engines, have triggered new research aimed at ameliorating information retrieval and storage. New ways of storing information meant for the internet were developed, such as XML (W3C, 1999a), HTML^a^ (Fensel, Decker, Erdmann, & Studer, 1998), DTD and RDF (W3C, 1999b). These languages provide a tool to store the information in a structured way, but, with that, another problem arose; everyone was free to develop their own taxonomy of how they want to categorize their information. Some examples can be found in Heflin, Hender and Luke (1999) and Harmelin and Fensel (1999). It is clear that widely accepted standards should be used as metadata to define how the actual information is split up, no matter what language or syntax is used to implement this. These widespread standards are formulated as ontologies. In the initial and very broad definition (Gruber, 1993a, 1993b), an ontology is a specification of a conceptualization of a problem domain.

The first wave of ontology applications and researchers mainly concentrated on getting an effective system up, and solving the apparent issues that had been holding back knowledge acquisition from the Internet and related resources. A number of these have turned out to be beneficial, but without any of them clearly standing out, and no single standard has been agreed upon (Hovy, 1998). Since then, we have seen the merging of some of the standards—e.g., OIL incorporating elements of OKBC (Fensel et al., 2000), XOL and RDF, Ontolingua using KIF (Genesreth, 1991; Genesreth & Fikes, 1992; Gruber, 1992)—and diversification of others.

Now that the first generation of ontology applications has settled in, more complicated issues and considerations have reared their heads, such as the quality of ontologies in all their facets (see Colomb & Weber, 1998; Guarino & Welty, 2002; Hahn & Schnattinger, 1998; Kaplan, 2001; Holsapple & Joshi, 2002). Improvements need to be made to the systems that are already in place, and theoretical and practical modifications are required for versioning, maintenance and distribution of ontologies. Furthermore, a continuing integration of different existing systems is needed.

Ontologies tend to grow larger, to a point where, ideally, the entire world is modeled in one super-ontology (Lenat, 1995), providing great compatibility and consistency across all sub-domains. But practically, it introduces the new problem of being too vast to be used in its entirety by any application. Considering the Internet as a data repository, it seems clear that users with a very slow or costly connection to this repository might opt to get a local,
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