ONTOMETRIC: A Method to Choose the Appropriate Ontology

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ABSTRACT

In the last years, the development of ontology-based applications has increased considerably, mainly related to the semantic web. Users currently looking for ontologies in order to incorporate them into their systems, just use their experience and intuition. This makes it difficult for them to justify their choices. Mainly, this is due to the lack of methods that help the user to determine which are the most appropriate ontologies for the new system. To solve this deficiency, the present work proposes a method, ONTOMETRIC, which allows the users to measure the suitability of existing ontologies, regarding the requirements of their systems.

Keywords: ONTOMETRIC, ontologies, metrics, selection of ontologies

THE PROBLEM OF ONTOLOGIES SELECTION

In 1991, the ARPA Knowledge Sharing Effort (Neches, 1991) revolutionized the way in which intelligent systems were built in Artificial Intelligence when proposing the construction of knowledge-based systems by means of the “assembling” of reusable components. Reusable components become the base (or skeleton) of the new system, to which are added specialized knowledge and specific reasoning methods, characteristic of the task that the system attempts to solve. This vision allows building bigger and more potent systems. The ontologies, used to represent the “static” knowledge of a domain, and the problem-solving methods used to carry out reasoning, become the key pieces that allow the reuse of knowledge and problem-solving methods (Gómez-Pérez, 1999a). The saving in costs and time that it is obtained in the software reuse (Bolinger, 1990; Poulin, 1997) is achieved in more scope in the reuse of these knowledge (ontologies and problem-solving methods), due to the enormous effort in the processes of knowledge acquisition of a domain, the conceptual model’s construction, formalization and implementation of such knowledge.
At the moment, the ontologies are implemented in a great variety of languages. At the beginning of the decade of the nineties, a group of languages was designed and used for the implementation of ontologies. The most representative languages are: Ontolingua (Gruber, 1993), LOOM (McGregor, 1991), OCML (Motta, 1999), FLogic (Kifer, 1995), etc. These languages receive the name of “classic languages” (Corcho, 2000), they follow a syntax based on LISP (to exception of FLogic), and they are in a phase of stable development. Recently, XML has been adopted as a standard language to exchange information on the web. In the field of the ontologies, several languages have been created based on XML to implement ontologies. For example RDF (Lassila, 1999), RDF Schema (Brickley, 1999), XOL (Karp, 1999), SHOE (Luke, 2000), OIL (Horrocks, 2000), DAML+OIL (Horrocks, 2001) and OWL (Dean, 2003). These languages, called “web-based languages,” are still in the development phase and in continuous evolution.

Equally, methodologies for building ontologies have been numerous. Already in 1990, Lenat and Guha (1990) published some methodological considerations related with the development of the CYC ontology. Some years later, in 1995, Uschold and King (1995) published the main steps in the development of the Enterprise ontology. In the same year, Grüninger and Fox (1995) showed the methodology used in the development of the TOVE ontology (Virtual Toronto Enterprise). One year later, Uschold (1996) carries out a proposal of unification of both methodologies. In the 12th European Conference for Artificial Intelligence, the methodology used to build the project Esprit KACTUS project’s ontologies (Bernaras, 1996) is presented. In 1997, METHONTOLOGY appears (Fernández, 1997), which was extended later (Fernández, 1999a, 2000). It proposes the steps that should be continued to build ontologies, some guides to carry out ontologies reengineering (Gómez-Pérez, 1999b) and ontologies evaluation (Gómez-Pérez, 1999c). Also in 1997, it is presented the methodology used to build domains ontologies from the SENSUS ontology (Swartout, 1997). All these methodologies do not consider the cooperative development of ontologies. The first methodology that includes development aspects in group is Co4 (Euzenat, 1995). A comparative study of some of these methodologies appears in Fernández (1999b).

Since 1996 there is an important increase in the development of technological platforms related with the ontologies. The first ontology site was the Ontolingua Server (Farquhar, 1996) of the Knowledge Systems Laboratory (KSL) at Stanford University. In 1997, Ontosaurus appeared (Swartout, 1997), developed by the Information Sciences Institute (ISI) in the University of South California. Later, several tools have been created based on Java technology: WebOnto (Domingue, 1998) developed in the Knowledge Media Institute (KMI) of the Open University (UK); OILed (Bechhofer, 2001), developed in the IST OntoKnowledge project; OntoEdit (Staab, 2000), developed by the AIFB of the Karlsruhe University; Protégé2000 (Noy, 2001) developed by Stanford Medical Informatics (SMI) at Stanford University; and WebODE (Arpírez, 2001), developed at the Universidad Politécnica de Madrid.

In spite of the great increase that the use of ontologies has acquired, nowadays, the knowledge engineers need to look for ontologies dispersed in quite a few web servers. When they find several that can
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