Chapter 5

Fuzzy Ontologies Building Platform for Semantic Web: FOB Platform

Hanène Ghorbel
University of Sfax, Tunisia

Afeef Bahri
University of Sfax, Tunisia

Rafik Bouaziz
University of Sfax, Tunisia

ABSTRACT

The unstructured design of Web resources favors human comprehension, but makes difficult the automatic exploitation of the contents of these resources by machines. So, the Semantic Web aims at making the cooperation between human and machine possible, by giving any information a well defined meaning. The first weavings of the Semantic Web are already prepared. Machines become able to treat and understand the data that were accustomed to only visualization, by using ontologies constitute an essential element of the Semantic Web, as they serve as a form of knowledge representation, sharing, and reuse. However, the Web content is subject to imperfection, and crisp ontologies become less suitable to represent concepts with imprecise definitions. To overcome this problem, fuzzy ontologies constitute a promising research orientation. Indeed, the definition of fuzzy ontologies components constitutes an issue that needs to be well treated. It is necessary to have an appropriate methodology of building an operationalization of fuzzy ontological models. This chapter defines a fuzzy ontological model based on fuzzy description logic. This model uses a new approach for the formal description of fuzzy ontologies. This new methodology shows how all the basic components defined for fuzzy ontologies can be constructed.

DOI: 10.4018/978-1-4666-0330-1.ch005
1. INTRODUCTION

In the Semantic Web, the manipulation of Web resources by machine requires the description of these resources. Several languages have been defined for this purpose, as RDF Schema (abbreviated as RDFS, RDF(S), RDF-S or RDF/S) which represents an extensible knowledge representation language. RDFS provides basic elements for the description of ontologies with Resource Description Framework (RDF) vocabularies, intended to structure RDF resources (Broekstra et al., 2001). We can also use it to describe services and to give an abstract model of a domain through the use of ontologies (Ghorbel et al., 2008). Informally, ontology consists of a hierarchical description of the concepts of a particular domain, along with the instances description of the properties of each concept. The Web content is then annotated by relying on the concepts defined in specific domain ontology. However, ontology description languages become less suitable in all those domains in which the concepts to be defined have not a precise definition. For instance, just consider the case where we would like to build ontology about “Management of Employee’s Competences”. Then we may encounter the problem of representing ideas like “Hakim acquires the competence – know how to interpret a message – with a good level”. As it becomes apparent that such notions are hardly encoded into concepts in ontology, as they involve so-called fuzzy or vague concepts, like “Acquire” and “Level-Acquisition” for which a clear and precise definition is not possible. The problem to deal with imprecise concepts has been addressed several decades ago by Zadeh (1975), who gave birth in the meanwhile to the so-called fuzzy set and fuzzy logic theory. A huge number of real life applications are based on it. Unfortunately, despite the popularity of fuzzy set theory, only a few number of works has been carried out in extending ontology description languages towards the representation of imprecise concepts (Ghorbel et al., 2008). Indeed, fuzzy ontologies now constitute a promising research orientation, on which we located our work. The definition of fuzzy ontologies components constitutes an issue that need to be well treated. Most of the works realized on fuzzy ontologies suppose that fuzzy ontology components are already defined and they just need to use them. We see that methods used to construct crisp ontologies are insufficient in this context. To use successfully fuzzy ontologies in the Semantic Web, it is necessary to have an appropriate methodology for building and making operational fuzzy ontological models.

So, to help developers to use fuzzy ontologies in order to improve the quality of result in Web information retrieval system, we need to propose a methodology for fuzzy ontologies building, on the one hand, and to create the necessary tools to make them operational, on the other hand.

This chapter goes as follows. We present in Section 2 our motivations and some related works. Section 3 deals with fuzzy ontologies and proposes a definition of a fuzzy ontology model. Section 4 defines the fuzzy ontologies building methodology: Fuzzy OntoMethodology. In Section 5, we present our Fuzzy Ontologies Building Platform: FOB Platform. Finally in Section 6, we conclude and we present some further works.

2. MOTIVATIONS AND RELATED WORK

Motivations

Fuzzy ontology building may be a difficult task, especially if it is done by hand. Some classic ontologies exist, such as WordNet1, exhibiting different kinds of relations between concepts. For some extents, these relations can be mapped to degrees of membership values. For instance, relations such as synonymy and hyponymy (i.e., specialization) yield degrees of membership. Other semantic relations, like “Acquire” (cf., Section 1 – Introduction), can be interpreted in terms of