Selection of Foundational Ontology for Collaborative Knowledge Modeling in Healthcare Domain

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Abstract. Ontology design is an important process for structuring knowledge to be reused in different projects in the health domain. In this paper, we describe an ontology design for the collaborative knowledge building system ACKTUS to be used for developing personalized knowledge applications for different domains. Different foundational ontologies were compared with respect to selected criteria considered vital for the project, such as modularity and descriptiveness.

1 Motivation

The objective of the work presented in this paper is to propose a foundational ontology selection process for developing decision support systems in the health domain. Involving health professionals in the modeling of knowledge is a challenging task, since the use of formal frameworks and systems requires knowledge in formalization and is often time consuming. ACKTUS is being developed as a common architecture and framework for facilitating knowledge modeling in the health domain [1]. The resulting knowledge systems that are created will be web applications built on semantic web techniques that enable users to contribute with their experiences and knowledge. The purpose of the initial prototype was to provide the expert physicians participating in knowledge engineering an intuitive framework and system for modeling, validating and maintaining knowledge integrated in a decision support system for dementia care [1]. However, the ontology of the framework is currently being generalized to provide a common base for additional domains such as monitoring of health in work environments and rehabilitation. In this paper we draw a comparison to select a foundational ontology for OntACKTUS, a generalized ontology for the purpose. OntACKTUS should provide a base for the acquisition and management of medical and health related knowledge in a collaborative knowledge engineering process.

2 Results and Conclusions

Ontology organizes knowledge about some specific domain in a structured system of concepts, properties and their relationships. To overcome problem of ontology design methods, Guarino and Welty proposed a method for ontology analysis and cleaning [2]. With few extensions, a method was proposed to explicitly dividing ontology into

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the layers *foundational* ontology, *core* and *domain* ontology for reusability across different domains and within the domain [3]. There is large number of foundational ontologies available [3], [4], [5] such as DOLCE, GFO, BFO, Cyc and SUMO. [4], [5] provide extensive analyses about selection of foundational ontologies by giving multipoint criteria for selection. Different options described by [4] that are considered important for our work, are *descriptiveness*, *multiplicative* and *perdurantism*. There are also some other qualities that are relevant like modularity, availability in a recommended language by the W3C and modeling flexibility for information objects. Table 1 shows the criteria selected for comparison of different features available in foundational ontologies [4], [5]. The comparison made shows that DOLCE sufficiently fulfills our requirements (Table 1). In addition, DOLCE provides careful formation, strong logical axiomatisation for the removal of conceptual ambiguities, availability of lighter versions for minimal use and further extendibility.

Table 1. Comparison of ontologies (NA *information not available*; - *not present*; X *present*)

	DOLCE	BFO	GFO	Cyc	SUMO
Descriptiveness	X	-	X	X	X
Multiplicative	X	-	NA	NA	X
Perdurantism	X	X	X	NA	X
Modularity	X	X	X	-	-
OWL Availability	X	X	X	X	X
Modeling of information objects	X	-	NA	-	-
Availability of domain ontologies	X	-	-	X	X

OntACKTUS is being further developed using DOLCE and is evaluated and modified in an iterative process as a part of the application developments. In our ontology design, the basic theme is re-usability and portability of available resources, and designing of new resources in such a way that it should be reusable and modifiable.

References

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