Paving the way towards the e-humanities: a Semantic Web approach to support the learning of philosophy

Michele Pasin, Enrico Motta
Knowledge Media Institute
The Open University
Milton Keynes, MK7 6AA, UK
+44 (0) 1908 858730

{m.pasin, e.motta}@open.ac.uk

ABSTRACT

Use of the Semantic Web for e-Learning (SWEL)[1] brings great advantages by the accurate description of the semantics of a domain, in order to enhance the navigation and retrieval of the related resources. Even though much work has already been done in relation to scientific areas of research (biology, physics, computer science), in the humanities there has not been the same urgency of delivering the advantages of the new technologies to the classroom or scholars. In this paper, we sum up the research we are pursuing for an e-Learning approach to the field of philosophy, based on ontological engineering and narrative studies.

Categories and Subject Descriptors

K.3.1 [Computer Uses in Education] - Computer-assisted instruction (CAI), Computer-managed instruction (CMI), Distance learning. H.5.4 [Information Interfaces and Presentation]: Hypertext/Hypermedia - Architectures, Navigation, User issues. J.5 [Computer Applications – Arts and Humanities]: Fine arts.

General Terms

Design, Standardization.

Keywords

Ontology, humanities, philosophy, learning narratives.

1. INTRODUCTION

Recent research on the application of Semantic Web technologies to e-Learning (SWEL) has already produced various results [9]. Ontologies can be used to describe learning resources directly, or to provide a common ground on which to map LOs annotated using the traditional metadata standards. Ontologies are also used to describe other dimensions involved in the educational scenario (pedagogical assumptions, presentation strategies). It is not our purpose here to sum up these attempts; instead, we would like to highlight the fact that in contrast to much work done in scientific fields such as biology, physics or computer science (readers can take as a proof of this the various e-science projects [4]), there are very few e-Learning systems in the humanities that adopt knowledge representation techniques in order to enhance the usage and understanding of available digital artifacts. This, in spite of the great number of resources on the web, and the

richness of these domains' semantic relations, translatable in non trivial browsing facilities. In the humanities knowledge is not usually as structured and hierarchically organized as it would be in computer science, for example. Here, or in any other "scientific" domain, in fact, the taxonomical relations between the concepts represented are often enough, in order to provide useful navigation structures [5].

In the following sections we describe in more detail our approach to the formalization of a specific domain in the humanities, philosophy. Section 2 introduces the ontology we have created to describe at a fine level the knowledge needed in the teaching of philosophy; section 3 deals with the model, drawn from narrative studies, we are using in order to support a constructivist approach to learning; section 4 concludes with a description of the ongoing and future work.

2. ONTOLOGY FOR PHILOSOPHY

Within the PhiloSURFical project[2] we are defining an ontology that captures the various dimensions involved in the philosophical work. The ontology, being engineered with a clear educational purpose in mind, could be divided into three super-categories: the empirical domain, the pedagogical domain, and the theoretical domain of a philosophical resource. The empirical domain is used to describe all the knowledge related to the material and not-domain-specific aspects of a philosophical resource, such as *authors*, *dates*, *places* etc. In doing so, we have readapted and extended the AKT reference ontology [1]. The pedagogical domain abstracts the educational value of a resource, its role in the overall structure from the educational point of view.
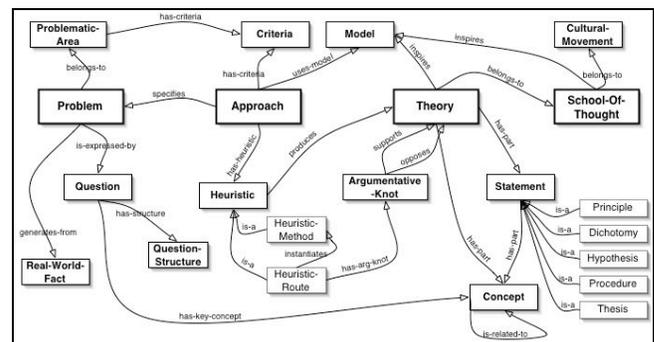

Fig.1 Theoretical domain of the philosophical ontology.

A previous and valuable attempt to model this dimension is the one done by Ullrich [11], that we have used as a starting point.

The theoretical domain, finally, tries to reflect the way things happen in the philosophical work. It models philosophical concepts such as *problem, school-of-thought, approach, theory* so as to emphasize their interdependence and their changes in meaning depending on the context.

This framework lets us go, for example, from Democritus to Russell, for they share a similar "interest" in atoms (although one in a physical sense, the other in a logical one) or from this latter to Popper, because beyond their involvement in epistemology they are also contemporaries and fierce opponents of the second world war. The first pathway mentioned is clearly a theoretical one, rooted in the contents of the authors' doctrines, while the second one is also historical, since it is based on the fact that the two authors lived at the same time.

All these dimensions are implemented using OWL and Protégé [10]. Even if here these three knowledge domains have been treated as separated for explanation purposes, they are instead grouped into the same ontology, which has been modeled taking inspiration from SUMO [7]. A version of the ontology is available online on www.kmi.open.ac.uk/people/mikele/philontology/Philo-know.owl.

3. LEARNING THROUGH STORIES

As already discussed elsewhere [8], we have adopted an approach to learning based on story construction. Within a classroom scenario, a teacher annotates his/her materials using the ontology, then lets students play with them through the medium of a story construction interface. This means that students can identify items of interest and use them as concepts in a *story*; they can declare the kind of *discourse* they would like these items to be connected with and the kind of *plot* the final hypertextual narrative should have. An adequate mapping from these classic narrative concepts [3] to knowledge base queries allows the dynamic reconstruction of the annotated materials into a personalized learning hypertext. Such a *learning narrative* can be, for example, the instance of a geo-historical discourse, of a theoretical one or probably, more often, of a mix of the two. So, for example, we can retrieve the different answers (*theories*) to the mind-body *problem* during the eighteenth century (*history*) in Europe and Asia (*geography*).

Moreover, these narratives result from the intersection of the domain semantics with the pedagogical one, adding a further dimension to the plot construction process. The reconstruction of Bloom's taxonomy of learning objectives [2] in the form of specific ways to traverse the semantic space is one of our goals.

This approach has already been tested within our department [6], although with less emphasis on the learning dimension and a more constrained application domain. Thus, we are working on implementing this framework in an extended and improved manner. From our first results, it is clear that the main axis (that is, the concepts' relations) needed to build valuable browsing facilities are not specific to the philosophical domain only. We therefore envisage other humanities' related domains where this approach could be replicated or extended. A desired outcome is also the definition of an abstract *learning narratives* ontology.

For example, going beyond the specific domain of philosophy, from a resource about Plato's theory of ideas it could be possible to browse, according to a specific learning narrative (*historical-context*, for example), to a document discussing the contemporary Peloponnesian war, or (following a more *conceptual* narrative) to a resource examining Raffaello's painting about the Athen's school. This last phase would end with the production of a series of reusable cross-domain semantic models for navigation.

4. CONCLUSION

Two of their courses are being annotated using this ontology, and the resultant material will be used to experiment the creation of personalized learning narratives for the students. The same students and teachers of the Open University will be an ideal test bed for the final application, and the main source of data for the evaluation phase

5. REFERENCES

[1] AKT, *AKT Reference Ontology v.2 - AKTive Portal Ontology v.2*. 2002, http://d3e.open.ac.uk/akt/2002/portal-ocml-v2.0/portal-ocml-v2.0-t.html.

[2] Bloom, B.S., *Taxonomy of Educational Objectives - The classification of educational goals*, ed. Bloom, B.S. 1956: Longman.

[3] Chatman, S., *Story and Discourse*. 1978: Cornell University Press.

[4] Globe, C., *Hatching the next generation Web in the incubator of e-Science Or Lets stop doing stuff in the abstract, we nearly always get it wrong anyhow*. 2005, http://www.semanticgrid.org/docs/goblewebscipos.html.

[5] Henze, N. and Herrlich, M. *The Personal Reader: A Framework for Enabling Personalization Services on the Semantic Web*. in AH 2004: International Conference on Adaptive Hypermedia and Adaptive Web-Based Systems. 2004.

[6] Mulholland, P. and Collins, T. *Using Digital Narratives to Support the Collaborative Learning and Exploration of Cultural Heritage*. in IEEE International workshop on Presenting and Exploring Heritage on the Web (PEH'02), DEXA 2002. 2002. Aix-En-Provence, France.

[7] Niles, I. and Pease, A. *Towards a standard upper ontology*. in Formal Ontology in Information Systems. 2001.

[8] Pasin, M. and Motta, E. *Semantic Learning Narratives*. in International Workshop on Applications of Semantic Web Technologies for E-Learning (SW-EL), KCAP-05. 2005. Banff, Canada.

[9] Pasin, M., *Semantic Learning Narratives*, Technical Report KMI-05-07, 2005, Knowledge Media Institute.

[10] Stanford-Medical-Informatics, *The Protege Ontology Editor and Knowledge Acquisition System*, http://protege.stanford.edu/.

[11] Ullrich, C. *Description of an instructional ontology and its application in web services for education*. in Proceedings of Workshop on Applications of Semantic Web Technologies for E-learning. 2004. Hiroshima, Japan.