An Ontology Infrastructure for an E-Learning Scenario

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ABSTRACT

Selecting appropriate learning services for a learner from a large number of heterogeneous knowledge sources is a complex and challenging task. This article illustrates and discusses how Semantic Web technologies such as RDF and ontology can be applied to e-learning systems to help the learner in selecting an appropriate learning course or retrieving relevant information. It presents the main features of an e-learning scenario and the ontology on which it is based, then illustrates the scenario ontology with the training domain and the application domain. Finally, it presents semantic querying and semantic mapping approaches.

Keywords: e-learning; ontology; semantic mapping; semantic querying

INTRODUCTION

It is clear that new styles of e-learning are some of the next challenges for every industry. Learning is a critical support mechanism for organizations and individuals to enhance their skills in the new economy. The incredible velocity and volatility of today’s markets require just-in-time methods for supporting the need-to-know of employees, partners, and distribution paths. It is also clear that this new style of e-learning will be driven by the requirements of the new economy: efficiency, just-in-time delivery, and task relevance.

The vision of the Semantic Web is to enable machines to interpret and process information in the World Wide Web in order to better support humans in carrying out their various tasks with
Several technologies have been developed for shaping, constructing, and developing the Semantic Web. Many of the Semantic Web technologies developed thus far provide us with tools for describing and annotating resources on the Web in standardized ways, such as with the resource description framework (RDF [RDF, 2002]) and its binding to XML (eXtensible Markup Language [XML, 2003]).

E-learning is an area that can benefit from Semantic Web technologies. Recent advances in technologies for Web-based education provide learners with a broad variety of learning content available. Learners may choose between different lecture providers and learning management systems to access the learning content. On the other hand, the increasing variety of the learning material influences effort needed to select a course or training package. Adaptive support based on learner needs, background, and other characteristics can help in selecting appropriate learning and during the learning process. Current approaches to e-learning implement the teacher-student model: Students are presented with material and then tested to assess their learning. However, e-learning frameworks should take advantage of semantic services interoperability. The Semantic Web could offer more flexibility in e-learning systems through use of new emergent semantic Web technologies.

Numerous document resources may be used during e-learning. Some are internal and made by several actors implied in the e-learning, others are available on the Web: online courses, course supports, slides, bibliographies, frequently asked questions, lecture notes, and so forth. Ontologies are a way of representing such formal and shared information. They can be used to index data indicating their meaning, thereby making their semantics explicit and machine-accessible. They also can be used in e-learning as a formal means to describe the organization of universities and courses and to define services. An e-learning ontology should include descriptions of educational organizations (course providers), courses, and people involved in the learning process.

This paper represents our effort toward a problem of semantic solution in an e-learning system. It is organized as follows: the second section describes the metadata and ontologies concepts. The third section reviews related work. The fourth section shows our e-learning scenario. The fifth section describes our ontology design and representation. The sixth section shows our semantic querying and semantic mapping approach. The seventh gives conclusions and future works.

**METADATA FOR E-LEARNING**

Compared to traditional learning, in which the instructor plays the intermediate role between the learner and the learning material, the learning scenario in e-learning is completely different: Instructors no longer control the delivery of material and learners have a possibility to combine learning
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