Chapter XX
Digital Libraries and Ontology

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ABSTRACT

Nowadays, social, economical, cultural, and technological changes deeply stress the professional profiles. As a consequence, everyone needs to be continually improving his/her professional skills by means of different kinds of continuing learning or lifelong learning. This changeable context also stresses the teachers’ job. Networking technologies can be useful in helping teachers to improve their skills anywhere (i.e., home, office, or school). However, the Web had grown up as a business space and has become an important repository of all kinds of information. As a result, searching information is a hard and slow process. Tools for data retrieval work at the syntactic level, disregarding the semantic aspects. Solutions show up to Web Semantic technologies. Our contribution is to develop a digital library for the e-learning specific domain using ontology-based semantic querying.

INTRODUCTION

Technological changes are deeply stressing professional profiles and people need to continually improve their professional skills using different kinds of lifelong learning. Networking technologies became widely adopted to promote lifelong learning. However, searching information on the Web is a hard process. Current search engines were developed to work as productivity tools, helping users to retrieve data by means of information retrieval at the syntactic level, disregarding the semantics aspect. Words have different meanings depending on the context. The Web, on the other hand, is organized as an information network without any hierarchy or navigational contexts. Users often feel lost and cognitively overloaded, and they not always find the information they are looking for.
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searching for. Solutions point to the Semantic Web (Berners-Lee, Handler, & Lassila, 2001) and a key point is the notion of ontology (Guarino, 1998).

Aiming to help lifelong learning initiatives and improve information search at the Web, we are developing a digital library for the e-learning domain which main service is a search engine that retrieves information by tracing the domain vocabulary met on ontology (Santos, Campos, & Braga, 2005). Our digital library extends the Web portal’s functionalities, providing technical information and communication and collaboration spaces, and hosts a wide variety of information (e.g., technical papers, Web sites of systems and tools, Web sites of Brazilian and international experience on e-learning, and some e-learning software artifacts to be used to create tailored e-learning applications). It provides services for cataloging, storing, searching, and retrieving information based on ontology-based semantic queries. The next sections argue domain ontology and e-learning ontology, describe the digital library, and offer the conclusions and future works.

Domain Ontology and e-learning Ontology

Ontology, in philosophy, refers to a conception of what can exist or “be” in the world. The artificial intelligence community has appropriated the term to mean the construction of knowledge models (Gruber, 1993), which specify concepts or objects, their attributes, and interrelationships. A knowledge model is a specification of a domain, or problem solving behavior, which abstracts from implementation-specific considerations and focuses instead on the concepts, relations, and reasoning steps in order to solve the problem (Shum, Motta, & Domingue, 2000).

Ontology specifies a shared understanding of a domain of interest and contains a set of concepts, together with its definitions and interrelationships, and possibly encodes a logical layer for inference and reasoning. The role of ontology is to reflect a community’s consensus on a useful way to conceptualize a particular domain. Building ontology implies acquiring the domain knowledge and collecting appropriate information resources that will define, with consensus and consistency, the terms used formally to describe the domain of study.

Ontology is beginning to be used in the context of digital libraries for many different purposes. It can assist the extraction of concepts from unstructured textual documents (Embley, Campbell, Smith, & Liddle, 1998) by serving as a source of knowledge about the particular topic. In addition, it can also assist in managing documents descriptions in large digital libraries (Weinstein & Alloway, 1997).

The understanding about digital library is quite different according to its specific users. A digital library is a Web-based electronic storage and access environment for information stored in the digital format either locally in a library, in a group of networked libraries, or at a remote location (Cleveland, 1998). It also means an integrated set of services for capturing, cataloging, storing, searching, protecting, and retrieving information. It comprises digital collections, services, and infrastructure to support lifelong learning, research, scholarly communication, and preservation.

For many people the Web is not a digital library, because digital libraries are libraries with the same purposes, functions, and goals as traditional libraries, that is, collection development and management, subject analysis, index creation, provision of access, reference work, and preservation. Due to its inherent complexity, the current tendency in building digital libraries is to move forward in small, manageable, evolutionary steps, rather than in a rapid revolutionary manner. We are following this tendency.

Building ontology means different things to different practitioners. The distinction of how one carries out describing something reflects a progression in ontology: from simple lexicons or controlled vocabularies to categorically organized thesauri; to hierarchies called taxonomies where terms are given distinguishing properties; to full-blown ontologies where these properties
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