Chapter 7.21
A Basis for the Semantic Web and E–Business:
Efficient Organization of Ontology Languages and Ontologies

Changqing Li
National University of Singapore, Singapore

Tok Wang Ling
National University of Singapore, Singapore

ABSTRACT

This chapter introduces how to effectively organize ontology languages and ontologies and how to efficiently process semantic information based on ontologies. In this chapter we propose the hierarchies to organize ontology languages and ontologies. Based on the hierarchy of ontology languages, the ontology designers need not bear in mind which ontology language the primitives exactly come from, also we can automatically and seamlessly use the ontologies defined with different ontology languages in an integrated environment. Based on the hierarchy of ontologies, the conflicts in different ontologies are resolved, thus the semantics in different ontologies are clear without ambiguities. Also, these semantic-clear ontologies can be used to efficiently process the semantic information in Semantic Web and e-business.

INTRODUCTION

The Extensible Markup Language (XML) (Bray et al., 2004) developed by the World Wide Web Consortium (W3C) has recently emerged as a new standard for data representation and exchange on the Internet. However, the information exchange based on XML is at the syntactic level (Garshol & Moore, 2004). Nowadays, how to process and exchange semantic information becomes very important. Semantic Web and e-business are two important applications which need to process the

semantic information. *Semantic Web* (Lee, 1999) means that the Web pages are annotated with the *concepts* (terms and relationships) from sharing ontologies; because Web information refers to the sharing ontologies, computers can automatically understand and process the semantic information. Similarly, when different partners (agents) of e-business refer to the sharing concepts in ontologies, they can semantically communicate with each other. This is a *semantic e-business* which is different from the traditional e-business. To process the semantic information, the traditional e-business is a person-to-person communication; now with ontologies the semantic communication of e-business partners is an agent-to-agent communication.

It can be seen that ontologies play a core role in processing semantic information. An *ontology* defines the basic terms and relationships comprising the vocabulary of a topic area, as well as the rules for combining terms and relationships to define extensions to the vocabulary (Gruber, 1993). How to organize ontologies and clearly define the semantics in ontologies are very important. Presently, the ontologies are built by different organizations for their own purposes, therefore we need to effectively organize different ontologies together with hierarchies, then the concepts of the ontologies can be efficiently used to annotate Web pages and e-business agents, and semantic information can be efficiently processed based on the well-organized ontologies.

To define ontologies, *ontology languages* are required. Ontolingua (Gruber, 1992) is an ontology interchange language which was proposed to support the design of ontologies. Loom (MacGregor, 1991), a knowledge representation system, is used to provide deductive support. We will further introduce the XML-based ontology languages in the "Background" section.

In this chapter, we propose hierarchies to effectively organize ontology languages and ontologies and discuss how to efficiently process semantic information in Semantic Web and e-business.

The rest of this chapter is organized as follows. In the "Background" section, we introduce the background and the motivation of this chapter. In the "Ontology Language Organization" section, the hierarchy to organize ontology languages is proposed. We propose the hierarchy to organize ontologies and discuss how to resolve the conflicts in the ontology hierarchy in the "Building Ontology System" section. How to efficiently process the semantic information in the Semantic Web and e-business is discussed in the "Semantic Information Processing in the Semantic Web and E-Business" section. In the "Conclusion" section, we summarize this chapter.

BACKGROUND

Some comparisons have been done to compare different ontology languages. Although XML(S) has no semantics, it may help bootstrap the development of content and tools for the Semantic Web (Gil & Ratnakar, 2002). Another comparison (Gomez-Perez & Corcho, 2002) about ontology languages is from three aspects, that is, (1) general issues (partitions and documentation), (2) attributes (instance attributes, class attributes, local scope, and global scope), and (3) facets (default value, type constraints, cardinality constraints, and documentation). The existing works are mainly about comparing different ontology languages, then choosing the best ontology language to use. Different from the existing works, this chapter is mainly about how to organize ontology languages and ontologies with hierarchies, therefore we mainly compare the changes of primitives in different ontology languages. From these changes, we can find the change trends of ontology languages, then it is motivated, that is, it is very important to effectively organize different ontology languages.

The Simple HTML Ontological Extensions (SHOE) (Luke & Heflin, 2000) extends HTML with machine-readable knowledge annotated,

Related Content

A Holistic View of the Challenges and Social Implications of Online Distribution: The Case of Pensions

Tina Harrisonand Kathryn Waite (2010). *Encyclopedia of E-Business Development and Management in the Global Economy (pp. 1107-1116).*

www.irma-international.org/chapter/holistic-view-challenges-social-implications/41273

Information Technology Continuance Intention: A Systematic Literature Review

Ali Nabavi, Mohammad Taghi Taghavi-Fard, Payam Hanafizadehand Mohammad Reza Taghva (2016). *International Journal of E-Business Research (pp. 58-95).*

www.irma-international.org/article/information-technology-continuance-intention/144856

Electronic Commerce Prospects in Emerging Economies: Lessons from Egypt

Sherif Kamel (2010). *Encyclopedia of E-Business Development and Management in the Global Economy (pp. 1086-1097).*

www.irma-international.org/chapter/electronic-commerce-prospects-emerging-economies/41271

A Roadmap for Ambient E-Service: Applications and Embracing Model

Yuan-Chu Hwangand Soe-Tsyr Yuan (2007). *International Journal of E-Business Research (pp. 51-73).*

www.irma-international.org/article/roadmap-ambient-service/1875

SMEs Performance: Leveraging Marketing Process Through E-Business

Malliga Marimuthu, Azizah Omar, T. Ramayahand Osman Mohamad (2012). *International Journal of E-Business Research (pp. 49-66).*

www.irma-international.org/article/smes-performance-leveraging-marketing-process/66053