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ONTOLOGICAL ENGINEERING FROM THE INFORMATICS PERSPECTIVE

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Abstract:In this report we present an introductory overview of ontological engineering from the informatics (computer science) perspective. The term "ontology" is inherited from philosophy,in which it is a branch of metaphysics concerned with the nature of being. Ontologies are knowledge management and representation techniques that can be analyzed theoretically using concepts from description logic for Web Ontology Language. Ontological engineering paradigm,have become an efficient methodology for knowledge representation and management in many intelligent information systems and e-technologies for all domains and tasks.

INTRODUCTION

From the knowledge engineering point of view,ontology provides a common vocabulary of aspecific area and defines the meaning of the terms and the relationships between them. Recently, increasing attention has been focused on developing ontologiesin all areas of informatics and knowledge engineering. From the ontological engineering point of view, ontologies are classified into three main categories; the domain–related ontology, the task-related ontology and the application-related ontology.Most of the usages of ontologies are related to knowledge based systems and intelligent information systems.

Ontologies are now ubiquitous in many information-systems enterprises. They constitute the backbone for the Semantic Web as well as they is used in all of e-activities domains and e-technologies (e.g. e-Government, e-Learning, e-Health, e-Business, and others). As a result, developers are designing a large number of ontologies using different tools and different languages. These ontologies cover unrelated or overlapping domains, at different levels of detail and granularity. Such wide-spread use of ontologies inevitably produces an ontology-management problem: ontology developers and users need to be able to find and compare existing ontologies, reuse complete ontologies or their parts, maintain different versions, and so on.

TECHNICAL ASPECTS OF ONTOLOGICAL ENGINEERING (OE)

Methodologies

OE approaches and methodologies are very important issues for designing ontologies for specific task.OE is still relatively immature discipline; each research group employs its own methodology. Ontology methodologies differ according to the strategy of identifying concepts. The well-known three possible strategies for identifying concepts are: (a) bottom-up from the most concrete to the most abstract; (b) top-down from the most abstract to the most concrete; and (c) middle-out from the most relevant to the most abstract and most concrete.

Ontological Languages and Tools

Many languages have been used for implementing ontologies for specific task(e.g.Ontolingua, LOOM, OCML, FLogic, CARIN, OKBC, Telos, andCycl). Recently, Web-based ontology specification languages have been developed in the context of the World Wide Web .These languages have had great impact in the development of the Semantic Web (e.g. SHOE, XOL, OML, OIL, DAML+OIL and OWL).The syntaxof these languages is based on XML, except for SHOE, whose syntax is based on HTML. On the other side, ontological tools have emerged in the informatics industryfor developing, designing, editing and managing ontologies language (e.g. Onto Edit,OilEd ,WebODE,Ontolingua ,Link Factory) [1-4].

Ontology Interoperability

Everyday a lot of ontologies were developed, even different ontologies for the same task.

Inorder to assure the interoperability between software applications, it is necessary to guarantee the interoperability between their ontologies. In the literature, there are different techniques related to the ontologies' interoperability, namely; ontology alignment, ontology mapping matching, ontology translation, ontology integration, ontology refinement and ontology unification.

Ontology Validation and Evaluation

There are a several methodologies that can be used to validate ontology: (a) Verify the fulfillment of the purpose, (b) Check that all usage examples are expressible, (c) Create examples that are the consistent with the ontology, and determine whether they are meaningful, and (d) Check that the ontology is formally consistent. Validation can be performed after the ontology has been developed, but it is usually better to validate while the ontology is being built. Quality of the ontology is validated based on the following criteria: (a) consistency; (b) completeness; (c) conciseness; (d) clarity; (e) generality; and (f) robustness.From the other side,ontology evaluation is based on the following criteria: (a) completeness; (b) correctness; (c) decidability; (d) maintainability; (e) minimal redundancy; (f) rich axiomatisation;and (g) efficiency.

ONTOLOGICAL ENGINEERING APPLICATIONS

The notion of ontology is becoming widespread in fields such as intelligent information integration, knowledge computing and engineering, cooperative information systems, information retrieval, electronic commerce, and health informatics. At present, ontologies have been used for a wide range of applications,including medical diagnosis of diseases, e-business ,data mining classification and clusteringtasks, life sciences, robot control, sports, Scheduling, educationand many others [5-9]. Ontologies were developed in intelligent learning and educational assessmentsystems. Moreover, ontology approach enables to solve the complexity and the incertitude of the instructional systems. An intelligent learning system based on a multi-agent approach can understand and interpret the messages due to a common ontology or the interoperability of the private ontologies.

On the other side, ontology brings most value when it is used in combination with such procedural computing paradigms. Ontology can help make data-mining procedures more efficient, adaptive, and smart by externalizing and organizing domain knowledge the data-mining algorithms use in ontological based systems. Ontology can be used with databases to provide a conceptual view of various data sources scattered in a number of databases with an ontological model, and virtually integrate (federate) the data sources without replicating data instances [2].

FINAL REMARK

The ontology paradigm belongs to symbolic computation, as opposed to procedural computation, and that's where it brings value to solving problems with automated reasoning and inference. Ontologies have been applied to many real-world problems, producing excellent results.These include,data mining [2], e-technologies and e-government [2,4], health informatics [7,9],and education [8].

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