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A PATH FOR HORIZING YOUR INNOVATIVE WORK

TERMINOLOGICAL AND WEB SERVICE MODELING ONTOLOGY

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Abstract*:* The fields of artificial intelligence, the semantic web, systems engineering, software engineering, biomedical informatics, library science, enterprise bookmarking, and information architecture all create ontologies to limit complexity and to organize information. The ontology can then be applied to problem solving. "Ontologies are not limited to conservative definitions, that is, definitions in the traditional logic sense that only introduce terminology and do not add any knowledge about the world." The goal of the Semantic Web is to make it possible for software to find the data it needs on the Web, understand it, cross-reference it and apply it to a particular task. In this paper we describe the modeling phases of terminological ontology, ontology management and design principles of web service modeling ontology.

Keywords: Ontology, Terminological ontology, Ontology- driven integration, Ontology Management, WSMO.

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INTRODUCTION

Ontologies can be generated using different representation languages, which are based on different knowledge representation paradigms (e.g. description logics, frame logics, etc.). An ontology whose categories need not be fully specified by axioms and definitions. An example of a terminological ontology is WordNet, whose categories are partially specified by relations such as subtype-supertype or part-whole, which determine the relative positions of the concepts with respect to one another but do not completely define them. Most fields of science, engineering, business, and law have evolved systems of terminology or nomenclature for naming, classifying, and standardizing their concepts. Axiomatizing all the concepts in any such field is a Herculean task, but subsets of the terminology can be used as starting points for formalization. Unfortunately, the axioms developed from different starting points are often incompatible with one another.

Terminological ontologies are good for

Concept clarification and knowledge sharing

Classification systems, taxonomies and thesauri

Data exchange and data models

Ontology-based querying

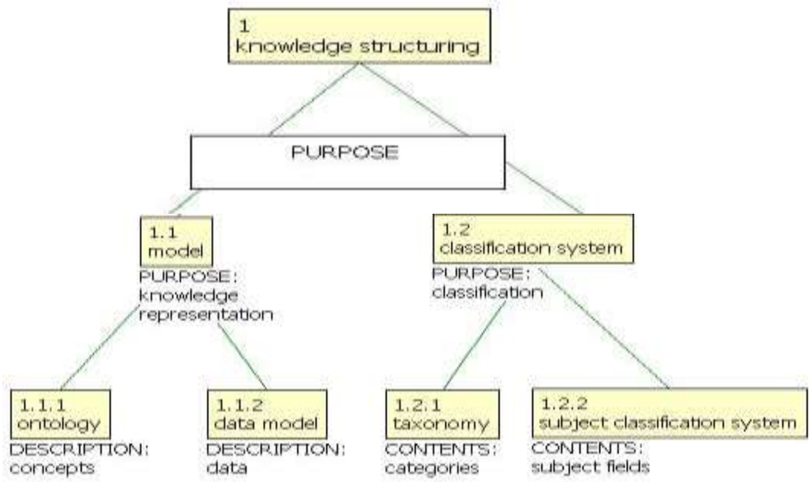
1.1 Concept clarification and knowledge sharing

Monolingual terminology work based on the establishment of domain-specific ontologies is, for example, used in the health care sector as a basis for the definition of central concepts related to electronic health records (EHR). This work is normative, since it is a must that all stakeholders in this sector, ranging from health care professionals to developers of EHR systems, use the same definition of the central concepts. The goal is therefore to create one ontology for a given set of concepts in a sub domain. The ontologies will form the basis for the design of the conceptual data models for EHR systems.

Model: Simplified representation of knowledge about phenomena.

Classification system: System for the division of phenomena into classes.

Ontology: Model for the description of knowledge about concepts



Taxonomy: classification system for the division of categories of a domain.

Subject classification system: Classification system for the division of phenomena into subject fields.

Data model: Formal model for the description of data in an IT system.

Thesaurus: A thesaurus is a set of terms describing the vocabulary of a controlled indexing language, formally organized so that the apriori relationships between concepts (e.g., synonymous terms, broader terms, or narrower terms) are made explicit. A thesaurus is a controlled indexing language in the form of a systematic list of keywords (descriptors and non-descriptors). A thesaurus should be based on an ontology, but may be simplified compared to the ontology. An ontology-based thesaurus good for

User friendly registration and maintenance of the catalogue of services

Completeness of the catalogue of services

Consistent registration of services

1.3 Data exchange and data models

Ontology vs. conceptual data model: Extract of an ontology for terminological information

Ontologies (concept models) and conceptual data models have different aims. ontologies aim at concept clarification, mutual understanding of concepts and consistent use of terms. conceptual data models aim at specifying the information types of an IT system and their mutual relationships.

The four modeling phases:

Phase 1 - Concept modeling: Developing one or several concept systems which contain information about the relevant concepts in the form of characteristic features and concept relations.

Phase 2 - Conceptual Data Modeling: Developing a data model which reflects types of entities and their mutual relations and which constitute an abstracts representation of data.

Phase 3 - Logical Data modeling: Developing a data model which specifies the organisation of data in a way that reflects the logical structure of an IT system.

Phase 4 - Physical Data Modeling: Developing a data model which reflects the physical structure in an IT system.

1.4 Ontology based Querying

Retrieval of information and knowledge from huge, diverse resources is vital, and therefore they need advanced search methods that will give as result exactly the hits that are relevant, and not thousands of irrelevant hits. As a basis for intelligent search systems domain specific ontologies are useful.

2 ONTOLOGY-DRIVEN SYSTEMS INTEGRATION

Ontological-Driven Information Integration and Delivery involves using a rich domain ontology (as opposed to a flat keyword list) to index a collection of resources that may have overlapping metadata. Ontologies are important because they provide a shared and common understanding of data within a problem/solution domain, and by organizing and sharing enterprise information, as well as managing content and knowledge; they allow “better interoperability and integration of intra- and inter-company information systems.”

A portal can be used to provide search, navigation and delivery of the underlying resources by exploiting the structure of the domain ontology also called ontology-driven information retrieval. This is different from a traditional portal because it establishes stable and reusable domain indexes that are separate from the organization of the portal, i.e., the navigation view provided by the access portal and the domain semantics are loosely coupled. The portal may easily be reorganized to suit different user needs. The ontology-driven navigation to information provides unanticipated relationships discovery, supports advanced drill down capabilities, and allows structured and unstructured information to be aggregated, organized and filtered.

The process of finding commonalities between two different ontologies A and B and deriving a new ontology C that facilitates interoperability between computer systems that are based on the A and B ontologies. The new ontology C may replace A or B, or it may be used only as an intermediary between a system based on A and a system based on B. Depending on the amount of change necessary to derive C from A and B, different levels of integration can be distinguished: alignment, partial compatibility, and unification. Alignment is the weakest form of integration: it requires minimal change, but it can only support limited kinds of interoperability. It is useful for classification and information retrieval, but it does not support deep inferences and computations.

Partial compatibility requires more changes in order to support more extensive interoperability, even though there may be some concepts or relations in one system or the other that could create obstacles to full interoperability. Unification or total compatibility may require extensive changes or major reorganizations of A and B, but it can result in the most complete interoperability: everything that can be done with one can be done in an exactly equivalent way with the other.

3 ONTOLOGY MANAGEMENT

An ontology used in conjunction with an IS should not be considered a static artifact, because the changes in the task specification or the domain have to be reflected on the ontology as well. To automate such necessary adaptations, the OMM should provide data-driven change detection. This can be achieved by supplying the OMM with a file corpus of relevant documents to the domain. Enriching components of the ontology with additional semantic knowledge indicating their estimated behaviour over time, would further ease this process. In their proposed extended ontology model, Tamma and Bench-Capon (Tamma & Bench-Capon, 2002), propose an attribute (property: value change frequency) that indicates whether an ontological component is allowed to change its value over time or not.

Ontology management infrastructures are needed for the increasing development of semantic applications especially in the corporate semantic web, which comprises the application of semantic technologies in an enterprise environment. Ontology management technologies are naturally connected to a wide variety of other areas in the field of semantically enabled knowledge management technologies.

4 WEB SERVICE MODELING ONTOLOGY

WSMO or Web Service Modeling Ontology is a conceptual model for relevant aspects related to Semantic Web Services. It provides an ontology based framework, which supports the deployment and interoperability of Semantic Web Services Semantic Web Services. Web Service Modeling Ontology (WSMO) as an ontology for semantically describing Semantic Web Services. Taking the Web Service Modeling Framework (WSMF) [Fensel & Bussler, 2002] as a starting point, WSMO refines and extends this framework, and develops a formal ontology and language. WSMF consists of four different main elements for describing semantic Web Services:

(1) Ontologies which provide the concepts and relationships used by other elements.

(2) Goals that define the users' objectives, i.e. the (potential) problems that should be solved by Web Services.

(3) Web Services descriptions that define various aspects of a Web Service

(4) Mediators which bypass interoperability problems

The WSMO has four main components:

• Goals - The client's objectives when consulting a Web Service.

• Ontologies - A formal Semantic description of the information used by all other components.

• Mediators - Connectors between components with mediation facilities. Provides interoperability between different ontologies.

• Web Services - Semantic description of Web Services. May include functional (Capability) and usage (Interface) descriptions.

4.1 WSMO Principles Design

WSMO provides ontological specifications for the core elements of Semantic Web services. In fact, Semantic Web services aim at an integrated technology for the next generation of the Web by combining Semantic Web technologies and Web services, thereby turning the Internet from an information repository for human consumption into a world-wide system for distributed Web computing. Therefore, appropriate frameworks for Semantic Web services need to integrate the basic Web design principles, those defined for the Semantic Web, as well as design principles for distributed, service- orientated computing of the Web. WSMO is therefore based on the following design principles:

Web Compliance - WSMO inherits the concept of URI (Universal Resource Identifier) for unique identification of resources as the essential design principle of the World Wide Web. Moreover, WSMO adopts the concept of Namespaces for denoting consistent information spaces, and supports XML and other W3C Web technology recommendations, as well as the decentralization of resources.

Ontology-Based - Ontologies are used as the data model throughout WSMO, meaning that all resource descriptions as well as all data interchanged during service usage are based on ontologies. Ontologies are a widely accepted state-of-the-art knowledge representation, and have thus been identified as the central enabling technology for the Semantic Web. The extensive usage of ontologies allows semantically enhanced information processing as well as support for interoperability; WSMO also supports the ontology languages defined for the Semantic Web.

Strict Decoupling - Decoupling denotes that WSMO resources are defined in isolation, meaning that each resource is specified independently without regard to possible usage or interactions with other resources. This complies with the open and distributed nature of the Web.

Centrality of Mediation - As a complementary design principle to strict decoupling, mediation addresses the handling of heterogeneities that naturally arise in open environments. Heterogeneity can occur in terms of data or process. WSMO recognizes the importance of mediation for the successful deployment of Web services by making mediation a first class component of the framework.

Ontological Role Separation - User requests are formulated independently of (in a different context than) the available Web services. The underlying epistemology of WSMO differentiates between the desires of users or clients and available Web services.

Description versus Implementation - WSMO differentiates between the descriptions of Semantic Web services elements (description) and executable technologies (implementation). While the former requires a concise and sound description framework based on appropriate formalisms in order to provide a concise expression for semantic descriptions, the latter is concerned with the support of existing and emerging execution technologies for the Semantic Web and Web services. WSMO aims at providing an appropriate ontological description model, and to be compliant with existing and emerging technologies.

Execution Semantics - In order to verify the WSMO specification, the formal execution semantics of reference implementations like WSMX as well as other WSMO-enabled systems provide the technical realization of WSMO.

Service versus Web service - A Web service is a computational entity which is able (by invocation) to achieve a goal. A service in contrast is the actual value provided by this invocation [Baida et al., 2004],[Preist, 2004]. Thus, WSMO does not specify services, but Web services which are actually means to buy and search services.

Web services provided by cooperating businesses or applications can be automatically located based on another business or application needs, they can be composed to achieve more complex, added-value functionalities, and cooperating businesses or applications can interoperate without prior agreements custom codes. Therefore, much more flexible and cost-effective integration can be achieved.

5 CONCLUSION & FUTURE WORK

Traditional approaches to knowledge management are insufficient. Managing ontologies and annotated data throughout their life-cycles is at the core of semantic systems of all kinds. The use of terminological ontologies is vital in classification and information retrieval to obtain high quality results. A Web service ontology intended to facilitate the semantic Web by describing the properties and capabilities of Web-available services in an unambiguous, computer-interpretable form. Computers don't understand natural language yet and manual ontological mark-up of web pages is unfeasable. So furure work to be done to focus on natural language in ontological modeling and web service modeling ontology.

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