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An Enhanced Approach for Ontology based Classification in Semantic Web Technology

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Abstract: Semantic Web is actually an extension of the current one in that it represents information more meaningfully for humans and computers comparable. It is enables the report of contents and services in machine readable form and enables discovering, publishing, promotion and composing services to be mechanical. Ontology classification is the process of establishing partial order on the set of named concepts in ontology using the subsumption tests. Besides answering specific subsumption and satisfiability queries, it is often useful to compute and store the subsumption relation of all the concept names in the ontology. It was developed based on the Ontology it is measured as the spine of the Semantic Web. In new terminology, the present Web is transformed from being machine readable to machine understandable. One function of the Web is to build a source of reference for information on several subjects, while the Semantic Web is designed to build a web of meaning. The foundation of vocabularies and effective communication on the Semantic Web is ontology. Ontology provides a formal, explicit specification of a shared conceptualization of a domain.

Keywords: Ontology Classification, OWL, Semantic Web, Web Services

I. Introduction

Semantics is considered to be the best framework to deal with the heterogeneity, huge scale and active temperament of the resources on the Web. The issues pertaining to semantics have been addressed in other fields like linguistics, data representation. The secure of semantics and challenges in mounting semantic techniques are new to researchers in the database and information system field either. For instance, semantics has been studied or applied in the context of data modeling, query and transaction processing, etc. We review a few applications developed using business technologies to offer insights into what Semantic (Web) Technology can do today. Based on the rising complexity and the deeper function of semantics, we split the applications into three types.

1. Semantic search and contextual browsing
2. Semantic integration
3. Analytics and Knowledge Discovery

Ontology's, which are used in order to maintain interoperability and ordinary sympathetic between the different parties, are a key component in solving the difficulty of semantic heterogeneity, thus enabling semantic interoperability among dissimilar web applications and services.

II. Literature Review

A. *Ontology*

Ontologies expressed using the Web Ontology Language (OWL) and its revision OWL 2 play a vital job in the development of the Semantic Web. They are also extensively used in biomedical information systems, with an increasing range of application domains such as agriculture, astronomy, defense and geography. Ontology classification the calculation of the subsumption hierarchies for classes and properties is a center reasoning service provided by all OWL reasoners known to us. The consequential class and property hierarchies are used by ontology engineers to steer the ontology and recognize modeling errors, with the supposition, clarification and query answering. Separately from the classification of classes, we also think the classification of objective and data properties. To the greatest of our data, all situation of the art OWL reasoners construct property hierarchies by just computing the impulsive transitive closure of the subproperty axioms in the ontology.

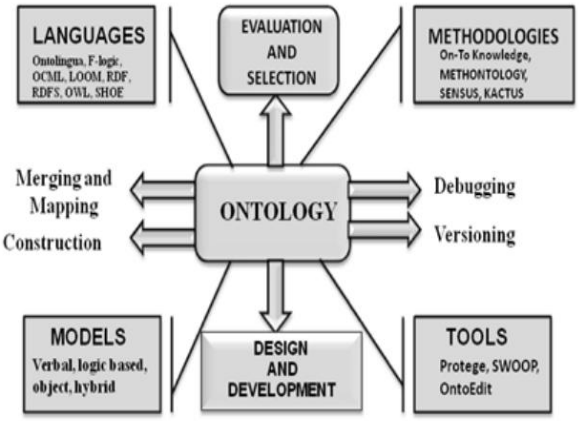

Fig.1 Ontology and its Constituents

Research region in various communities with data engineering, electronic commerce, knowledge management and natural language processing. Ontologies offer a general understanding of a domain that can be communicated between people and of varied and extensively extend application systems. Actually, they have been developed in Artificial Intelligence (AI) research communities to ease knowledge sharing and recycle. The objective of ontology is to attain a frequent and communal knowledge that can be transmitted between people and application systems.

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Structure of Ontology: generally, the structure of an ontology is described as a 5-*tuple O:* = (C, HC, R, HR, I), where

- C represents a set of concepts (instances of "*rdf:Class*"). These concepts are approved with a corresponding subsumption hierarchy H^C.
- R represents a set of relationships that relay concepts to one another (instances of "*rdf:Property*"). $Ri \in R$ and $Ri \rightarrow C \times C$.
- HC represents a concept hierarchy in the structure of a relation (a binary relation corresponding to "*rdfs:subClassOf*"). $H^C \subseteq C \times C$, where HC (C_1, C_2) denotes that C_1 is a subconcept of C_2.
- H^R represents a relation hierarchy in the form of a relation $H^R \subseteq R \times R$, where H^R (R_1, R_2) denotes that R_1 is a subrelation of R_2("*rdfs:subPropertyOf*").
- I is the instantiation of the concepts in a particular domain ("*rdf:type*").

III. ONTOLOGY CLASSIFICATION

Actually, many ontology reasoners use subsumption test algorithm that are not proficient of determining subsumption relations with respect to a subjective ontology. In the past years, sound and complete subsumption test algorithms for large concepts of ontology have been developed. Most of these algorithms are calculated based on satisfiable checking algorithms.

A. *Enhanced Top-Down and Bottom-Up Search Algorithm*

So as to use negative information during processing the top-down search, the enhanced algorithm checks whether for several predecessor z of y the test c α z has failed. In this case, we can conclude that c ¢ y without performing the expensive subsumption test.

In turn to gain greatest advantage, all predecessors of y should have been tested before the test is performed on y. To use positive information during processing the top-down search, we ensure whether for some successor z of y the test c α z has succeeded. In this case, we can terminate that c α y exclusive of performing expensive subsumption tests. In order to gain maximum advantage, all successors of y should have been tested before the test is performed on y.

(a) *.Enhanced top-down search algorithm*

```
top-search(c, x)
mark(x, "visited")
for all y with y ≺ x do¢¢
if enhanced-top-subs?(y, c)
then Pos-Succ ← Pos-Succ ∪ {y}
propagate-information("Positive", y)
else
propagate-information("Negative", y)
fi
od
if Pos-Succ is empty then
Result ← {x}
else
for all y∈ Pos-Succ do
if not marked?(y, "visited")
Result ← Result ∪ top-search(c, y)
fi
od
fi
```

(b) *.Enhanced bottom-up search algorithm*

```
bottom-search(c, x)
mark(x, "visited")
for all y with x ≺ y do
if enhanced-bottom-subs?(y, c)
then positive-down-propagate(y)
Pos-Succ ← Pos-Succ ∪{y}
else negative-up-propagate(y)
fi
od
if Pos-Succ is empty
then Result ← {x}
else
for all y∈ Pos-Succ do
if not marked?(y, "visited")
then Result ← Result ∪ bottom-search(c, y)
fi
od
fi
```

IV. APPLICATIONS OF ONTOLOGY

Ontology has become a trendy examine topic in a collection of disciplines, with the aim of increasing kind of and build an agreement in a given part of knowledge.

Ontology also leads to the allocation of knowledge between systems and people. While mentioned previously, ontology initial appeared in AI laboratories, before being used in other fields such as:

- Semantic Web
- Semantic Web Service Discovery
- Artificial Intelligence
- Search Engines
- E-Commerce
- Interoperability

A. *Web Service*

Web services connect computers and devices with each other with the Internet to substitute data and merge data in latest traditions. They can be defining as software objects that can be assembled over the Internet using normal protocols to execute functions.

The solution to Web services is on software creation through the use of loosely coupled, reusable software components. This has basic implications in both technical and business terms. Software can be delivered and paid for as streams of services, as divergent to packaged products.

It is feasible to attain automatic, ad-hoc interoperability between systems to carry out business tasks. A Web service is defined as a computational unit available over the Internet (using Web service standards and protocols).

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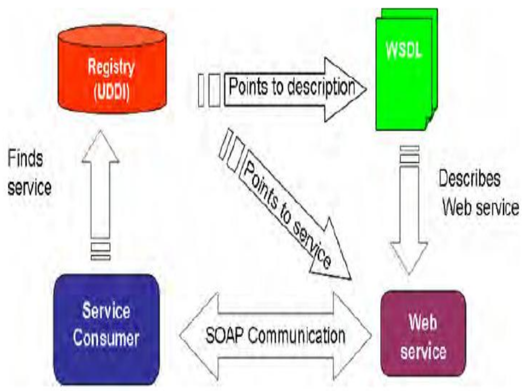

Fig.2 Web Service Usage Process

B. *Semantic Web approach to data integration*

The W3C defines the abilities of the Semantic Web as follows:

The Semantic Web is about two things. It is about general formats for integration and arrangement of data drawn from various sources, where on the original Web mostly determined on the substitution of documents. It is also about language for copy how the information relates to real world things. That allows a person or a machine to begin off in one database and then go through an unending set of databases which are linked not by wires but by being about the similar thing. Semantic Web approach to data integration can contract with heterogeneity by provide structured meta-information to obtainable documents and data. A key feature integrating information is the use of semantics which gives meaning to a word or concept. Semantics can solve the problem of homonyms and synonyms between different sources because it is able to ensure the equivalence of two concepts which may have dissimilar names and forms (synonyms) or the difference of two concepts which might have the similar name and form (homonyms).

C. *OWL (Web Ontology Language)*

OWL is designed to enable machine processing of information content. OWL can clearly symbolize the meaning in terms of vocabularies and their connection with each other to build ontology.

- *OWL Lite* to generate a classification hierarchy and make simpler constraints. -> simply implementable
- *OWL DL* (description logic) supports maximum expressiveness while retaining computational completeness and decidability. -> Mechanizable logic.
- *OWL Full* provides maximum expression and syntactic freedom of RDF but with no computational guarantees. -> Complete Logic

V. Conclusion

In this paper, we recommend an enhanced system for optimizing the ontology classification process in ontology reasoning. Ontology reasoners are used to categorize concepts in ontology, which is to compute a partial ordering or hierarchy of named concepts in the ontology based on subsumption testing. As subsumption testing is costly, it is essential to guarantee that the classification process uses the least number of tests. One objective of this paper is to optimize top-down searches and bottom-up searches for minimize subsumption tests. In order to carry out this study, First during the top-down search, we can get results of tests that have been performed and the benefit of the transitivity of the subsumption relation by propagating unsuccessful results down the hierarchy or propagating successful results up the hierarchy. Second, in the bottom-up search, we can use the information gained during the top-down search as well. Therefore of this optimization, an amount of necessary contrast operations can be cut down to a fraction compared with the classical top-down search and the classical bottom-up search. The enhanced search method shows good performance improvement as compared with the classical method. In future work, if we develop the web services using different classification methods in semantic web technology will gives accurate results.

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