



NEED OF OWL ONTOLOGIES IN SEMANTIC WEB

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ABSTRACT: Semantic Web ontologies are extensively used to drive Decision Support System, Data Integration, Natural Language Processing, Information extraction and many other fields. Ontologies specify complete descriptions and relationships about how to express information. Semantic Interoperability and Integration is also a major issue involved in semantic web. In this paper, we have discussed the importance and need of OWL ontologies in Semantic Web.

I. INTRODUCTION

An ontology database takes a semantic web ontology as input and generate a database schema based on it. Ontologies are usually developed on different for specific purpose, therefore, using the same ontology on different knowledge domain may not work. A mapping between concepts, attributes, values and relations in different ontologies is needed to achieve a single unified ontology. Since ontology provide information about user actions and web pages in a standardized form that enables discovery of more knowledge patterns. Therefore, Semantic Web can be widely used for Web Usage Mining if associated with ontologies. The major shortcoming of ontologies is that large applications need large ontologies and maintained through semi automatic process. In our research we have planned to construct and design of ontologies for functions of web services.

II. MOTIVATION

Current applications of Semantic Web ideas suffer partially from a lack of speed [4]. In addition, large number of ontologies are not available. Ontologies, instances, log files are usually kept locally to achieve high speed lead to limit the usage of Semantic Web at large scale. The role of web mining is increasing in Industry, government, education and many other fields. The extreme used of annotated documents, standardized format, and standardized vocabulary for information on web will increase the Web Usage Mining[6], The construction of ontology at large scale on semantic web will leads to usage of Data Mining methods and likely to be essential to enable the Semantic Web.

III. OWL

OWL is an ontology language that defines terminology that can be used in RDF documents. A simple OWL ontology is shown in fig 1.

```
<!DOCTYPE rdf:RDF [  
<!ENTITY owl "http://www.w3.org/2002/07/owl#">>  
<rdf:RDF xmlns:owl="http://www.w3.org/2002/07/owl#"  
"  
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"  
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"  
">  
<owl:Ontology rdf:about="">  
<rdfs:label>My Ontology</rdfs:label>  
<rdfs:comment>An example ontology</rdfs:comment>  
</owl:Ontology> <owl:Class rdf:ID="Human" />  
<owl:Class rdf:ID="Woman" />  
<rdfs:subClassOf rdf:resource="#Human" />  
</owl:Class>  
<owl:ObjectProperty rdf:ID="hasChild" />  
<owl:ObjectProperty rdf:ID="hasSon">  
<rdfs:subPropertyOf rdf:resource="#hasChild" />  
</owl:ObjectProperty> <owl:DatatypeProperty rdf:ID="age" />  
<owl:ObjectProperty rdf:ID="isParentOf">
```

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<owl:inverseOf rdf:resource="isChildOf" />
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="isTallerThan">
<rdf:type rdf:resource="owl:TransitiveProperty" /
>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="isFriendOf">
<rdf:type rdf:resource="owl:SymmetricProperty" />
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasSSN">
<rdf:type rdf:resource="owl:FunctionalProperty" /
>
<rdf:type rdf:resource="owl:InverseFunctionalProp
erty" />
</owl:ObjectProperty>
</rdf:RDF>

```

As shown in figure, root of OWL document is an RDF element because all OWL documents are RDF documents providing some degree of compatibility. The OWL:Ontology element serves two purpose

- (i) It identifies current document as ontology.
- (ii) It serves as container for metadata about ontology.

IV. NEED of OWL

The design of OWL is influenced from established formalism, knowledge representation, existing ontology language, existing semantic web languages. OWL is majorly influenced by its predecessor DAML+OIL i.e. form Description Logics form paradigms and RDF[5].

The multiple influences of OWL have lead to number of problems, leads to conflicting requirements[3].

These problems are categorized as

- (i) Syntactic Problems
- (ii) Semantic Problem
- (iii) Expressive Power
- (iv) Computational Problem

It would have been much easier to eradicate the above said problems if only OWL could have been an extension of RDF syntax. OWL DL, OWL Lite and OWL Full are versions of OWL to overcome the above said problems. OWL is sufficient to express ontological information about individual appearing in multiple documents supports linking of data form various sources. The interference over this data may yield to unwanted results. The inferential power of OWL the data can be merged form multiple sources.

V. INTEROPERABILITY & INTEGRATION IN SEMANTIC WEB

Semantic Integration and Semantic Interoperability are commonly used interchangeably in RDF whereas this is not true in each & every case. In common both bridge a semantic gap between various applications with different vocabularies, conceptual models or ontologies. In difference, Semantic Interoperability deals to maintain system and ontologies intact whereas Semantic integration deals with merging of ontologies of application.

Semantic Web and Semantic Web languages both facilitate Semantic Integration and Interoperability through well defined syntax and semantics. Since language does not have any explicit specification of their syntax, vocabularies, grammars and semantics; therefore need for such specifications may not arise.

The semantic web activities in W3C made a significant on the language heterogeneity problem and defined the following 5 principles to facilitate Semantic Integration and Interoperability[7]:

1. Create new ontologies in OWL: To build new ontologies OWL is to be used, It will ensure Semantic Integration and Interoperability at language level.

2. Translate Existing Ontologies into OWL To make sharing of existing ontologies effective, translate then into OWL. Some challenge to be faced while translating existing ontologies in OWL i.e. some ontologies are written in languages that are more expressive than OWL and thus there is probability that some details in original ontology will not translate into OWL. E.g. KIF is first order logic language.

Some ontologies are written in languages that embody paradigm similar to OWL; such ontologies can be translated easily into OWL. OWL provides natural support for modeling classes and binary relations. The Semantic for OWL fixes the meanings of the reserved vocabulary and specifies how the meaning of complex expressions using various syntactic constructs.

3. Reduce Ambiguity by Expressing More Meanings: Web content consists of unstructured text and graphics where most or all of the meaning is implicit. OWL's constructs open up the possibility of explicitly declaring the meaning of the content.

Designer of ontology must specify the meaning of terms in the ontology to ensure the reuse of ontology. It is also appreciable to specify properties of these relations e.g. reflexive etc.

Expressing more meaning in OWL leads to capture different aspects of meaning of given terms. Using OWL's reserved vocabulary is added more meaning to axiomatize the classes, properties and individuals in an ontology.

4. Reuse Terms from Existing Ontology: OWL offers the standardized representation and richer content together with infrastructure connectivity opens up the aspect of genuine, robust reuse of ontology. In addition, Uniform Resource Locator (URI) with XML namespaces facilitate reuse by allowing import of content directly from remote ontologies leads to elimination of transcription errors.

5. Use OWL Mapping Constructs to Relate Terms from Different Ontologies: It is a common practice that whenever some term from one ontology is reused to the building process of a new ontology, it comes "tagged" with its original namespaces. It enable a single term to be used in both ontologies. This is done by using the various mapping facilities provided by OWL.

The simple mapping construct declare exact logical equivalence are:

- (i) owl:same AS
- (ii) owl:equivalent Class
- (iii) owl:equivalent Property

These mapping construct may be used in combination with other OWL constructs to create complex mapping between terms from different ontologies. In addition, logical connections may go beyond simple equivalence statements.

VI. CONCLUSION

It is found that OWL is very much capable to handle the issues involved with Semantic Integration and Interoperability through its properties i.e. OWL constructs can be used to define logical relationship between

- (i) Existing terms across multiple ontologies.
- (ii) Formal relationships between existing ontology terms and a new ontology term.

Reference

- [1]. <http://www.cse.lehigh.edu/~heflin/IntroToOWL.pdf>
- [2]. <http://www.w3.org/TR/2003/PR-owl-guide-20031215/>
- [3]. Ian Horrocks, Peter F. Patel-Schneider, and Frank van Harmelen. "From SHIQ and RDF to OWL: The Making of a Web Ontology Language.", *Journal of Web Semantics*, 1:1, December 2003, pages 7–26.
- [4]. Bettina Berendt, Andreas Hotho, Dunja Mladenic, Maarten van Someren, Myra Spiliopoulou, Gerd Stumme., "A roadmap for web mining: from web to semantic web", in: First European Web Mining Forum (EWMF), in: B. Berent (Ed.), Lecture Notes in Computer Science (LNCS), Springer, 2004, pp. 1–22.
- [5]. Ankita Jain, Prof. Ilyas Khan and Dr. Bhupendra Verma. "Secure and Intelligent Decision Making in Semantic Web Mining", *International Journal of Computer Applications* 15(7):14–18, February 2011.
- [6]. G Ramu, 2Dr B Eswara Reddy, "A Framework for Semantic Web Mining Model", *International Journal of Internet Computing*, Volume-I, Issue-1, 2011.
- [7]. <http://www.w3.org/2001/sw/BestPractices/OEP/SemInt/>