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### DEVELOPING ONTOLOGY FOR BUYING CARS

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#### Abstract

Evolution of web 4.0 made each and every individual to utilize internet. Easy accessibility, magnificent cloud services, the need of every individual to use the internet and its services increased the amount of information in the World Wide Web. The information in the web is wide, huge and is not connected to each other. This creates difficulty for individual in getting the information as soon as possible. Ontology is the one way to represent the connections between each and every entities. This paper deals with creating and evaluating ontology for buying cars. We are going to use the formal ontology creation methods to build the ontology on the domain of cars. After developing complete ontology for car domain, evaluation is done to represent the relations between each object. Ontology will be evaluated through the intrinsic or extrinsic values. The creation and development of ontology is done through the existing methods and evaluation is done through protégé-owl. The evaluation will provide us with the correctness of ontology, usefulness of ontology on representing and maintaining the knowledge base. This study will give readers, clear understanding on ontology developments and its evaluation methods.

**Key words:** Ontology, Mapping Techniques, Extrinsic Evaluation, Intrinsic Evaluation.

#### 1. Introduction

Ontology is a conceptualization of knowledge. It defines how an knowledge is structured and the concepts in the structure. Ontology helps people or any software renders to share the common understanding about a domain. It helps largely in analysing the domain or analysing knowledge about a particular domain. Reusing of domain knowledge can be done using ontology. Domain assumptions can be made by people who don't have coding knowledge using ontology it makes changing a domain or adding new information into a domain can be made easy using ontology. It helps us in differentiating domain knowledge from operation knowledge. Understanding ontology remains easy in spite of its machine readable format. It remains easy because of its structure and way of representing the domain knowledge [1-2]Incorporating ontology into application oriented task remain integral part of semantic web. Ontology

can support any knowledge based system which needs reusability and inter-operating of data [3]. Our car domain also needs reusability and interoperability of data. Developing ontology on predefined standards and rules helps efficient way of communication between domains. Ontology developed by ad hoc nature fails in efficient communication. There is no proper way of evaluating ontology. So we are going to develop an ontology based on cars using formal developing methods and going to study the usefulness of the domain.

## **2. Related Work**

Knowledge based system represents the domains computation knowledge. Representing the knowledge and reasoning aims at designing computer system that can do reasoning similar to humans [4]. Knowledge base system maintains detailed knowledge and statements similar to its computational model about a domain [5]. Domain driven software model can be developed using ontology since the ontology adapts to a dynamic way of new constrains and they are defined on particular domain. Ontology can be used as business logic. There are many positive aspects in building ontology driven software model [6]. Ontology can check the system design and specify the functionality of the system. Ontologies can be organised into modules which defines the domains sub domains and how they are related to one another these can be edited and reused when needed. Ontology can act as an guide in knowledge acquisition process. Ontologies allow sharing knowledge between two different projects thus making the development cycle simpler. It reduces concept mismatching errors. It provides a common understanding of domains between developers. These are the positive aspect of using ontology. There are many tools developed by researchers for developing ontology. More than fifty tools are there for developing. We need to choose the best among them to develop ontology. Tools are compared based on their consistency check, language, its web support, user interface, modelling features and limitations, extracting information, merging of ontologies, import and export format, multi user and graph view [7]. We have considered few tools for developing ontology they are protégé, onto track, Top braid composer, internet business logic and swoop among the tools we studied that protege remains better tool over other tool. As like, there are other knowledge representation techniques such as Descriptive Logic and formal concept analysis with their supporting tools to analyse their validity.

## **3. Developing Ontology**

Our study includes developing ontology intrinsic evaluation studying the correctness in developing the ontology extrinsic evaluation studying the usefulness of ontology. In developing ontology we followed guidelines and predefined method.

First step in developing ontology is studying the domain. Classes involved in the domain, object and data property in the domain. Reviewing about the existing ontology what will be scope of the ontology are studied. We used protégé tool in developing ontology.

#### 4. Building Ontology Domain

To build our car domain we studied the needed classes and properties. The manufacturer plays the major classifier from them each manufacturer were driven. We have analysed some functional properties for our domain. We can also build an upper ontology by reviewing all the other existing ontology and can merge them to form an unified domain. This knowledge base can be used in sharing information and analysing knowledge.

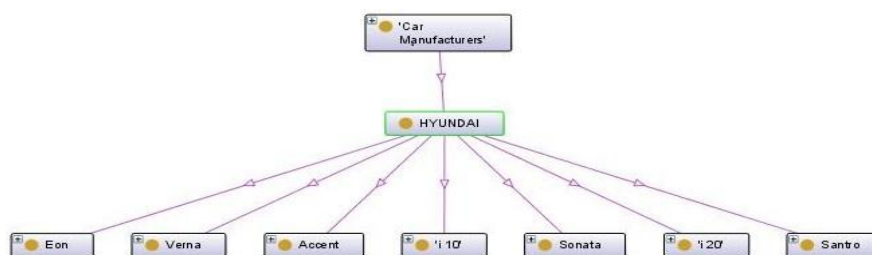


Figure 1. Casiffication of Classes.

#### 5. Defining Classes and Properties

Requirement of the domain is studied and we have created total of 131 classes with 60 instances and 16 data properties which are needed in building the domain. Consistency whether any classes are duplicated or any other duplication and classification is of the classes is checked using protégé pellet reasoner. It took only milliseconds in checking the consistency by this way we can say that our ontology has developed in an efficient manner. Figure 1 shows how we classified the class. Figure 2 shows how our entire car ontology domain structured and how they are related to one another. We have considered major factors customer can find in buying car and we tabulated the data property into the ontology, queries are created for all the classes considering three constraints By our car domain clean analysis can be done in an efficient way.

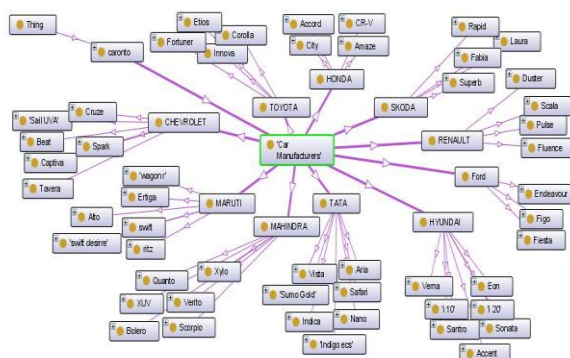


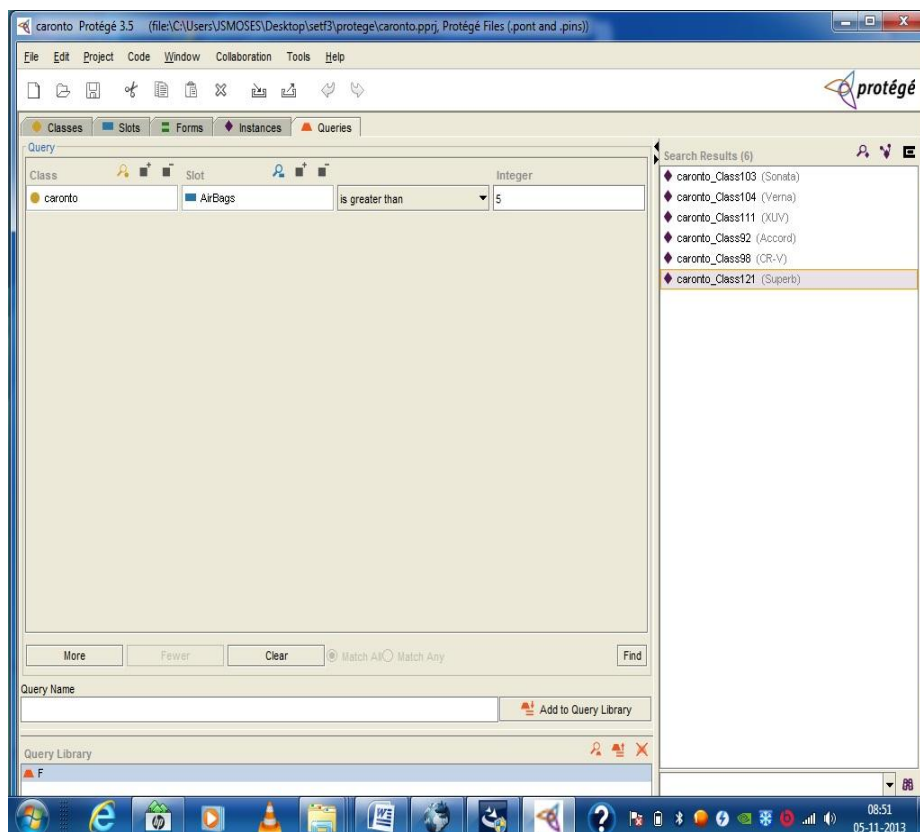
Figure 2. Car Ontology Domain.

## 6. Upper Ontology

Upper ontology is used in maximizing the reusability and interoperability of other existing and future ontology. Our basic ontology is created like an upper ontology [7] which can be reused with the future ontologies irrespective of the domain based applications. We created our ontology in OWL- ontology web language using protégé [8, 9]. That is easy and enables the creation of ontology using owl [10]. Since protege is an open source there are many developers who contribute plug-in to protege this make it simple in checking the consistency and implementing.

## 7. Evaluation

Our evaluation involves two process intrinsic and extrinsic evaluations. In intrinsic evaluation created ontologies property is evaluated like ontology reusability and consistency checking this is done through protege reasoner. Extrinsic evaluation involves evaluating the usefulness of the ontology. In intrinsic evaluation our ontology proved to be consistent pellet reasoner took 0.593 seconds in synchronising with the knowledge base consistency checking started at 0.098 seconds and finished at 0.7918 seconds stating our ontology is consistent. No redundancy is found in our ontology. Non semantic concepts and multiple granularities will be studied in our future work. Extrinsic evaluation studying the usefulness of our ontology. In our car domain ontology, query involving all the classes and data properties with three constraints is-equal to, less than, greater then are defined. Evaluating query finds us the needed information from our knowledge base. In figure 3 screen shot of evaluating query can be seen.



**Figure 3. Screen Shot of Query Evaluation.**

## 8. Conclusion

This study contributes clear understanding in the methodological development and evaluation of ontology and also the impacts and benefits of using ontology in a domain based application. Thus our domain can help people in buying car. Knowledge base created for car ontology involves 131 classes. This ontology can be further developed and merged with existing ontology making huge business analysis on cars.

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