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Formalisms of Representing Knowledge

Archana Patel\*, Sarika Jain

National Institute of Technology, Kurukshetra, 136119, Haryana, India

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**Abstract**

Incomplete, imprecise and large volume of data generates the concept of knowledge base. Knowledge base which is collection of facts, procedures and meaning is much better than database because it provides the power of reasoning, with the help of which the complicated questions are solved. Knowledge representation is a method to encode knowledge, beliefs, action, feeling, goals, desires, preferences and all other mental states in the Knowledge base. Semantic web defines standards for exchanging knowledge via coherent knowledge base. To develop a good knowledge base it is necessary to have good knowledge representation. For this reason, knowledge representation is our main consideration. This paper gives an overview on knowledge representation aspects in the context of semantic web.

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**1. Introduction**

Many researchers have been discussing the differences between three close categories, data, information and knowledge over the years, but the distinction of these is not clear yet. Some authors believe that data is a representation of “to process”, information is a representation of “to inform” and knowledge means representation of “to know” on the other side, some authors argued that data, information and knowledge can be represented as one according to the situation. The fact that “Delhi is the capital of India” will be data when it is saved in a database, will be information when it is told to a person and will be knowledge of a person who knows it. This informs the thing itself has not a clue for such type of a question [1]. Database is mainly classified in relational databases and non-relational databases. Relational database stores data in table format and uses "join" operators whereas non

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\* Corresponding Author.

Email: [archanamca92@gmail.com](mailto:archanamca92@gmail.com)

relational database provides a mechanism for storage and retrieval of data without joining operation but it may add a lot of complexity for data maintenance. Some popular views of data storage are described below:

- File System: It process only simple data and have no requirements for querying the data.
- Object Oriented Data Base: Object oriented database has bought the principle of object oriented in which information is represented in form of objects. It enables to process complex data but have no requirements for querying the data.
- Relational Data Base: Relational database system is a table oriented database which stores the data in structured format like phone book. It process simple data and also has requirements for complex querying. It does not have enough storage area to handle data such as images, audio, video.
- Object Relational Data Base: It process complex data and have complex querying requirements but the complexity and cost is very high.

All databases do not provide rich semantic information and logical procedures. Databases are completely based on closed world assumption and unique name assumption because of this reason they cannot deal with incomplete information. Therefore people thought of such a database which could provide logical reasoning on incomplete data which is known as knowledge base. Knowledge base is collection of declarative knowledge and procedural knowledge where declarative knowledge deals with incomplete information and procedural knowledge defines procedures and rules. The relationship between knower and proposition called knowledge.

Example: Suppose we say something like “Ram knows that .....

We fill in the blank by: Ram knows that Sita will come to the college.

Here: Knower is Ram. Proposition is the idea represented by a declarative sentence like that Sita will come to the college.

Organizing knowledge in proper format is necessary condition for extracting the knowledge from knowledge base. Knowledge representation is a method to infer reasoning over information in order to achieve intelligent behaviour.

The remainder of the paper is organized as follows. Section 2 introduces review of related works. Section 3 presents knowledge representation structures and its features. In section 4, we discuss knowledge representation forms and its problems. Last section concludes the discussion and proposes future works.

## 2. Related Works

Knowledge representation is most glamorous thing to build the system intelligent. John Mccarthy in 1955 coined the term Artificial Intelligence as a branch of computer science that undertakes research and design of intelligent machine. An intelligent machine is information processing entity which has ability to think about something via good knowledge representation. Davis et al. [2] has defined knowledge representation (KR) in five terms: KR is a Surrogate, Set of Ontological Commitments, Fragmentary Theory of Intelligent Reasoning, Medium for Efficient Computation and Medium of Human Expression. In the context of semantic web, ontology is a good knowledge representation structures. Brewste et al. [3] have mentioned knowledge representation with ontologies and discussed the present and future of the ontologies with knowledge representation. Grimm et al. [4] have published a chapter on knowledge representation aspects and describe all knowledge representations forms with description logic. Tobias [5] has completed her Doctoral Thesis on Controlled English for Knowledge Representation. she has introduced theoretical and practical building blocks for the design and application of controlled English for the purpose of knowledge representation and shown how controlled natural language (CNL) can be defined in an ample and easy way by the opening of a novel grammar notation she has also described efficient algorithms to process such grammars. The main difficulty is devising of generalized knowledge representation methods which can be used as a general procedure for multilingual context sensitive user interface, underlying representation, along with learning methods, top down and bottom up reasoning.

Knowledge Engineering and Knowledge Representation are central point to all research. Machines are addresses the problem of object representation, events, categories and relations among objects and situations, properties, effects with Meta knowledge that is knowledge about knowledge and time cause. Tanwar et al. [6] have built the

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