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A Review: Knowledge Representation using Fuzzy Logic in Ontology Modelling

Preksha[1], Mrs. Chandna Jain[2]

M.Tech, CSE, JCDV, Sirsa, India[1]

Asst Professor (CSE), JCDM College of Engineering, Sirsa, India[2]

Abstract: Ontology is a term in philosophy and its meaning is theory of existence. Ontology is a body of knowledge describing some domain, typically common sense knowledge domain. This views ontology as an inner body of knowledge, not as the way to describe the knowledge. The most commonly quoted definition of ontology is that ontology is a formal, explicit specification of a shared conceptualization. A conceptualization, in this context, refers to an abstract model of thinking of the people about things in the world, usually restricted to a particular subject area. An explicit specification means that the concepts and relationships in the abstract model are given explicit names and definitions. The name is a term, and the definition is a specification of the meaning of the concept or relation. An agent communicates to another agent by using the constructs from some ontology. In order to understand in communication, ontology's must be shared between agents. This paper explains the new concept of ontology. In this paper our main motive is to study about the basics of ontology, fuzzy logic and machine learning algorithm.

Keywords: Ontology, Methodology, Knowledge Analysis, Domain Analysis, Fuzzy Logic, Machine Learning Algorithm.

1. INTRODUCTION

ONTOLOGY

"Ontology" is intensively used in artificial intelligence and information systems areas. However, there is no clear definition of what ontology is. Often, we find in the literature definitions that are general or tailored according to the domain where the application is developed. The term "Ontology" is sometime used as a synonym for other terms such as "Controlled Vocabulary", or "Taxonomy", or "Knowledge Base". This is due to the overlapping of some common features of these concepts. Informally, we define ontology as an intentional description of what's known about the essence of the entities in a particular domain of interest using abstractions, also called concepts and their relationships. Basically, the hierarchical organization associated to the concepts through the inheritance ("ISA") relationship constitutes the backbone of ontology. Ontologies in particular fulfill the requirements for knowledge representation for the semantic web. Ontology research is another discipline that deals with semantic heterogeneity in structured data. Ontology is a broad term including a wide range of activities and complexities playing a pivotal role in information exchange with respect to Semantic Web vision. Ontology is the main building block of Semantic Web vision to provide the information in machine process able semantic models and produce semantically modeled knowledge representation systems. Ontology is the collection of interrelated semantic based concepts based on a finite set of pre-defined terms and concepts of a domain. The visual representation of the generic concepts of a domain best facilitates both syntactic and semantic knowledge. Ontology is the only solution as a common place to interpret the common meanings of the key terms of a domain where conceptual information is spread across two knowledge base in web.

FUZZY LOGIC

Our attempt is to forecast rainfall with the help of fuzzy logic based approximate reasoning. This process uses the concept of a pure fuzzy logic system where the fuzzy rule base consists of a collection of fuzzy (IF–THEN) rules. The FIS (fuzzy inference engine) uses these fuzzy IF–THEN rules to determine a mapping from fuzzy sets in the input universe of discourse to fuzzy sets in the output universe of discourse based on fuzzy logic values. In order to form our models we defines the fuzzy sets consist of five parameters: total cloud cover, wind direction, temperature ,relative humidity and surface pressure are the input variables for our model; each has three membership functions with single output which is rain event percentage. Fuzzy inference is the process of mapping functions from a given input to an output using fuzzy logic The fuzzy theory operated through three main steps.

- Fuzzification: This step is to determine the definition domain of each variable based on the ranges of input and output variables in actual conditions.
- Determination: Fuzzy rules determination and fuzzy inference: Based on the experience and knowledge of experts, the language rules of determination were transferred into the executable fuzzy syntax for inference.
- Defuzzification: The FIS (fuzzy inference system) outputs are finally transformed back into crisp values.

MACHINE LEARNINIG ALGORITHM

Machine Learning Technique: Machine learning is a subfield of computer science that evolved from the study of pattern recognition and computational learning theory

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in artificial intelligence. Machine learning explores the construction and study of algorithms that can learn from and make predictions on data. There are different ways an algorithm can model a problem based on its interaction with the experience or environment want to call the input data. There are only a few main learning styles or learning models.

Supervised Learning: Input data is called training data and has a known label or result such as spam/not-spam or a stock price at a time. A model is prepared through a training process where it is required to make predictions and is corrected when those predictions are wrong. The training process continues until the model achieves a desired level of accuracy on the training data. Example problems are classification and regression. Example algorithms are Logistic Regression and the Back Propagation Neural Network.

Unsupervised Learning: Input data is not labeled and does not have a known result. A model is prepared by deducing structures present in the input data. Example problems are association rule learning and clustering. Example algorithms are the Apriori algorithm and k-means.

Semi-Supervised Learning: Input data is a mixture of labeled and unlabelled examples. There is a desired prediction problem but the model must learn the structures to organize the data as well as make predictions. Example problems are classification and regression. Example algorithms are extensions to other flexible methods that make assumptions about how to model the unlabelled data.

Reinforcement Learning: Input data is provided as stimulus to a model from an environment to which the model must respond and react. Feedback is provided not from of a teaching process as in supervised learning, but as punishments and rewards in the environment. Example problems are systems and robot control. Example algorithms are Q-learning and temporal difference learning.

2. LITERATURE REVIEW

Karl Hammar and Kurt Sandkuhl [1] While the use of patterns in computer science is well established, research into ontology design patterns is a fairly recent development. We believe that it is important to develop an overview of the state of research in this new field, in order to stake out possibilities for future research and in order to provide an introduction for researchers new to the topic. This paper presents a systematic literature review of all papers published at the three large semantic web conferences and their associated workshops in the last five years. Their findings indicate among other things that a lot of papers in this field are lacking in empirical validation that ontology design patterns tend to be one of the main focuses of papers that mention them, and that although research on using patterns is being performed, studying patterns as artifacts of their own is less common.

Santhosh John [2] “Semantic Web” refers to W3C’s vision of future web. It aims at a web of data, where information is linked up in such a way to be process able by devices and agents. In a wider canvas, semantic web can be seen as a huge engineering solution. Ontologies are playing the vital role in Semantic Web vision for its full-fledged implementation. Though lot of developments happened in this arena of ontology development in line with the implementation of semantic web, the standardization of process models, tools and methodologies are yet to be saturated. Researches in ontology engineering had pointed out that an effective ontology application development methodology with integrated tool support is a mandatory for its success. The researcher in his previous publication, proposed a hybrid methodology for ontology development by leveraging the well proven process models and methods of software engineering. This paper explains the philosophical, engineering aspects of the newly derived methodology and applies the same for the development of a Java Learning Educational Ontology (JLEO). JLEO organizes the learning hierarchy of Java Programming Language suitable to the related modules spread across the curriculum of Middle East College. An appropriate ontology editing tool has been used for the practical development of ontology.

Pornpit Wongthongtham [3] this paper aims to present an ontology model of software engineering to represent its knowledge. This paper gives an analysis of what software engineering ontology is, what it consists of and what it is used for in the form of usage example scenarios. The usage scenarios presented in the paper highlight characteristics of the software engineering ontology. The software engineering ontology assists in defining information for the exchange of semantic project information and is used as a communication framework. Its end users are software engineers sharing domain knowledge as well as instance knowledge of software engineering.

3. CONCLUSION

In this paper a modified Ontology based Knowledge representation has been auspiciously explained. The proposed approach will produce a remarkable performance as compared to the previously used algorithms. The implementation part will be covered in the next paper, which will demonstrate the real working of proposed algorithm.

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