What are Ontologies and why do we need them?

Review

As the title of the paper suggests, the paper concentrates on what are ontologies and why do we actually need them. It is a theoretical paper stating facts about ontologies. It emphasizes more on role of ontologies in information systems and AI. It categorizes ontologies into two areas – Ontology as vocabulary, ontology as content theory. It is short and concise paper but states important facts about ontologies. The paper is well organized with introduction to ontologies, their categorization, importance and uses. As the paper is considering the use of ontologies in AI, therefore the discussion on the ontologies as content theory is more as this categorization is used in AI. It also mentions the work related to this field and other informative content like special issues on ontologies, ontology development, natural-language theory, ontologies and information sources, ontologies and knowledge management, task and method ontologies and ontology workshops. It gives good overview of the terms related to ontologies and also points to good resources where information about ontologies can be found.

Topic/Facts learnt

Categorization of Ontologies

In this paper ontologies are categorized into ontology as vocabulary and ontology as content theory. Basically Ontologies are conceptualizations that the terms in the vocabulary are planned to capture. Sometimes ontology can also be referred to as describing some domain of knowledge. One of the facts that the paper stresses on is that AI focuses on content theory and mechanism theory. But however good the mechanism is, it cannot do without a good content theory of the domain it is working on.
There are two types of Ontology specification in knowledge systems:
• Domain factual knowledge – It provides knowledge about the objective realities in the domain of interest.
• Problem-solving knowledge – It provides knowledge about how to achieve various goals.

Importance of Ontologies

The ontological analysis explains the structure of knowledge. Ontology is the most essential part any system of knowledge representation for a domain. The first step to develop a knowledge representation system, and vocabulary, is to perform an ontological analysis of the field. The ontologies also enable knowledge sharing. The ontology captures the conceptual structure of the domain. Shared ontologies help in increasing the reuse of knowledge.

Use of ontologies

Information-retrieval systems, digital libraries, integration of heterogeneous information sources, and Internet search engines need domain ontologies to organize information and enhance the search processes. Domain ontology helps in developing

object-oriented design. Domain ontologies also help in building large knowledge systems e.g. in many areas of AI.

The two areas of application which depend on rich body of knowledge are natural-language understanding and Knowledge-based problem solving. In the field of natural-language understanding, domain knowledge helps in removing ambiguity. Ontology plays the role of concept dictionary in natural-language understanding.

The Knowledge-based problem solving is the second area in AI that is a big consumer of knowledge. KBPS systems help in solving problems like diagnosis, planning, and design.

Contribution of the paper to the field

The paper gives theoretical knowledge of the facts in the field of ontology. It describes how ontologies can be categorized. It tells why ontologies are important. It also states the use of ontologies in various areas. This paper mostly contributes on giving elementary theoretical knowledge about the ontologies.

Status

Most of the research on ontologies focuses on domain factual knowledge. The other area is KBS in which sharing knowledge about reasoning strategies or problem solving methods. ***OntoLingua*** a language to construct ontologies have been developed.

The Knowledge-based problem solving systems use the domain specific knowledge. This helps in constructing knowledge systems for specific applications. But sometimes even the knowledge systems can fail. As a solution to this problem the researchers have proposed that problem solving systems need commonsense knowledge in addition to domain-specific knowledge. There is also a need for developing domain-specific knowledge.

According to the author, ontology based knowledge-base development provides a double advantage. We can build knowledge bases using the structure of conceptualization using the ontologies and these ontologies are also sharable. The knowledge bases that are developed can be shared more reliably because the formal ontology that underlies these knowledge bases helps in clarifying the knowledge representation's semantics.

Future research suggested

As the paper gives mostly theoretical knowledge but the author suggests some research questions. The knowledge representation in some cases might need an ontology that describes knowledge at higher levels of generalization. The descriptive terms are such level are called upper-level ontology or top level ontology. There are issues how to correctly analyze knowledge at upper level.

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