

Ontology

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This paper provides information about Ontology in Artificial Intelligence

OVERVIEW

“The word element onto- comes from the Greek ὄν, ὄντος, ("being", "that which is"), present participle of the verb εἶμι ("be") (Wikipedia, 2017)”

According to Tom Gruber, an AI specialist at Stanford University, in artificial intelligence (AI), an ontology is, *"the specification of conceptualizations, used to help programs and humans share knowledge"*. For AI systems, what "exists" is that which can be represented.

Ontologies typically contain representations and descriptions of:

- The types of **objects** found in the domain
- The **attributes** which these objects may have
- The **relationships** which these objects may enter into
- **Values** that the attributes may have for particular types
- **Axioms**: assertions in a logical form that together comprise the

overall theory that the ontology describes in its domain of application.

FORMAL DEFINITION OF AN ONTOLOGY

Assuming a set of data types D , an *ontology signature* is a pair $\langle C, A \rangle$

- Where C is a partial order of classes (class hierarchy)
- A is a family of sets $A_{c,e}$ of attribute symbols where e is the type of the value of attribute a in c ($e \in C \cup D$)
- An ontology consists of a signature and a set of axioms which constrain the values of attributes.

(Bench –Capon et al, 2003)

USES OF ONTOLOGIES

- An ontology provides a very helpful framework to drive the **knowledge acquisition** process.

- A motivation for ontologies is to provide a way to **share knowledge** between applications. A current example of knowledge sharing is the semantic web, which focuses a lot of current thinking about ontologies.
- **Verification and Validation** of knowledge based systems
- **Knowledge Re-use**

TYPES OF ONTOLOGY

Domain Ontology: attempts to articulate the concepts fundamental to some particular domain. Domain ontologies represent concepts in very specific ways making them incompatible. As systems that rely on domain ontologies expand, they often need to merge domain ontologies into a more general representation. This presents a challenge to the ontology designer. Different ontologies in the same domain arise due to different languages, different intended usage of the ontologies, and different perceptions of the domain

Upper ontology: consists of very general terms that are common across all domains. An important function of an upper ontology is to support broad semantic interoperability among a large number of domain-specific ontologies by providing a common starting point for the formulation of definitions. Terms in the domain ontology are ranked "under" the terms in the upper ontology, and the former stand to the latter in subclass relations.

Hybrid Ontology: is a combination of the domain and upper ontology.

APPLICATIONS THAT USE ONTOLOGY

Ontologies are part of the W3C standards stack for the Semantic Web, in which they are used to specify standard conceptual vocabularies in which to exchange data among systems, provide services for answering queries, publish reusable knowledge bases, and offer services to facilitate interoperability across multiple, heterogeneous systems and databases. Successful applications include database interoperability, cross database search, and the integration of web services.

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