Logic-Based Representation

About logic-based representation

Natural language is the most **expressive** knowledge representation formalism we have. However, it is hard to model and reasoning becomes very complex. The other **problems with natural language** are **ambiguity** of natural language, **understanding** of syntax and semantics, and **little uniformity** in the structure of sentences.

Logic was developed as an attempt to overcome the problems with natural language by creating a **formal language** based on mathematical principles. Logic-based representation should be **expressive, unambiguous, context independent, and compositional**. Logic-based representation requires the following concepts to be defined [1]:

- **Vocabulary**: a collection of symbols represented as chars, words, icons, or even sounds.
- **Syntax**: a logic must have grammar rules that determine how symbols combine to form well-formed sentences.
- **Semantics**: it is necessary to make meaningful statements. It comprises a theory of reference that determines how the constants and variables relate to things in the universe of discourse. Moreover, it also includes a theory of truth to distinguish true statements from false.
- **Inference**: carried out by rules that determine how patterns are generated from others. Appropriate inference rules allow reasoning mechanisms automation and, thus, the generation of new knowledge from previous one.

Technologies

First-order predicate logic

First-order logic is a formal system used in mathematics, philosophy, linguistics, and computer science. It is also known as first-order predicate calculus, the lower predicate calculus, quantification theory, and predicate logic (a less precise term). First-order logic is distinguished from propositional logic by its use of **quantified variables**.

Tools

Prolog

Other tools

Bibliography

1. Roberto García. A Semantic Web Approach to Digital Rights Management. Retreived April 28,

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Read more

1. Franz Baader. Logic-based Knowledge Representation
2. H. Reichgelt. “Knowledge representation: an AI perspective”. Ablex Pub. Corp., 1991
3. University of Texas at Austin: First Order Predicate Calculus