A Nonmonotonic Rule System in Semantic Web using an Extension of Defeasible Logic

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Abstract

The Semantic Web is an extension of the current Web, in which information is given well-defined meaning, better enabling computers and people to work in cooperation. For the Semantic Web to function, computers must have access to structured collections of information and sets of inference rules that they can use to conduct automated reasoning. The development of the Semantic Web proceeds in layers, each layer being on top of other layers. At present, the highest layer that has reached sufficient maturity is the ontology layer in the form of the description logic based languages. The next step will be the logic and proof layer and rule systems appear to lie in the mainstream of such activities.

Nonmonotonic reasoning comprises knowledge representation approaches that deal with incomplete and conflicting information. This family also includes rule-based approaches. Defeasible logic is a nonmonotonic reasoning approach that would be suitable solution for the requirements that arise from the specific nature of business rules. It offers many reasoning capabilities, embodies the concept of preference, it has low computational complexity and powerful implementations. The weakness of defeasible logic in this situation is that the representation of business rules requires a formal specification language with higher expression power, including the notion of deontic logic.

In the current work, for a proper representation of business rules and to be able to reason with them, we use an extend variant of Defeasible Logic, that uses the deontic operators of obligation and permission and other modal operators (agency and intention). We develop a nonmonotonic reasoning system that translates knowledge from this extension of Defeasible Logic and can reason in applications associated with business rules. We present the usage of our system in the application area of university regulations.