Belief Revision and Argumentation Approaches to Support Commonsense Reasoning

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Abstract

Allowing artificial agents to model and reason about commonsense phenomena is one of the major problems of AI research since its conception. In this talk, I will present recent (and partly unpublished) research that has been performed in the Symbolic AI group of FORTH-ICS, which connects the fields of commonsense reasoning with the fields of belief revision and computational argumentation. The talk will be split in two parts.

In the first part, I will consider how belief revision can support agents in their reasoning about events, their effects, and their preconditions, which is one of the main desiderata of commonsense reasoning. Event Calculus is a powerful non-monotonic language for allowing this kind of reasoning, enabling the modelling of commonsense phenomena in causal domains, but no belief revision methods for Knowledge Bases modelled using Event Calculus exist. As a result, agents cannot handle unexpected observations, i.e., observations that are inconsistent with the agent's perceived world view, as dictated by the events that the agent has witnessed (and their expected effects). To address this problem, I will describe work that adapts well-known ideas from belief revision to apply on Event Calculus theories, proposing a belief revision algorithm for Event Calculus that satisfies the main principles of belief change.

In the second part of this talk, I will present recently-proposed extensions of the standard frameworks for Computational Argumentation, which are more suitable for reasoning about the scope of arguments, their exceptions, and their relevance for specific contexts, an important concept of commonsense and non-monotonic reasoning. In the proposed extensions, arguments are equipped with a domain of application, referring to the objects in the universe that each argument applies to. Appropriate semantics for these frameworks are presented, through which attacks among arguments limit their domain of application, rather than invalidating them altogether (as in classical Computational Argumentation settings). Thus, the proposed models inherently support the notions of exception and scope of arguments.

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