Conceptual reasoning

Belief, multiple agents and preference

By
Krzysztof Zbigniew Nowak
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Abstract

One of the central issues in Artificial Intelligence (AI) in general—and in the area of knowledge representation and reasoning in particular—is *common sense reasoning*. This includes logics of knowledge and belief, non-monotonic reasoning, truth-maintenance and belief revision. Within these fields the notion of a *consistent belief state* is the crucial one. Additionally, there is a growing interest in *partial information states*, with an *information ordering* being the key notion.

The issues of *inconsistency* and *partiality of information* are central to this work. The thesis proposes a logical knowledge representation formalism employing *partial objects* and *partial worlds* on its semantic side. The syntax includes a language, formulae, and *partial theories*, theories associated with partial worlds. Partial worlds and theories are *consistent*, and *contradictory information* is assumed to arise in *multiple agent* situations. Relevant mathematical structures are discussed, in particular partial theories are related to partial worlds.

A multiple agent case is considered. A set of agents is assumed to provide multiple description sets, where description sets represent *partial* syntactic information about partial worlds. A set of description sets gives rise to a set of theories, equipped with an information ordering—a *lattice* containing all those theories (and some alternatives) can be derived. This demonstrates that partial theories can be partially ordered by an information ordering and the obtained lattice structure facilitates the theory selection process based on *information value* and *truthness* of theories. It is also suggested how to derive a numeric measure (and hence a linear order) on the theories.