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A guide to completeness and complexity for modal logics of knowledge and belief. (English)

Zbl 0762.68029

Artif. Intell. 54, No. 3, 319-379 (1992).

Summary: We review and re-examine possible-worlds semantics for propositional logics of knowledge and belief with three particular points of emphasis:

- (1) we show how general techniques for finding decision procedures and complete axiomatizations apply to models for knowledge and belief,
- (2) we show how sensitive the difficulty of the decision procedure is to such issues as the choice of modal operators and the axiom system, and
- (3) we discuss how notions of common knowledge and distributed knowledge among a group of agents fit into the possible-worlds framework.

As far as complexity is concerned, we show, among other results, that while the problem of deciding satisfiability of an $S5$ formula with one agent is NP -complete, the problem for many agents in $PSPACE$ -complete. Adding a distributed knowledge operator does not change the complexity, but once a common knowledge operator is added to the language, the problem becomes complete for exponential time.

MSC:

- [68Q25](#) Analysis of algorithms and problem complexity
- [68T30](#) Knowledge representation
- [03B45](#) Modal logic (including the logic of norms)

Cited in **1** Review
Cited in **132** Documents

Keywords:

reasoning about knowledge and belief; possible-worlds semantics; decision procedures; distributed knowledge; NP -complete; $PSPACE$ -complete

Full Text: [DOI](#)

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