Reasoning about Rational, but Not Logically Omniscient Agents (Extended Abstract)

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Epistemic logic, or the logic of the concepts of knowledge and belief, has become a major tool for knowledge representation recently. However, it is a very controversial matter whether epistemic logic is suitable for this purpose. Among the main problems of epistemic logic is the so-called Logical Omniscience Problem. This and related problems are examined, and some recent proposals to solve them are reviewed. Almost all attempts in the literature to solve this problem consist in weakening the standard epistemic systems: weaker systems are considered where the agents do not possess the full reasoning capacities of ideal reasoners. It is argued that this solution is not satisfactory: in this way omniscience can be avoided, but many intuitions about the concepts of knowledge and belief get lost. The main problems of epistemic logic cannot be solved satisfactorily within a static framework. To solve these problems we should take the reasoning activities of the agents into account. Therefore, we need dynamic epistemic logic for modeling knowledge. We shall show that axioms for epistemic logics must have the following form: if the agent knows all premises of a valid inference rule, and if she thinks hard enough, then she will know the conclusion. To formalize such an idea, we propose to "dynamize" epistemic logic, that is, to introduce a dynamic component into the language. Some sample systems of dynamic epistemic logic are then developed within the framework. It will be shown that these logics are suited to formalize resource bounded agents.

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