

Knowledge and action: how should we combine their logics?

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The design of logical systems accounting for both knowledge and action is an important issue in AI and MAS. While there are fairly well-established logics of knowledge—essentially the modal logics S5 and S4.2—, there is much less consensus about logical formalisms for actions: there exists a plethora of rather expressive formal systems, including situation calculus, event calculus, fluent calculus, and dynamic logic. When one combines these formal systems with epistemic logic then one typically supposes that knowledge and actions are related through the principles of perfect recall and no miracles. The resulting many-dimensional logics often have high complexity or are undecidable.

In this talk, building on previous work with several colleagues [6,2,4,5] I will advocate a combination that is based on a simple, STRIPS-like account of action: a dialect of Propositional Dynamic Logic PDL whose atomic programs are assignments of propositional variables. Its epistemic extension generalises the notion of visibility of a propositional variable by an agent, as proposed by van der Hoek, Wooldridge and colleagues [9,8]. The model checking, satisfiability and validity problems of the resulting logic are all PSPACE complete. The logic allows to capture in a natural way several concepts that were studied in the literature, including logics of propositional control [3,7] and epistemic boolean games [1].

References

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