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Logics for reasoning about agents' attitudes in strategic contexts.

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Summary: Logics, especially modal logics, have been widely used in the past to model the properties of autonomous agents and multi-agent systems (MAS). Different variants of epistemic logics, dynamic epistemic logics, logics of preferences and intention have been proposed whose aim is to describe both the static and the dynamic properties of agents' mental attitudes. Furthermore, there are logics of collective attitudes including common knowledge and common belief, joint intention and collective acceptance. Finally, several logical systems for reasoning about actions and capabilities of agents and groups of agents have been proposed such as Coalition Logic, STIT logic and ATL. The concepts formalized in these logics are mainly inspired by game theory and social choice theory. In this talk I will present some recent works on the logical formalization of agents' attitudes, both individual and collective, in strategic contexts. The logics I will present support reasoning about different concepts such as group preference, graded belief, disposition to believe, certain belief, robust belief, common certainty and common robust belief. I will show how these logics can be applied to game theory by providing a formal analysis of the epistemic conditions of different solution concepts such as Nash equilibrium, iterated strong dominance, iterated weak dominance and social-welfare equilibrium. In the last part of my talk (time permitting) I may discuss some open issues and challenges in the area of logical modelling of agents' attitudes such as the issue of representing strategic emotions (e.g., regret and guilt), as well as the problem of relaxing the assumption of logical omniscience in order to represent both the static and the dynamic properties of explicit beliefs and explicit common beliefs and in order to distinguish them from implicit beliefs and implicit common beliefs.

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