REASONING ABOUT EPISTEMIC SUPERIORITY

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Dynamic-epistemic logics and temporal-epistemic logics have been used as a fruitful basis to model various interactive scenarios that involve the change in epistemic attitudes of communicating agents. While these systems are excellent for the purpose of modelling several communication-based scenarios, the downside is that they require us to make explicit all the specific sentences that are being communicated. This level of specification can be too strong for several applications. In particular when we aim to model scenarios in which agents communicate 'all they know' (by e.g. giving access to one's information database to all or some of the other agents), as well as more complex informational events, such as hacking. In these cases we assume that some agent(s) instantly 'read' all the information stored at a specific source.

Modelling such scenarios requires us to extend the framework of epistemic logics to one in which we abstract away from the specific announcement and formalize directly the action of sharing 'all you know' (with some or all of the other agents). In order to do this, we introduce these sharing 'all you know'-actions and formalize their effect, i.e. the state of affairs in which one agent (or group of agents) has *epistemic superiority* over another agent (or group). Concrete we capture the epistemic superiority of agents by enriching the language with comparative epistemic assertions for individual and groups of agents (as such extending the comparison-types considered in [5]).

Another ingredient that we add to our logical system, is a new modal operator for 'common distributed knowledge', used to model situations in which we achieve common knowledge in a larger group of agents by information-sharing only within each of the subgroups. This new concept of 'common distributed knowledge' combines features of both common knowledge and distributed knowledge. We position this work in the context of other known work related to: the problem of converting distributed knowledge into common knowledge via acts of sharing [4]; the more semantic approach in [2] on communication protocols requiring agents to "tell everybody all they know"; the work on public sharing

events with a version of common distributed knowledge in [1]; and the work on resolution actions in [6].

In this presentation I will focus on the above described tools to reason about epistemic superiority and common distributed knowledge, which have led to completely axiomatized and decidable logical systems. This work is fully based on recent joint work with A. Baltag in [3].

References

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