$\mathcal{E}_{\mathsf{BDI}}$ in Coq

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Emotional agents have been subject of research in formal methods with the goal of obtaining frameworks which allow us to model, reason about and verify their behaviour. The aim of this paper is two-fold: first, we present the multi-modal logic $\mathcal{E}_{\mathsf{BDI}}$ for modelling, reasoning and verify BDI agents with emotions; second we present our ongoing work on the implementation of $\mathcal{E}_{\mathsf{BDI}}$'s [5] syntax and semantics, as well as, its decision procedures in the interactive theorem prover Coq [1].

The $\mathcal{E}_{\mathsf{BDI}}$ logic was conceived to model, reason about and verify Emotional-BDI agents, a class of emotional agents which have as basis the classical BDI model of agency as proposed by Bratman *et al.* [2]. Formally, it is an extension of Rao & Georgeff's $\mathsf{BDI}_{\mathsf{CTL}}$ logic [7] which supports explicit reference to regular actions (in a PDL fashion [4]), *capabilities* (similarly to $\mathcal{L}_{\mathbf{KARO}}$'s notion of *ability* [8]) and resource management. We use these new constructors to express the activation of three emotions: *fear*, *anxiety* and *self-confidence*.

Currently we are implementing $\mathcal{E}_{\mathsf{BDI}}$ syntax and semantics as a module of the Coq interactive theorem prover system. Our aim is to provide a computational mean of doing model-checking for $\mathcal{E}_{\mathsf{BDI}}$-formulae. We base our approach in the work of [3] in implementing normal modal logic in Coq plus some implementations of formal concepts present in the $\mathcal{E}_{\mathsf{BDI}}$ logic and already implemented in Coq.

References

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