

A hybrid POMDP-BDI agent architecture with online stochastic planning and plan caching

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ABSTRACT:

This article presents an agent architecture for controlling an autonomous agent in stochastic, noisy environments. The architecture combines the partially observable Markov decision process (POMDP) model with the belief-desire-intention (BDI) framework. The Hybrid POMDP-BDI agent architecture takes the best features from the two approaches, that is, the online generation of reward-maximizing courses of action from POMDP theory, and sophisticated multiple goal management from BDI theory. We introduce the advances made since the introduction of the basic architecture, including (i) the ability to pursue and manage multiple goals simultaneously and (ii) a plan library for storing pre-written plans and for storing recently generated plans for future reuse. A version of the architecture is implemented and is evaluated in a simulated environment. The results of the experiments show that the improved hybrid architecture outperforms the standard POMDP architecture and the previous basic hybrid architecture for both processing speed and effectiveness of the agent in reaching its goals.