Exploring the integration of BDI agents in games and virtual environments

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Introduction Multi-Agent Systems (MAS) has seen successful applications in communication, administration and industry and gained a notable popularity in entertainment, namely in the form of video games AI bots [2]. A common critique to traditional AI-driven virtual players is the plain absence of human-like behavior, negatively felt by the real players interacting with such technology [5].

One proposed solution to this issue is building agents upon the Belief–Desire–Intention (BDI) model, which is recognized for its effectiveness in approximating human approach in problem solving, which generally works by setting goals and making plans to achieve them based on belief on the environment [5] [8] [1]. While it was proven that BDI agents can interact well with real world players in games requiring more complex tasks, like storytelling [6], counter-examples of this model reportedly under-performing are offered, and unsurprisingly a not too dissimilar model, with roots in psychology as well, successfully replaces it [7]. This only cements the emerging importance of designing agents capable of emulating human behavioral patterns as accurate as possible.

Motivation In game development, BDI is successful at efficiently [2] animating the virtual world (be it a shooter [5], a role-playing [1] or a real-time strategy game [4]) with deliberative agents in a realistic way thus enhancing players' experience and entertainment. However, a sub-genre of games, namely simulators, poses an attractive point of interest with implications way beyond player-base satisfaction. Considering a game as a simplified model of one or more real world aspects, then agents interacting with the virtual environment and with each other can, on one hand, teach us facts about the evolution of the system, like in population dynamics [3] or resource management [1]. On the other hand, agents designed in virtual environments may be reused in other similar contexts [7], or even serve as prototype for real world autonomous robots capable of interacting with objects around [5] or agents responsible for decision making and integrating in social contexts [1].

The potential of games becoming a playground for multi-agent research justifies the effort put into developing and analyzing such systems and designing suitable architectures. Moreover, a simulated environment allows for automation of processes implying running, observing and testing the agents' behavior in contexts where otherwise the presence of a human interacting actor may be necessary, which is one of the core use-cases with a BDI model.

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References

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