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Students required: *1*

Defining nudging strategies in the specification of properties for multi-agent systems

The problem of assuring systems correctness is particularly felt in hardware and software design, especially in safety-critical scenarios. When we talk about a safety-critical system, we mean the one in which failure is not an option. To face this problem, several methodologies have been proposed. Amongst these, model checking [1] results to be very useful. This approach provides a formal-based methodology to model systems, to specify properties via temporal logics, and to verify that a system satisfies a given specification.

Notably, first applications of model checking just concerned closed systems, which are characterized by the fact that their behavior is completely determined by their internal states. Unfortunately, model checking techniques developed to handle closed systems turn out to be quite useless in practice, as most of the systems are open and are characterized by an ongoing interaction with other systems. To overcome this problem, model checking has been extended to multi-agent systems. In the latter context, temporal logics have been extended to temporal logics for the strategic reasoning such as Alternating-time Temporal Logic (ATL) [2], Strategy Logic (SL) [3], and their extensions.

One aspect that is relevant in the context of multi-agent systems is the influence that one agent, or a group of agents, can have on the strategies of other agents. This property, commonly referred to as nudging, has also led to the introduction of nudging theory [4]. However, this concept has never been formalized within the context of formal verification for multi-agent systems.

The aim of this project is divided in four macro steps:

1. Analyze the state of the art on formal verification for multi-agent systems and on nudging theory.

2. Define a new logic for the strategic reasoning that can incorporate the concept of nudging.

3. Provide a verification algorithm for the new proposed logic.

4. Develop a module in the VITAMIN tool [5] that can solve the verification problem for the new logic proposed.

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