MULTI-AGENT SYSTEMS RUNTIME VERIFICATION FOR ASSESSING QUALITY OF AGENTS COMMUNICATION

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ABSTRACT
This research investigates the issues of agent communication failures in runtime execution. Since multi-agent systems (MAS) are inherently complex, there are possibilities that errors related to agents interaction could occur. There are possibilities of flaws in MAS design model, bugs in agent-based programming code, and errors during runtime. Thus, verification during each of these lifecycle phases needs to be performed. Currently, many verification approaches have been proposed by focusing on specific properties, using a particular technique and during certain development phase. However, each technique has its limitations related to comprehensiveness of the checked properties and scalability. Verification during design may help to improve the correctness of certain properties of the modeled systems but there is a possible risk of missing certain properties due to incompleteness of the specifications and accuracy of the modeling. In addition, not all agents interaction properties can be verified during design, coding or testing. As agents interaction and environments evolve during runtime, some new interaction properties need to be verified and not all interactions can be specified during development by following standard agent interaction protocols and application-dependent ontologies. Hence, in this research, a novel verification process model approach, newly defined agents interaction quality metrics and algorithm to perform verification based on the metrics are proposed. The proposed solution components are implemented within multi-agent systems runtime verification (MARV) tool. It is expected to improve the effectiveness of the verification of agent interactions during runtime. The thesis will demonstrate the effectiveness of the new approach by applying it towards multi-agent systems applications developed using multi-agent platforms.

KEYWORD
multi-agent systems, verification