Verifying Autonomous Agents

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Abstract

In this talk, I will introduce an agent-oriented programming language, then address the use of model-checking techniques for the verification of multi-agent systems implemented in that programming language. The language is called AgentSpeak, a logic-based agent-oriented programming language influenced by the BDI architecture. The main part of the talk will overview the research leading to the development of a set of tools which automatically translate AgentSpeak code and a simplified BDI property specification language into the input languages of existing model checkers, thus allowing the verification of multi-agent programs. To address the state-explosion problem, abstraction techniques tailored specifically to that agent-oriented programming language are required. The talk also refers to recent work on a property-based slicing algorithm for AgentSpeak.

This talk is based on material that appeared in [1, 2, 3, 4, 5].

References

[1] R. H. Bordini, M. Fisher, C. Pardavila, and M. Wooldridge. Model checking AgentSpeak. In J. S. Rosenschein, T. Sandholm, M. Wooldridge, and M. Yokoo, editors, *Proceedings of the Second International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS-2003), Melbourne, Australia, 14–18 July*, pages 409–416, New York, NY, 2003. ACM Press.

[2] R. H. Bordini, M. Fisher, W. Visser, and M. Wooldridge. Verifiable multi-agent programs. In *Proceedings of the First International Workshop on Programming Multiagent Systems: languages, frameworks, techniques and tools (ProMAS-03), held with AAMAS-03, 15 July, 2003, Melbourne, Australia*, 2003. To appear as a volume in Springer's LNAI series.

[3] R. H. Bordini, M. Fisher, W. Visser, and M. Wooldridge. Model checking rational agents. *IEEE Intelligent Systems*, 19(5):46–52, September/October 2004.

[4] R. H. Bordini, M. Fisher, W. Visser, and M. Wooldridge. State-space reduction techniques in agent verification. In N. R. Jennings, C. Sierra, L. Sonenberg, and M. Tambe, editors, *Proceedings of the Third International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS-2004), New York, NY, 19–23 July*, pages 896–903, New York, NY, 2004. ACM Press.

[5] R. H. Bordini, W. Visser, M. Fisher, C. Pardavila, and M. Wooldridge. Model checking multi-agent programs with CASP. In W. A. Hunt Jr. and F. Somenzi, editors, *Proceedgins of the Fifteenth Conference on Computer-Aided Verification (CAV-2003), Boulder, CO, 8–12 July*, number 2725 in Lecture Notes in Computer Science, pages 110–113, Berlin, 2003. Springer-Verlag. Tool description.