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Generating, Ranking, and Enacting Commitment Protocols

Abstract

Multiagent systems offer novel techniques to solve computational challenges that involve data interpretation, reasoning and decision making, without human intervention. An important aspect of every multiagent system is interaction among agents, which requires agents to employ regulation mechanisms to coordinate their actions. Commitment protocols provide an effective mechanism for this purpose. Typically, these protocols are defined at design time and embedded into agents' implementation. However, predefined commitment protocols are not adequate for large-scale, open multiagent systems, because of the variety of agents, changes in the agent preferences and changes in the environment. Accordingly, in this thesis we argue that agents should not rely on preexisting commitment protocols and they should be able to generate their own commitment protocols when needed, taking the current context of the multiagent system into account. In order to achieve that, we propose a three-phase agent process. In the first phase an agent generates a set of commitment protocols based on its goals, capabilities and other agents' services. For this purpose we propose two sound and complete algorithms that can efficiently generate commitment protocols. In the second phase, the generated commitment protocols are ranked from the generating agent's perspective. To achieve this we formulate a set of metrics that use cost, benefit and trustworthiness of commitment protocols to rank them. Finally, in the third-phase the agent negotiates with other agents over selected feasible commitment protocols to reach an agreement on a protocol for enactment. In this context we formalize commitment feasibility and provide an algorithm based on constraint satisfaction techniques to check if a set of commitments can be carried out. This three-phase process provides a complete method for agents to generate and enact commitment protocols on demand.

PUBLICATIONS

Journals

1. **Akın Günay**, Michael Winikoff and Pınar Yolum, “Dynamically Generated Commitment Protocols in Open Systems”, *Autonomous Agents and Multi-agent Systems*, 2014, [DOI: 10.1007/s10458-014-9251-7] (SCI-E)
2. **Akın Günay** and Pınar Yolum, “Constraint Satisfaction as a Tool for Modeling and Checking Feasibility of Multiagent Commitments”, *Applied Intelligence*, 39(3), pp. 489-509, 2013, (SCI)

Book Chapters

1. **Akın Günay**, Michael Winikoff and Pınar Yolum, “Commitment Protocol Generation”, *Declarative Agent Languages and Technologies X (DALT)*, LNAI 7784, pp. 136-152, Springer, Heidelberg, 2013.
2. **Akın Günay** and Pınar Yolum, “Detecting Conflicts in Commitments”, *Declarative Agent Languages and Technologies IX (DALT)*, LNAI 7169, pp. 51-66, Springer, Heidelberg, 2012

Conferences & Workshops

1. **Akın Günay**, Michael Winikoff and Pınar Yolum, “Generating and Ranking Commitment Protocols”, In Proceedings of the 12th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), pp. 1323-1324, Saint Paul, MN, US, 2013.

2. **Akın Günay** and Pınar Yolum, “Engineering Conflict-free Multiagent Systems”, First International Workshop on Engineering Multiagent Systems (EMAS), pp. 192-207, Saint Paul, MN, US, 2013.

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Defense Date: 30.09.2013