

Modular Reasoning in Multi-Agent Systems Using Meta-Knowledge and Answer Set Programming

Tony Ribeiro

Department of Informatics, The Graduate University for Advanced Studies (Sokendai), Tokyo, Japan
keijurosan@gmail.com

Katsumi Inoue

National Institute of Informatics, Tokyo, Japan
inoue@nii.ac.jp, <http://research.nii.ac.jp/~inoue/>

Gauvain Bourgne

Université Pierre et Marie Curie, Paris, France
gauvain.bourgne@gmail.com

keywords: multi-agents systems, answer set programming, meta-knowledge, modularity, dynamic environment

Summary

We are concerned with multi-agent systems in dynamic environment, and focus on knowledge representation and reasoning of such systems. In dynamic environment, an agent needs to be able to manage its knowledge according to context changes. To achieve this goal, an agent has to adapt his beliefs and behaviour with respect to the current state of the world. In this work, we define a method to design agents' knowledge and reason efficiently in dynamic contexts. For this purpose, we use the expressibility of answer set programming (ASP) and propose a method based on combinations of modules that are represented in ASP. Using meta-knowledge on these combinations, we can easily realise dynamic behaviour and meta-reasoning. We propose an algorithm to combine modules and implement the framework in an example of multi-agent systems in a dynamic world. Using experimental results, we show that modular knowledge can be used to optimize reasoning time.
