

Argumentation Tool that Enables Agents to Argue^{*}

Jaume Jordán, Stella Heras, and Vicente Julián

Departamento de Sistemas Informáticos y Computación
Universitat Politècnica de València, València (Spain)
Email: {jjordan,sheras,vinglada}@dsic.upv.es

Abstract. Multi-Agent Systems are suitable to provide a framework that allows to perform collaborative processes in distributed environments. Furthermore, argumentation is a natural way of reaching agreements between several parties. We propose an infrastructure to develop and execute argumentative agents in an open MAS. It offers the tools to develop agents with argumentation capabilities. It also offers support for agent societies and their social context, which allows agents to engage in argumentation dialogues in more realistic environments. In our application scenario, the argumentative agents try to reach an agreement about the best solution to apply to solve a problem reported to the system.

1 Introduction

Argumentation theory has produced important benefits on many AI research areas, including its applications in Multi-Agent Systems (MAS) [4]. The argumentation skills increases the agents' autonomy and provides them with a more intelligent behaviour. As member of a MAS, an agent interacts with other agents whose goals could come into conflict with those of the agent. In addition, agents can have a social context that imposes dependency relations between them and preference orders among a set of potential values to promote/demote. Therefore, agents must have the ability of reaching agreements that solve their conflicts with other agents by taking into account their social context. Argumentation is a natural way of reaching agreements between several parties. The argumentation techniques can be used to facilitate the agents' autonomous reasoning and to specify interaction protocols between them. In this paper, we describe the case-based argumentation infrastructure for agent societies proposed in [2, 3].

2 Infrastructure

The main components of our infrastructure are the argumentative agents, the Commitment Store and the knowledge interchange mechanism.

The argumentative agents have all the tools needed (argumentation protocol, communication skills and knowledge resources) to engage in an argumentation

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dialogue and reach an agreement with other agents about the best solution to apply for a problem. The solution applied to solve a problem in the past and the information about the problem-solving process can be reused to propose a solution to another similar problem. Case-Based Reasoning (CBR) systems have been widely applied to perform this task [1, 5]. The argumentative agents have two CBR based modules used as knowledge resources: Domain CBR, that stores cases that represent previous solved problems, and Argumentation CBR, that stores arguments that were used in previous argumentation dialogues.

The Commitment Store is a resource that stores all the information about the agents participating in the problem-solving process.

The case-bases of the domain CBR and the argumentation CBR are stored as OWL 2 data of an ontology that we have designed to act as language representation of the cases. In this way, heterogeneous agents can use it as common language to interchange solutions and arguments generated from the case-bases.

Furthermore, the proposed infrastructure has been validated with an example in a customer support application. In this example, the agents' social context simulates the roles of operators, experts and managers attending incidences of users. There are dependency relations between the roles representing a hierarchy. Also, each agent of the system has its own preference values to choose the solution to apply to a problem. In the performed tests, the best results are obtained using an argumentation policy that takes into account the social context of agents. In addition, having at least an expert involved in the group of agents that tries to solve a problem increases the quality of the final solution agreed.

3 Conclusions

In this work, we have implemented an infrastructure to develop and execute argumentative agents in an open MAS. This infrastructure offers the necessary tools to develop agents with argumentation capabilities, including the communication skills and the argumentation protocol. Also, it offers support for agent societies and takes into account the agents' social context. The infrastructure combines the CBR methodology, argumentation and MAS.

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