

A Structured Environment to Facilitate Agreements*

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Abstract. Multi-Agent Systems are good candidates to solve so-called DDD problems by making agents to get into joint agreements. A relevant component of a MAS is the Environment seen as an active medium to reach agreements or mutual contracts. In ANTE, besides being a facilitator, the Environment is also seen as a regulator as well as exploited as the social medium playing an active role in influencing agents behavior.

1 Problem Characterization

Many sophisticated problems we usually address belong to the so called DDD class of problems [1]. They deal with a reality that simultaneously is of a Distributed, Decentralized as well as Dynamic nature. MAS is a natural paradigm to cope with those situations asking for distributed problem solving as well as capabilities for reaching joint agreements. However, due to the intrinsic agents' property of Autonomy, the following questions arise: How can an agent select, in runtime, its best partners for jointly execute the tasks ahead, and why should the agent trust those selected agents? And, for the same purpose, how to coordinate joint work or facilitate mutual agreements together with the selected agents?

2 Active Environment

Since in the core of software agent's definition is the 'situatedness' property, meaning it is immersed in an Environment it can both sense and alter, it is mandatory to consider the Environment as an important component to be specified for MAS. The Environment can thus be seen as an active medium to facilitate how to reach consensus, agreements or mutual contracts. For an overview of the role of the Environment in agent systems see [2] where the environment has a dual role of providing conditions for the agents to exist and an abstraction to design MAS. The authors also recognize the environment as a means for communication, an organizational layer and a coordination infrastructure which are issues we have also been working at [3]. However, besides being a

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facilitator, an Environment can also be seen as a regulator. Normative environments provide monitoring capabilities and enforcement mechanisms influencing agents' behaviour. Moreover, it also makes available relevant data important to feed contextual-dependent trust models which, as a consequence, influence future possible negotiations leading to new agreements. Finally, the Environment can also be exploited as representing the social medium in which relationships take place and, thus, to play a more active role in supervising both agent actions and behaviors. Acting as an encompassing society, the Environment can actively decide on imposing either fines or incentives trying to punish/reward behaviors that may be considered maleficent/beneficial for that particular society.

3 ANTE Platform

Grounded on the recognition of the Environment as a relevant component to give structure and support to situated MAS, we developed ANTE (Agreement Negotiation in Normative and Trust-enabled Environments) a framework in which agents can both establish agreements (and contracts) through supporting negotiation protocols and benefit from monitoring capabilities that guarantee transparency of joint activities. Through the development of ANTE software platform, we intended to illustrate how an active environment is indeed a crucial framework for safer, reliable and informed agents decision-making in which joint agreements is concerned [3] [4]. In ANTE the Environment actively mediates interaction among agents (enterprise or individual delegates), in different ways: (a) as a Facilitator by providing negotiation protocols, Ontology translation services and Contract building processes. In this perspective we can see it as an Interaction-Mediation level[2] supporting access to resources and mediating interaction between agents; (b) providing mechanisms for the normative enactment of the agreements generating normative states and monitoring them through both constitutive and institutional rules; (c) gathering relevant data on contract fulfilment and evaluating the enactment phase, progressively updating socio-cognitive based Trust models improving the partners' selection process; (d) Finally, seen as a social environment, it provides an adaptive deterrence mechanism changing fines according to the population behaviour.

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