

A Model for the Decision Phase of Autonomous Belief Revision in Open Multi-Agent Systems

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Abstract

A belief revision procedure is composed of four phases: detection of an inconsistency, identification of the culprit(s), decision of a context to be maintained and propagation of the chosen context in the belief base. In this paper, we present a model and an implementation for the decision phase of such a procedure, to be used in an *open multi-agent* context. By open MAS, we denote a system where agents may dynamically enter and leave the agency whenever they want, and where they cooperate with each other by proposing and accepting to form coalitions in order to achieve one of their goals. Agents must have therefore a *social reasoning mechanism*, which enables them to reason about the others. We consider that the procedure of coalition formation — if not well succeeded — may lead an agent to revise his beliefs about the others. This process is done *autonomously*, i.e., without any pre-established centralized control. Our model is based on the notions of *information source* and *information topic*. We have implemented this model within the agents of the DEPINT system. We present the simulation results of a running session of the system,

illustrating when and how such an *autonomous belief revision* procedure is carried out in an open multi-agent context.

Keywords: distributed artificial intelligence, agent-oriented programming, belief revision, open systems.

1 Introduction

In [33, 47, 27], the information processing environments of the future are presented as being composed of huge heterogeneous networks of processing resources. These resources, autonomous and distributed, may consist of computers, huge applications and huge databases. Particularly, in [47], the author states that in the future local copies of programs will not be needed: it will be sufficient to ask for a site responsible for the execution of a service to perform it and to send back the results. The author calls these environments “societies of objects”. A similar idea is presented in [27], denoted by the expression “electronic organizations”.

Let us call *agent* a processing resource like the ones described above¹. A system composed of these agents will have the following characteristics:

- *decentralized design*: the notion of a single designer (or a single team of designers) respons-

*The work described in this paper was partially developed during the author's PhD program at LIFIA laboratory, Grenoble, France, when he was supported by FAPESP, grant number 91/1943-5. The author would like also to thank Rosaria Conte and Cristiano Castelfranchi, IP/CNR, Rome, Italy, for the useful discussions carried on during this period.

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¹This definition of agent is obviously vague and poor, and it is being used exclusively to stress some essential aspects of this section. A complete formal definition may be found in [40].