Chapter 24
Agreement Technologies for Conflict Resolution

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ABSTRACT

Recently, artificial intelligence, has emerged as a new source of scientific works in conflict resolution. The interest in conflict resolution lies in diverse reasons. One of the main reasons is that computational systems have gradually shifted towards a distributed paradigm where heterogeneous entities should include computational conflict resolution mechanisms, such as proposed by agreement technologies. This chapter gives an overview of these technologies, which are needed in order to ensure the accomplishment of the global system goal and to solve conflicts. Among agreement technologies, automated negotiation is proposed as one key mechanism in conflict resolution due to its analogous use in human conflict resolution. Automated negotiation consists of an automated exchange of proposals carried out by software agents on behalf of their users. Another key technology is argumentation, which provides a fruitful means of dealing with conflicts and knowledge inconsistencies. Agents can reach agreements by engaging in argumentation dialogues with their opponents in a discussion.

INTRODUCTION

Agreement Technologies (AT) is a new discipline, which covers a range of specific techniques for dealing with interactions in dynamic, open environments (Ossowsky, 2013; Sierra, Botti & Ossowski, 2011). They address issues such as finding ways to negotiate, agree and cooperate with other agents, and developing appropriate means of forming and managing coalitions. These aspects are extremely related with the concept of conflict resolution. Conflict is an omnipresent phenomenon in human society, which is related with the necessity to achieve an agreement between entities. Conflict spans from individual

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decision making trade-offs such as deciding what to do next (sleep, eat, work, play), to complex scenarios including politics and business. Over the last decades, computer science has tried to study conflict from a computational perspective. Conflict is a ubiquitous phenomenon and arises in many areas of our lives. It arises and needs to be dealt with in social settings, such as a group of friends deciding on a vacation or contract negotiation in business and politics (Browder, 2000), as well as in individual settings related to action selection (e.g., how to weigh one's preferences and decide what product to buy). Even if we are not aware of it, we are continuously facing conflict and attempting to solve it.

Different proposals based on agreement technologies have been developed with conflict resolution as their main research goal. For instance, automated negotiation approaches have been proposed as set of algorithms and protocols whose mission is providing effective deals in electronic marketplaces (Jennings et al, 2001; Parsons, Rodriguez-Aguilar & Klein, 2011; Sanchez-Anguix, Julian, Botti, & García-Fornes, 2013). Researchers in argumentation aim to solve conflicts by means of dialogue games, speech particles and information rebuttal (Rahwan et al, 2003). Works in cooperation and coordination try to give a joint solution to a problem, usually with no global information or control (Rebollo, Carrascosa, & Palomares, 2014). Reputation is another way to solve conflicts when an entity must to decide about other entities (Pinyol, Sabater-Mir, 2013). Finally, agent organizations, inspired by the metaphor of human organizations, allow achieving global goals (and solve conflicts) by using norms, plans and structures formally specified (Argente et al 2011; Hübner, Sichman & Boissier).

This chapter explores in detail several works done in the area of agreement technologies, which can be used as a way to engage new conflict resolution approach along with new challenges to face by these technologies. During the chapter we discuss different types of agreement and agreement processes related to conflict resolution, describing and relating the different technologies and application areas involved. First, the different related technologies are briefly introduced. After this, a detailed analysis of negotiation and argumentation technologies is introduced in the following sections.

AGREEMENT TECHNOLOGIES

Open multi-agent systems are distributed systems where heterogeneous agents, with their own goals, can enter and leave the system during the life of the system (Hewitt, 1991). For instance, we can think of an electronic commerce platform as an open system where users, human or even automated software, act according to their own interests: in the case of sellers to maximize their own profits, and in the case of buyers to acquire some goods at relatively good price. Since agents have different goals, act based on their goals, and they can be heterogeneous (i.e., humans and software agents may show different behaviors), it is feasible to find situations where an agent's goals conflict with other agents' goals. If we refer ourselves to the example of electronic commerce, the buyer may want to buy the product at a low price, while the seller may want to maximize its revenue. In these situations, mechanisms that allow agents to coordinate, regulate their behavior, and solve conflicts are needed.

Electronic commerce is not the only application where conflict may make act of presence. For instance, in the last few years, grid computing (Foster, Kesselman & Tuecke, 2001) has emerged as a new paradigm of computation where different entities collaborate to accomplish several tasks. In grid computing, entities share several resources: from hardware resources (e.g., computing nodes) to software resources (e.g., services). How should those resources be distributed among the different tasks or users of the system? Presumably, users want the best response time for their tasks, and resource owners want