

Chapter 3

Strategies for Agent-Based Negotiation in E-Trade

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ABSTRACT

E-negotiation handles negotiation over the Internet without human supervision and has shown effectiveness in concluding verifiable and more favorable agreements in a reasonably short time. In this chapter, the authors discuss the negotiation system and its components with particular emphasis on negotiation strategies. A negotiation strategy defines strategic tactics, which advise on the proper action to select from a set of possible actions that optimizes negotiation outcomes. A strategy should integrate negotiation goals and reactive attitudes. Usually, a fixed strategy is implemented during the course of negotiation regardless of significant decision-making factors including market status, opponent's profile, or eagerness for a negotiated goods/service. The chapter presents the main negotiation strategies and outlines the different decision-making factors that should be considered. A strategy uses a utility function to evaluate the offer of an opponent and advises on the generation of a counter offer or the best interaction. The authors finally discuss different utility functions presented in the literature.

INTRODUCTION

Negotiation is a process in which two or more parties have conflicting requirements in terms of goals and demands and try to reach mutual agreement through concession or change in re-

quirements (Pruitt, 1981). E-negotiation refers to negotiation conducted over the Internet and has been proposed to facilitate negotiation and generate better outcomes. It is an automated process that tries to optimize utilities of negotiating entities through iteration. It facilitates negotiation

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through the Internet as being free from place and time constraints. It also saves negotiators time and effort they usually spend in trying to reach an agreement.

E-negotiation is a hot research topic and represents a strategic stage in e-commerce (Sandholm, 1999). It manages beliefs and goals of interacting parties, and tries to resolve conflicts through concessions and search for affordable and acceptable alternatives (Calisti, 2002). It overcomes limitations of human negotiation that suffers from emotional, rational, or superficial responses. It also keeps a record of negotiation traces for later verification or jury cases. Moreover, it offers much broader market search and results in error-free calculations that promote customer satisfaction and trust in E-negotiation.

E-negotiation can be fully automated through the deployment of software intelligent agents. Agents can autonomously carry out negotiation on behalf of negotiating entities. Agents can be stationary or mobile. Agent-mediated negotiation has recently received much attention (Faratin et al., 1998; Kraus & Lehmann, 1995; Fatima et al., 2002, 2004; Luo et al., 2003; Li & Tesauro, 2003; Sandholm, 1999). The implementation of mobile agents in E-negotiation has shown that they are more efficient than stationary agents as they exhibit distinctive characteristics (Chen et al, 2008): (1) ability to reduce network loads; (2) dynamic adaptation to changes in the environment; (3) ability to overcome network latency; (4) asynchronous and autonomous execution. Hence, mobile agents have been recommended for E-negotiation (Faratin et al., 1998; Kraus & Lehmann, 1995).

Negotiation is a vital component of electronic trading. It is the key decision-making approach used to reach consensus between trading partners. Mobile agents have recently been proposed for negotiation in electronic trading applications. Agents are deployed to act on behalf of consumers and vendors roaming the Internet, negotiating their particular requests with various service providers,

and making decisions autonomously. They have shown effectiveness in automating human decisions such as concluding verifiable agreements, facilitating global trading, and optimizing clients' utilities. Moreover, they ensure timely delivery of services/resources, and less resources allocation.

Negotiation can be classified based on the number of participants as one-to-one, one-to-many, or many-to-many. They can negotiate a single issue or multiple issues. Also, they may negotiate multi-attributes of a particular issue. Negotiation can be bilateral or unilateral. During the course of negotiation, mobile agents are expected to receive offers from service providers and would accordingly respond with counter offers based on a predefined set of rules referred to as negotiation strategy. The strategy makes decisions based on preferences, constraints the negotiating entity has initially set. Preferences can be such as a non-stop route flight, and constraints can be such as price limit, warranty period, or bid deadline. Negotiation strategies vary from patient, desperate, to partially patient strategies. Negotiation strategies have a significant effect on the outcomes of negotiation and, thus, mobile agents seek negotiation strategies that optimize the utility of a negotiating entity.

In this chapter, we address agent-based negotiation strategies in e-Trade. We first present a background on E-negotiation and its real applications, interaction styles, and characteristics. We then describe E-negotiation system and related components including negotiation models and negotiation procedures. We then describe the different architectures of E-negotiation system. Next, we outline the different E-negotiation parameters including issues, attributes, preferences, and constraints with particular focus on temporal constraints. We then discuss different negotiation strategies and the two implemented tactics including the concession tactic and the search for alternatives tactic. We also discuss the different approaches for selecting a negotiation strategy. Finally, we present utility functions for multi-issue price-based negotiation and multiple

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