

Chapter IV

Agent-Based Matching of Demands and Supplies in Business Transactions Formation

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ABSTRACT

The theme of this chapter includes topics of matching, auction, and negotiation. We have shown that the knowledge of game theory is very important when designing an agent-based matching or negotiation system. The problem of bounded rationality in multi-agent systems is also discussed; we put forward the mechanism design and heuristic methods as solutions. A real negotiation scenario is presented to demonstrate our proposed solutions. In addition, we discuss the future trends of the agent technology in the e-commerce system.

INTRODUCTION

Since the commercialization of the Internet and the introduction of the World Wide Web in the early 1990s, e-commerce (EC) has expanded quickly. However, since 2000, there was a major shakeout in EC activities when hundreds of dot-com companies went out of business. By 2003,

EC has continued its steady progress. Today, the Internet has changed the nature of the supply chain and created significant need for electronic markets. Therefore, most medium and large organizations and many small ones are now closely involved in e-commerce. The field of e-commerce is broad. Various business-to-consumer (B2C) and business-to-business (B2B) activities, such

as e-auctions, e-marketplaces, and e-services, are mushrooming. The introduction of agent technology into the trading mechanism has improved efficiency and autonomy of the trading systems. Taking e-auctions as an example, bidding proxies have become a standard trading mechanism for auction participants.

The topics of matching, auction, and negotiation are the theme of this chapter. We assume predefined product/service ontology to exclude the need of Google-styled searching. The matching of descriptions of demands and supplies is integrated in a generic agent negotiation process, with non-negotiable terms treated as specific types of demands/supplies descriptions. The matching of negotiable demands/supplies descriptions can be quite difficult, especially when the matching involves multiple negotiating parties and multiple negotiable issues (not only prices). Agents on behalf of humans not only have to interact strategically to gain advantages in a negotiation but also have to be able to compute their chance of winning within a reasonable time. More efficient and strategy-proof mechanisms can be introduced to facilitate the negotiations; however, game-theoretic issues must be considered in the design of the agent-based trading mechanism.

The sections are arranged as follows. The second section gives background information regarding agents in e-commerce. The issues of designing negotiation agents for e-commerce are discussed in the third section. The fourth section summarizes generic solutions to the proposed issues. A real negotiation problem and its agent system designing based on the proposed solutions are presented in the fifth section. The sixth section is future trends, and conclusions are given in the last section.

BACKGROUND

Agents in E-Commerce

In e-commerce, there is a broad range of issues including security, trust, reputation, law, payment, advertising, electronic product catalogs, intermediaries, shopping experiences, and back-office management to be addressed (Guttman, Moukas, & Maes, 1999). Agent technologies can be applied to these areas where a personalized, continuously running semi-autonomous behavior is desirable. Certain characteristics determine to what extent agent technologies are appropriate, for instance, the money and time saved from partially automated processes, the risks of making a sub-optimal transaction decision, the consequences for missed opportunities, and so forth. It is suggested that exploring the roles of agent as mediators in e-commerce in the context of a common model could be useful for the research of agents in e-commerce (Guttman et al., 1999).

Some descriptive research, such as the Nicosia model (Nicosia, 1996), the HowardSheth model (Howard & Sheth, 1969), the EngelBlackwell model (Engel & Blackwell, 1982), the Bettman information processing model (Bettman, 1979), and the Andreasen model (Andreasen, 1965), attempts to capture consumer buying behavior using a model. Guttman et al. (1999) identify six common fundamental stages among the models. The six stages are potential areas to which agent technologies apply, and are briefly described in the following.

1. **Need identification:** In this stage, consumers are becoming aware of some unmet need, probably stimulated by product information.

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