Chapter 10
Cognitive Parameter Based Agent Selection and Negotiation Process for B2C E-Commerce

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ABSTRACT

Multi-agent paradigms have been developed for the negotiation and brokering in B2C e-commerce. Few of the models consider the mental states and social settings (trust and reputation) but rarely any model depicts their combination. In this chapter, a combined model of belief, desire, intention (BDI) for agent's mental attitudes and social settings is used to model their cognitive capabilities. The mental attitudes also include preferences, commitments, along with BDI. These attributes help to understand the commitment and capability of the negotiating agent. In this work, we present three mathematical models. First, a cognitive computational model is used for the computation of trust, and then index of negotiation, which is based on trust and reputation. The second computation model is developed for the computation of business index that characterizes the parameters of some of the business processes, which match the buyer's satisfaction level. On the basis of index of negotiation and business, we calculate SI (selection index) to select a seller agent with the highest value of SI. The third computation model of utility is used for negotiation between seller and buyer to achieve maximum combined utility increment (CUI), which is the difference of marginal utility gain (MUG) of buyer and marginal utility cost (MUC) of seller.

INTRODUCTION

Multi-agent paradigms have been developed for the negotiation and brokering in B2C e-commerce. Few of the models consider the mental states and social settings (trust and reputation) but rarely any model depicts their combination. By increasing the degree and the sophistication of

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the automation on both the buyer (contractee) and the seller (contractor), benefit to both can be enhanced. Various Multi-agent models have been developed; V Robu and C Jonker (Jonker, Robu, Treur, 2007) introduced component-based generic agent architecture for integrative multi-attribute negotiation, a negotiation strategy that has proved itself in experiments with human.

Some issues of engineering agents that partially automate some of the activities of information brokering in e-commerce (Mong, Sim, 2000) focuses on addressing the problem of connecting buyers and sellers. The process of matching and connecting buyers and sellers is divided in four stages: selection, evaluation, filtering and assignment. Trading agent have been developed which can either take or reject recommendations made by the broker agent (Suwu, 2001). They can also provide feedback to the brokering test bed by indicating their satisfaction level. Users' satisfaction will be used as one of the evaluation criteria of the agent-based information brokering with multiple connections for a request or an advertisement.

A multi-agent artificial market system, whose software broker agent can learn to build a relatively long-term trust relationship with their clients, the goals of these broker agents are not only to maximize the total revenue subject to their clients' risk preference as most other agents do but also to maximize the trust they receive from their clients. Social settings such as trust, reputation and mental states of buyer, seller and broker may be used individually or in combination in agent based model. In general, various trust models have been proposed with different components for different purposes.Chandrasekharan and Esfandiari (2001) model is based upon the cognitive approach in which trust and reputation are function of beliefs. Their trust acquisition network performs Bayesian learning. In the model proposed by Schillo et al. (2000), trust is based upon probability theory that deals with Boolean impression: good or bad. The trust model of Hailes (2000) is based upon the information of witness. A trust model, based upon the most recent experiences and historic information uses probabilistic computational model of Dempster-Shafer theory Yu and Singh (2001). Castelfranchi and Falcone (1998) proposed a cognitive trust model based upon the mental background of delegation. In their trust model, trust is a set of mental attitudes which prefers another agent doing the action. It is based upon agent's intentions of doing an action. Trust is introduced into I-TRUST (Tang, Winoto, Niu, 2003) as a relationship between clients and their software broker agents in terms of the amount of money they are willing to give to these agents to invest on their behalf. Broker agents are benevolent (i.e. they will not cheat their clients!); each client can only have one broker agent at one time.

Reputation is considered on the basis of two users rating in the modal Sporas (Zacharia, 1999; Sabater, Sierra, 2005). Histos (Zacharia, 1999; Sabater, Sierra, 2005) reputation model is based upon the use witness information i.e. the most recent experience with the agent that is being evaluated. Carter et al. (2002) have calculated the reputation value for each agent by a centralized mechanism that monitors the system. Therefore, the reputation value of each user is a global measure shared by all the observers. In our model reputation is based on only broker's rating of respective seller.

Shoham defines an agent to be "an entity whose state is viewed as consisting of mental components such as beliefs, capabilities, choices, and commitments (Shoham, 1993). A generic classification of an agent's attitudes is defined as follows: Informational attitudes i.e. Knowledge and Beliefs, Motivational attitudes i.e. Desires and Intentions, Commitments (Frances, Barbara, Treur, Verbrugge, 1997).

Few attempts by researchers are made to develop a computational model which integrates social settings and mental states of agents for the performances of some processes in B2C e-commerce. For example, MAGS, a monitoring multi-agent system for the management of business process