Multi-Agent Negotiation Paradigm for Agent Selection in B2C E-Commerce

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ABSTRACT
Multi-agent system (MAS) model has been extensively used in the different tasks of E-Commerce such as customer relation management (CRM), negotiation and brokering. The objective of this paper is to evaluate a seller agent’s various cognitive parameters like capability, trust, and desire. After selecting a best seller agent from ordering queue, it applies negotiation strategies to find the most profitable proposal for both buyer and seller. This mechanism belongs to a semi cooperative negotiation type, and selecting a seller and buyer agent pair using mental and cognitive parameters. This work provides a logical cognitive model, logical negotiation model between buyer agent and selected seller agent.

Keywords: B2C, Desire, E-Commerce Agents, Multi-Agent, Negotiation, Trust

INTRODUCTION
E-Commerce is the movement of business onto the World Wide Web (WWW). This movement has been broken up into two main sectors: business-to-business (B2B) and business-to-customer (B2C).

An agent is a software program that acts flexibly on behalf of its owner to achieve particular objectives. Buyer agent gives instructions to its agent to fulfill his all needs. An agent must be a good listener, analyzer and cooperative in nature; as well as has the quality of good coordination, good communication and negotiation with other agents (Jennings et al., 2003).

Hence the software agent should be autonomous, reactive and proactive.

Multi agent system (MAS) model has been extensively used in the different tasks of E-Commerce such as CRM, negotiation and brokering. A survey report provided by international data group (IDG) by its subsidiary IDC (http://www.idc.com), estimates that the global market for software agents grew from $7.2 million in 1997 to $51.5 million in 1999, and that it will reach $873.2 million in 2008. IDC also assumes that the dramatic growth in B2B e-commerce will accelerate the demand
for agents. BargainFinder (Krulwich, 1996) was the first system of this kind to employ agents and it operated in the following way: If a customer wants to buy a music CD, BargainFinder will launch its agent to collect the prices from a predefined set of CD shops, and then it will select the CD with the lowest price for the customer. Another similar example is Priceline (http://www.priceline.com), which carries out the same set of tasks for airline tickets, hotel rooms, and cars. Agent-based E-Commerce solutions are also available such as the Lost Wax E-Commerce Platform (http://www.lostwax.com) supports buyers and sellers in both public and private trading environments and the agent-based modules can represent differing trading mechanisms (such as auctions, contracting, and negotiation). Lost Wax has worked with a number of leading companies operating trading systems in a variety of sectors. The living markets platform (http://www.living-systems.com) is an agent-based product for real-time optimization of processes in business networks. Various Multi-agent models have been developed e.g. Chan, Cheng, and Hsu (2007) introduced an autonomous agent that represents the owner of an online store to bargain with customers. They consider that customers’ behaviors are different, and the store should identify a customer’s characteristics and apply different tactics to make profits from customers. Various customer orientation based models (Lee & Park, 2005; Bae, Ha, & Park, 2002) have proposed a survey based profitable customer segmentation system that conducts the customer satisfaction survey and deploy mining processes for the profitable customer segmentation.

Our approach focuses on the problem description and the basic definition of different types of agents. In this part, we define “Agent Model” in 3-stages: (1) need identification, (2) brokering (product brokering and merchant brokering), (3) negotiation. In the remainder of the paper, we present our work on agent selection and negotiation. We first describe our models. The major parts of the flow charts that implement the models are described also. Empirical validation and Evaluation is described in next part. Results of various experimentations are shown in later. Finally conclusions of the work are described.

**PROBLEM DESCRIPTION**

The process of brokering as often occurs in E-Commerce involves a number of agents. A buyer agent looking for products may be supported by a broker agent that takes its buyer agent’s queries and contacts other agents or looks at the web directly to find information on products within the buyer agent’s scope of interest.

The proposed model consists of three stages of CBB (Consumer Buying Behavior) model of B2C E-Commerce (Jennings et al., 2005). These stages are: need identification, seller selection and negotiation. In the first stage need identification tells the buyer agent recognizes a need for some product through a profile. This profile may be appearing to broker agent in many different ways. Secondly the seller selection involves the “broker agent” to determine what product is to be bought to satisfy this need and finding the seller that offered item at desired price. The main techniques used by the brokers in this stage are (1) feature-based filtering i.e. item based on brand and quality (2) constraint-based filtering i.e., the agent specifying price range and date limit. In agent mediated E-Commerce context it is common for seller agents to have capabilities, commitment and trust for processing the new business. Third stage “negotiation” requires negotiating the terms and conditions under which the desired items will be delivered. Automated negotiation capabilities are essential for the automated B2C E-Commerce. The buyer agent contacts with broker agent, the broker agent determines the desire (wishes) of the buyer agent. Then the broker matches products and sellers and selects one of the best proposals. The broker agent negotiates with seller agent on behalf of buyer agent to obtain best deal which satisfies both parties.
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