

Agent-Based Negotiation in E-Marketing

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INTRODUCTION

This article describes in brief the design of agent-based negotiation system in e-marketing. Such a negotiation scheme requires the construction of a suitable set of rules, called protocol, among the participating agents. The construction of the protocol is carried out in two stages: first expressing a program into an object-based rule system and then converting the rule applications into a set of agent-based transactions on a database of active objects represented using high-level data structures.

BACKGROUND

An agent is a code-containing object, that along with data and execution context can migrate autonomously and purposefully within a computer network. Thus an agent knows what to do with the information obtained from its environment. Agents behave like actors and have intentions and actions. In addition, agents are flexible, proactive and have multithreaded control. In this overview, we describe in detail how a set of agents can be used for negotiation in e-marketing. For this purpose we need to have a model of the multi agent-based paradigm for executing the negotiation process analogous to what we humans do. Negotiation is an interactive process among a number of agents that results in varying degrees of cooperation, competition and ultimately to commitment that leads to a total agreement, consensus or a disagreement. It has many applications, including economics, psychology, sociology and computer science.

MAIN THRUST OF THE ARTICLE

The following subsections bring out the main thrust of this chapter, namely: what is a multi-agent system, what is planning, reasoning and negotiation, and how agents can be useful in modeling e-market and e-auction. Also we will briefly describe how a coalition among agents can cause a speculation bubble or a crash in e-share market.

A MULTI-AGENT SYSTEM

A simple model of an agent that is suitable for our purpose is shown in Figure 1. This is a unified model based on several important contributions made by the following authors: (Chen & Dayal, 2000; Dignum & Sierra, 2001; Fisher, 1995; Genesereth & Nilsson, 1987; Ishida, 1994; Murthy, 2002; Woolridge, 2002).

As shown in Figure 1, an agent consists of the following subsystems:

- (1) Worldly states or environment U : Those states which completely describe the universe containing all the agents.
- (2) Percept: Depending upon the sensory capabilities (input interface to the universe or environment), an agent can partition U into a standard set of messages T , using a sensory function Perception (PERCEPT): $\text{PERCEPT} : U \rightarrow T$.
PERCEPT can involve various types of perception: see, read, hear, smell. The messages are assumed to be of standard types based on an interaction language that is interpreted identically by all agents.
- (3) Epistemic states or Mind M : We assume that the agent has a mind M (that is essentially a problem domain knowledge consisting of an internal database for the problem domain data and a set of problem domain rules) that can be clearly understood by the agent without involving any sensory function. The database D sentences are in first order predicate calculus (also known as extensional database) and agents' mental actions are viewed as inferences arising from the associated rules that result in an intentional database, which changes (revises or updates) D .
The agent's state of belief, or a representation of an agent's state of belief at a certain time, is represented by an ordered pair of elements (D, P) . D is a set of beliefs about objects, their attributes and relationships stored as an internal database and P is a set of rules expressed as preconditions and consequences (conditions and actions). When T is input, if the conditions given in the left-hand side of P match T , the elements from D that correspond to the right-hand side are taken

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