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MoCAAS: auction agent system using a collaborative mobile agent in electronic commerce

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Abstract

To get the items that a buyer wants in an Internet auction, he must search for the items through several auction sites. When the bidding starts, the buyer needs to connect to these auction sites frequently so that he can monitor the bid states and re-bid. A reserve-price auction reduces the number of connections, but this limits the user's bidding strategy. Another problem is equity between the buyer and the seller. Both the buyer and the seller should profit within proper limits. In this paper, we propose an auction agent system using a collaborative mobile agent and a brokering mechanism called MoCAAS (Mobile collaborative auction agent system), which mediates between the buyer and the seller and executes bidding asynchronously and autonomously. This reduces the network load more than with other auction-agents, offers more intelligent bidding, and increases the clear ratio.

Keywords: Mobile collaborative auction agent system; Reserve-price; Auction

1. Introduction

Though ECs technology has grown steadily, it is still difficult to implement the negotiation between a buyer and a seller online. The Internet auction has been widely expanded as an alternative solution (Lee, Choi, Kim, & Lee, 1999). However, to search for items, monitor bid states, and re-bid, users need to connect to the auction site frequently. Also, first-time buyers do not know bidding strategies nor an item's value; therefore a competitor may cheat them, and they may lose the chance to buy items at a cheaper price. As a result, they may not buy the items that they want, or they may pay too much.

When the above problems are solved, the Internet auction will become a generalized EC market. Thus, in this paper, we propose an auction agent system called MoCAAS (Mobile collaborative auction agent system), which mediates between the buyer and the seller and executes bidding autonomously for the buyer. When a buyer submits a reserve-price and the identity of an item, the agent searches for the item among registered auctions. It then recommends auctions to the buyer and informs the buyer of the expected price for the item. When the buyer selects the best among the recommended auctions, the agent executes bidding for the buyer.

This section of our paper presents an overview of the MoCAAS system and its benefits. Section 2 presents an overview of the auction, the auction agent, and the collaborative mobile agent. Section 3 presents the architecture and workflow of MoCAAS. Section 4 presents the bidding processes of MoCAAS. Section 5 presents the brokering algorithm of MoCAAS. Section 6 reports experimental evaluation results. Finally, Section 7 presents a brief summary and future considerations.

2. Related works

2.1. The English auction

The 'auction' is the buying and selling of property through public bidding. The 'English auction' is the most common and simplest type of auction.[1] Sotheby's and Christie's use this method for auctioning fine art. This is the method used at most Internet auction sites. In the English auction, the auction house will take bids in ascending order, and a bidder must bid more than the 'going price'. The highest bidder receives the item and pays for the item. The English auction is called 'open' because every bidder knows all of the other bids and 'ascending' because each bid must be higher than the one before. The method works with both

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[1] Auctus development Inc. (http://www.auctusdev.com/)

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single unit and multiple unit auctions. For example, if a case of coffee mugs is being auctioned and the bidders have to bid on the whole case, then this would be a single unit auction. If bidders can buy individual coffee mugs, then this is a multiple unit auction. In this paper, we set the English single auction as the target.

2.2. Other auction agent systems

Several auction sites have solutions that offer a convenience to the users. eBay uses a reserve-price auction method. This allows the user to enter a reserve-price. As long as the auction is open and the user's reserve-price has not been reached, the agent bids the minimum amount necessary to become the highest bidder. However, this limits the user's choice of bidding strategy and may involve taking into account the effect of the 'winner's curse'. The winner's curse is the difference between the amount the winner paid and the next lower bid.[1] If the bidder bids the perceived valuation of the item and wins, the bidder will know that he paid too much because others valued the item less. To solve this problem, the agent allows the user to coordinate bids across multiple auctions automatically and select a bidding strategy (Sandholm & Huai, 2000).

Nomad (Sandholm & Huai, 2000) and Magnet (Steinmetz et al., 1998) are auction agents using a mobile agent mechanism. A mobile agent has the unique ability to transport itself from one system to another. This ability allows mobile agents to execute asynchronously and autonomously. Also, the mobile agents communicate with one another. Because of this ability, the auction agent using a mobile agent is smarter than the reserve auction agent. Thus, the agents track bids in multiple auction houses in order to look for the best deal and/or coordinate the user's bids in the different auctions. However, these systems are inadequate when brokering between buyers and multiple auction sites. Much more network load is needed to compare one auction site to other auction site each bid time. Also, an individual agent cannot know all the auction conditions over multiple auction sites.

3. Architecture and workflow

MoCAAS consists of five main components:

- a buyer-agent,
- a broker-agent,
- a bid-agent,
- an auctioneer-agent.

The architecture of a MoCAAS is shown in Fig. 1. The buyer-agent offers a buyer interfaces for querying the broker-agent, specifying the bid-agents, controlling the bid-agents. An interface for querying the broker-agent shows a recommended auctioneer list and the expected price of

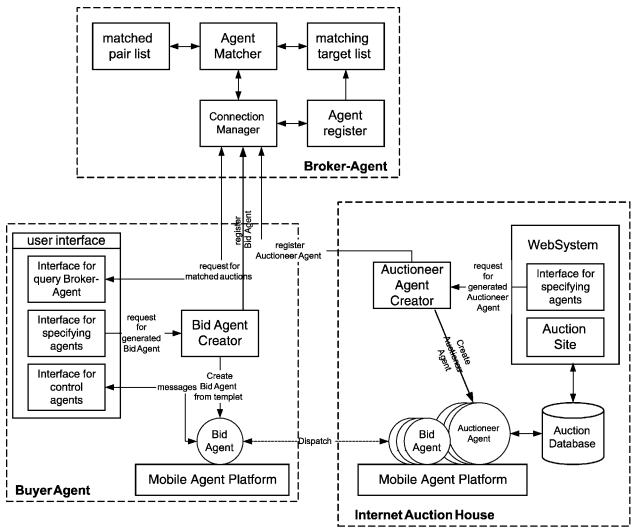

Fig. 1. MoCAAS architecture.

the item. An interface for specifying agents sends a bid-agent creator the information for creating the bid-agent. (Bidding strategy type, bidding schedule, etc.) Then, the bid-agent creator creates the bid-agent from a template and registers the bid-agent with the broker-agent. An interface for control agents allows the user to communicate with the bid-agent and controls the bid-agent's behaviors.

The broker-agent matches the buyers and the auctioneers, and informs buyers of the expected price of an item. A connection manager forwards messages to an agent register or an agent matcher. If the message comes from the buyer-agent and the message is a query for recommending the auctioneer-agent, the connection manager forwards the message to the agent matcher. If the message comes from the buyer-agent or the Internet auction house and the message is a request for registering the agent, the connection manager forwards the message to the agent register. The agent register registers agents with the matching target list. The agent matcher matches a buyer-agent and an auctioneer-agent. It inserts a matched pair into the matched pair list. The matched pair list contains buyer-seller pairs and expected price values.

The Internet auction house is the place that auctions are processed. An interface for specifying agents sends a request for a generated auctioneer-agent to the auctioneer-agent creator. The auctioneer-agent creator creates the auctioneer-agent from a template and registers the auctioneer-agent with the broker-agent. The created auctioneer-agent waits for the bid-agent in a mobile agent platform.

These agents collaborate with each other in order to execute an auction. When a new auctioneer-agent is created, it registers itself with a broker-agent. (1) The buyer submits the item's identity and reserve-price to the buyer-agent. (2) The buyer-agent submits the data received to the broker-agent. (3) The broker-agent searches for a recommendable auctioneer-agent and computes the expected price, then