BiddingBot: A Multiagent Support System for Cooperative Bidding in Multiple Auctions

Takayuki ITO   Naoki FUKUTA   Toramatsu SHINTANI   Katia SYCARA
Dept. of Intelligence and Computer Science,
Nagoya Institute of Technology,
Gokiso, Showa-ku, Nagoya,
466-8555 JAPAN.
{itota,fukuta,tora}@ics.nitech.ac.jp

The Robotics Institute,
Carnegie Mellon University,
5000 Forbes Ave., Pittsburgh,
PA 15213-3890 USA.
katia@cs.cmu.edu

Abstract

Online auctions are becoming an increasingly important channel for electronic commerce. There exist more than 150 online auction sites on the Internet. It is difficult for users to attend, monitor, and bid at multiple auction sites simultaneously. In this paper, we propose BiddingBot which is a multi agent system that supports users in attending, monitoring, and bidding in multiple auctions. BiddingBot monitors prices of goods in several online auction sites to get reasonable market prices of goods, and uses a new cooperative bidding mechanism to effectively bid in auctions.

1 Introduction

Online auctions are becoming an increasingly important channel for electronic commerce on the Internet. There exist more than 150 online auction sites on the Internet: eBay, Onsale, Yahoo! Auctions, and so on. Agent-mediated electronic commerces have recently commanded much attention[1]. Agents can act autonomously and cooperatively in a network environment on behalf of their users. It is hard for users to attend, monitor, and bid at the multiple auction sites simultaneously. In this paper, we propose *BiddingBot*, a system which can support bidding to several auction sites simultaneously.

In general, most of online auctions are classified into common-value auctions. For example, auctions for personal computers and cars are common-value auctions, because we can see a market price as a common valuation among bidders. In the case of a common-value auction, a bidder who wins an auction is the one with the most optimistic information. We call this the **winner's curse**. Therefore, in common-value auctions, it is an advantage to know real valuations of an item, since a bidder avoids the winner's curse if she knows a correct valuation (i.e. a market price) of an item. In *BiddingBot*, to predict a market price of an item, agents simultaneously monitor prices of the item in several online auction sites.

The paper consists of five sections. In section 2, we describe the outline of the *BiddingBot*. In section 3, we propose a cooperative bidding mechanism among agents. In section 4, we present experimental results. In section 5 we make some concluding remarks.

2 The Outline of *BiddingBot*

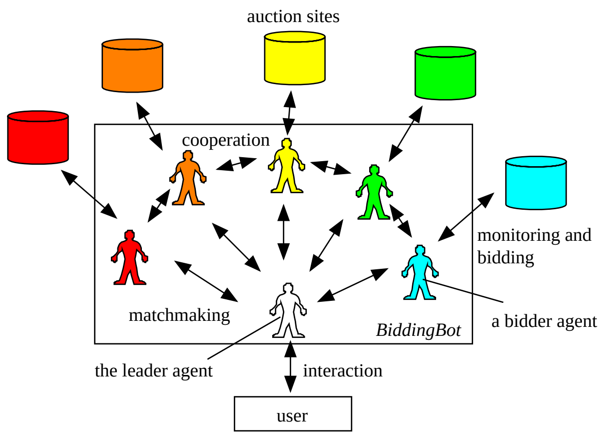

Figure 1. The system architecture

Figure 1 shows the architecture of *BiddingBot*. *BiddingBot* consists of one *leader agent* and several *bidder agents*. Each of bidder agents is assigned to an auction site. Bidder agents cooperatively gather information, monitor, and bid in the multiple auction sites simultaneously. The leader agent facilitates cooperation among bidder agents as a matchmaker, sends the user's request to the bidder agents, and presents bidding information to the user. In *BiddingBot*, each of bidder agents is specified to her auction site and can behave as a flexible wrapper, since the different auction sites represent information in different forms.

The bidding support process consists of the following five steps: (1)The user inputs keywords describing the desired item to the system. (2)The bidder agents gather the reasonable market price on the item by gathering information based on the keywords. (3)The users decide a valuation on the item based on the item's approximate market price. (4)The bidder agents cooperatively bid to the several auction sites. (5)The leader agents inform the user whether the item can be awarded or not.

3 Cooperative Bidding Among Agents

In this section, we propose a cooperation protocol among agents for bidding at multiple auction sites as follows.

(Step 1) Bidder agent a_i sends a proposal $Propose(new\_bid)$ to a leader agent, in order to get information regarding a bidder agent who is currently bidding.

(Step 2) A leader agent checks whether or not a new bid is possible. If there exists no bidder agent who is currently bidding and her bid is the highest price in an auction site, the leader agent sends an "Accept(new_bid)" message to the a_i. Go to (Step 5). If there exists a bidder agent $a_{bidding}$ who is currently bidding and her bid is the highest price in an auction site, if cancellation is possible at the auction site, the leader agent replies with the ID of the $a_{bidding}$. Go to (Step 3). If cancellation is impossible, the leader agent replies with a message $Reject(new\_bid)$ to the a_i. Go to (Step 5).

(Step 3) The bidder agent a_i sends a proposal message $Propose(new\_bid)$ to the bidder agent $a_{bidding}$ in order to propose the new bid new_bid.

(Step 4) The bidder agent $a_{bidding}$ receives the proposal $Propose(new\_bid)$. Firstly, the $a_{bidding}$ evaluates the received bid new_bid and her own bid now_bid. Secondly, based on the evaluation, if she can accept the proposal, she sends the $Accept(new\_bid)$ message to the a_i, and cancels her own bid. If not, she sends the $Reject(new\_bid)$ message to the a_i,

(Step 5) The bidder agent a_i receives the reply message. If the reply message is $Accept(new\_bid)$, the a_i asks her user whether she can bid or not. If she can, the bid new_bid is made. The a_i informs then the leader agent that she is now bidding. If the reply message is $Reject(new\_bid)$, the bid new_bid is deleted.

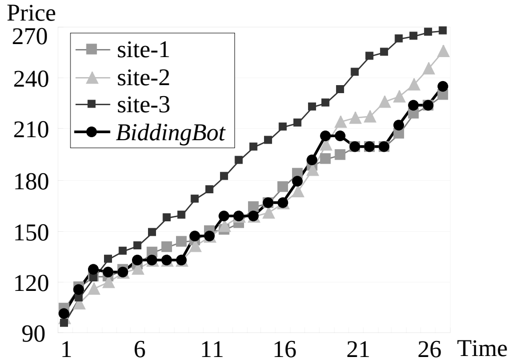

Figure 2. An experimental result

4 Experimental Results

In order to show how effectively the cooperative bidding mechanism can work, we conducted an experiment in the following setting. There exist online auction sites, site-1, site-2, and site-3. In these sites, the bidding price starts from 90 yen plus β (β is a small random value), and the bidding price is increased in every 1 time unit. *BiddingBot* makes a bid to the auction sites. Figure 2 shows the result of the experiment. As shown in Figure 2, it is almost certain that *BiddingBot* can bid in an auction site in which a bidding price is the cheaper than the other sites. This means that the cooperative bidding mechanism proposed here effectively bid in multiple auctions.

5 Conclusions

In this paper, we proposed a multi-agent cooperative bidding mechanism in the *BiddingBot*, which can support users in attending, monitoring, and bidding in several online auction sites on the Internet. In *BiddingBot*, in order to avoid "winer's curse," agents monitor several aution sites and gather information on the market price. Since it is hard for users to monitor, attend, and bid in multiple auctions simultaneously, agents in *BiddingBot* can cooperatively monitor, attend, and bid on behalf of the users. The results of our current experiments demonstrate that the cooperative bidding mechanism proposed here effectively bid in multiple auctions.

References

[1] R. H. Guttman, A. G. Moukas, and P. Maes. Agent-mediated electronic commerce: A survey. *The Knowledge Engineering Review*, 13(2):147–159, 1998.

[2] E. Rasmusen. *Games and information, an introduction to Game Theory*. Blackwell Publishers, Inc., 1989.