



Auction using Multi-Agent System

Ajitha S¹, Maruthi Prasad², T V Suresh Kumar³

Ramaiah Institute of Technology, Bangalore, Karnataka, India^{1,2,3}

Abstract: An Auction is a process of buying and selling goods or services by offering them up for bid, taking bids, and then selling the item to the highest bidder. In some cases, an auction may refer to any mechanism or set of trading rules for exchange. An auction is a procedure of buying and selling goods or services by bid and then selling the item to the highest bidder. Currently there are different strategies and many auction methodologies like English auction, Dutch auction, Sealed bid auctions and so on. In this paper, we introduce one such methodologies called the blind auction its simple predefined bidding ways for auction agents and bidding agents. To illustrate the feasibility of our approach, we implemented an agent- based auction systems demonstrating how agent based blind auctions generally happen using JADE, and illustrated how a flexible and complex bidding strategies can be precisely specified and efficiently executed.

Keywords: Agents, Multi-Agent, Auction, Bidding, JADE.

I. INTRODUCTION

Most popular e-commerce activities in recent years have been using the online systems. Among the various auction types, the first-price sealed-bid auction or blind auction has been taken under consideration for this paper. As the number of users and products increases, more time is required for a user to search and bid for an auctioned item. To deal with this problem, agent- based online market come into play. An agent based online auction system is a multi-agent system that comprises software agents to handle tedious tasks on behalf of human users. Each agent is autonomous and capable of taking actions to full fill its goal. Thus, in an agent based online auction system, an agent can be used to represent a user to search and bid for a product. The English auction on the other hand has been used for more formal or straight (e.g., eBay) due to its characteristics of multiple bids and ascending bidding price, where in the bidders would bid seeing the other bidders bid amount until certain period of time. However, with the rapid rise in the number of users, fake behaviors in online auctions become more and more severe. The Times recently revealed that biddings were very common one Bay [1,2,3]. In a blind auction system, the bidder prices are hidden, where in each bidder would send a sealed bid to the auctioneer without the knowledge of other bidders price. Thus, whoever bids for the product first above the initial price wins the bid and it is completely left to the auctioneer in clear judgment of who won the auction.

In this paper, we propose a blind auction implementation using JADE framework showing how each some of the agents like auctioneer agents, bidding agents work along the way.

The rest of this paper is organized as follows. Section 2 discusses about related work. Section 3 describes agent based online auction systems. Section 4 discuss the

methodology adopted for implementation. Section 5 discusses the results of implementation using JADE technology. Section 6 provides conclusions and future work.

II. RELATED WORK

The software agents and Multi-Agent Systems (MAS) are used in many real time problems. The author in [4] explains well the concepts of MAS and its applications in the real world. The usage of cooperative agent and peer to peer agent for the application of trading is discussed in [5, 6]. They found that peer-to-peer auctions are able to display price convergence behaviour similar to that of centralized auctions. The system can be used as a test bed for online auctions; however, it may have problems with secrecy and manipulation of bids. JADE (Java Agent Development Framework) is a software development framework aimed at developing multi-agent systems and applications conforming to FIPA standards for intelligent agents. It includes two main products: a FIPA-compliant agent platform and a package to develop Java agents. JADE has been fully coded in Java and an agent programmer, in order to exploit the framework [7].

In this approach author talks about the growth in networked information resources which requires information systems that can be distributed on a network and interoperate with other systems. Such systems cannot be easily realized with traditional software technologies because of the limits of these technologies in coping with distribution and interoperability. The agent-based technologies seem be a promising answer to facilitate the realization of such systems because they were invented to cope with distribution and interoperability and also what JADE offers to the agent programmer also JADE features:



- FIPA-compliant Agent Platform, which includes the AMS (Agent Management System), the DF (Directory Facilitator), and the ACC (Agent Communication Channel). All these three agents are automatically activated at the agent platform start-up; - distributed agent platform [8]. Different applications using agent based concepts are addressed in [9, 10, 11]. Although the above efforts are useful in justifying the feasibility of agent-based approach for online auctions especially in English auctions and Dutch auctions but there is always a concern when it comes to perform lot of decision making and quick work. Therefore, it is still hard to convince users to adopt the existing agent-based approaches for practical usage.

On the other hand, most of the previous work related to the agent based auctions has been in general with respect to the strategies used like English, Dutch auctions. In this paper we would like to present about another type of auctions called the blind auctions or first price sealed bid auctions.

III. AGENT BASED AUCTION SYSTEM

An agent based auction system is a multi-agent system that facilitates auction activities on behalf of human users to make users life much easier. We have developed an agent based auction system using the JADE agent development framework. Figure 1 shows the system architecture of the agent based auction system; it consists of various types of software agents, such as interface agent, auctioneer agent and the bidder agent.

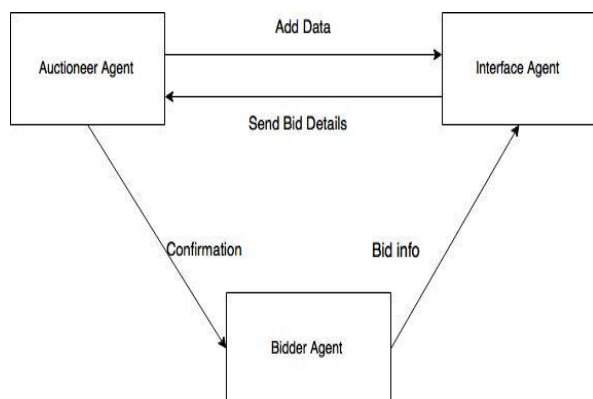


Figure1. Architecture of the proposed System

Auctioneer agent will add details through the interface agent. The bidding agents work on behalf of human users. A user who likes to bid for a particular auction has to provide the bidding agent the strategies of bidding. The bidding- agent will communicate with the corresponding auction -agent to query for related information, such as the current peak bid and the number of lively bidders at that auction. Based on the information procured, the bidding- agent makes a decision. The bidding-agent then

places a bid by sending a bid request to the auction- agent. For each new auction, a corresponding auction- agent is created to handle its auction related activities. While an auction is running, an agent representing a user can put bids on auctioned items; meanwhile. The auction-agent is responsible for updating bidding activities for all the agents involved in bidding. At the end of an auction, the auction-agent notifies the winner of the auction, and passes the control back to the main agent. As a major component for security, the security agent monitors all online auction transactions performed by bidding agents.

The agents that work on behalf of human users are implemented at the client side, which involves the Interface agent, the Auctioneer agent, bidding agent. A GUI agent receives commands from a user, and updates the user interface when messages are sent and received. A search agent can automatically search and join an auction on behalf of a user. Finally, a Selling/bidding agent is responsible for initiating auctions automatically placing bids on behalf of a user according to user defined bidding strategies. Note that a user can be a seller and a bidder at the same time.

In the agent based auction system, a user can configure a bidding agent by providing auction related information, such as the type of items they are interested in, maximum value for that item, and bidding strategies for how to put bids during an auction.

IV. METHODOLOGY

In this paper we have proposed a methodology which helps user to have an experience of how the blind auction really works. We have implemented this system by introducing Software agents who will take the input from the user about item name and item price, depending on the input the agent would store this information in the catalogue. The proposed algorithm is presented below.

- Step1: Start
- Step2: The user enters the details like item name and its price on the GUI
- Step3: The Interface Agent will accept the details and validates it.
- Step4: if (input is valid)
GOTO Step 5
Else
Displays "invalid input"
- Step5: Create and show the Auctioneer GUI
- Step6: Accept the data from the Interface Agent
- Step7: if (input data received)
Update the catalogue and display "item inserted".
Display "starting auction for item" and request for bidders to the Bidder Agent
GOTO Step 10
else



if (bidders found)
Update the list of bidders in catalogue and
Send CFP (Call For Proposals) to all bidders
Receive all proposals/refusals from bidders
find the highest bidder Send request order to the
bidder that provide the best offer
else
Wait for input data from the Interface Agent
GOTO Step 4

- Step8 : if (proposals received)
Announce the winner for that particular item
else
Display “No winner and bids are insufficient”
GOTO Step 13
Step9: Create and show the Bidder GUI
Step10: Send the bid amount to the Interface Agent
Step11: Add the behaviour for receiving CFP from
Auctioneer and for receiving item as the auction
winner
Step12: If (bid amount >= item initial price)
Accept the proposal order from the Auctioneer
Agent and process it,
Display “bid price sent”
else
send the refusal message to the Auctioneer Agent
Display “cannot join the auctions”
Step13: Stop

V. ILLUSTRATION

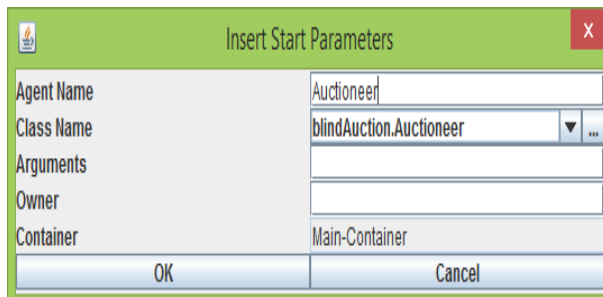


Figure2.Creation of the Auctioneer Agent

In Figure 2 the creation of an agent is illustrated. On click of the ok button the agent is created with the provided specifications.

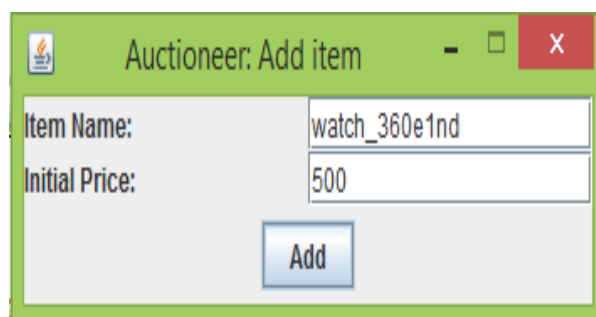


Figure3.User Interface for Auctioneer Agent

The Figure3 is the GUI through user can input his data like inserting the item name and its price. So the interface agent plays a crucial role in communicating as well as the user involvement.

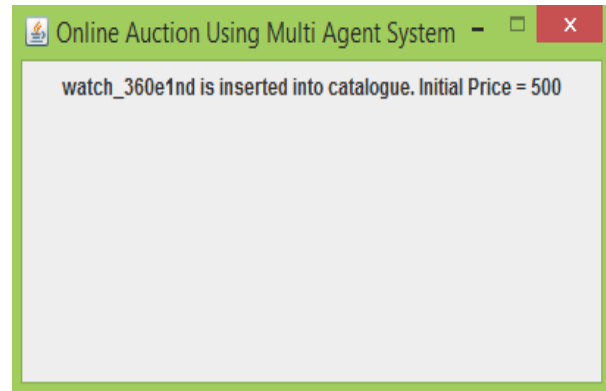


Figure4.Output Screen

The above screen is the output message indicating that the item is inserted into the catalogue.

Sniffer agent is an added advantage in JADE; it will capture the interaction between the agents in the system which can be used for analysis purpose. The figure5 shows the number of messages transferred in between agents in the application. The right arrow displays the sending information and left arrow will display the response message information. This message will be in format of ACL message structure. The agent will send messages using FIPA communication acts like Request, Response etc.

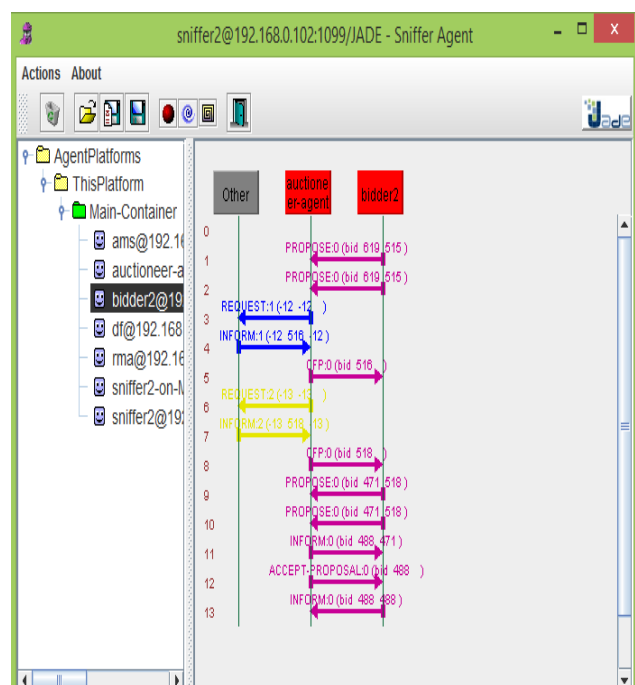


Figure5.Sniffer Agent



VI. CONCLUSIONS AND FUTURE ENHANCEMENTS

Auction using Multi Agent System has been developed with the use of JADE (Java Agent Development Framework). It consists of many agents like Interface Agent, Auctioneer Agent and the bidder Agents which are deployed and can interact with each other. With the help of the Interface Agent, the user can get the information of the items available without actually knowing from where the information is fetched. In this work we considered only one auction methodology we would like to extend our work by implementing the methodology using different auction methodologies and compare the results from each methodology and to propose an optimal methodology for Auction.

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