Online-Auction Tools Using Multi-agent System

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Abstract

Increasing number of online auctions is challenging to those who are looking for good deals. Agent technology can be applied to E-commerce today in order to help users in buying things. Online auctions and negotiations have come quite popular due to their implementation and integration in electronic commerce applications. This system presents an approach to develop bidders, participating in multiple alternative locations, for obtaining an item at the lowest price. The model is used English Auction Protocol where the item for sales is defined by several attributes. In this system, the seller agent is the auctioneer, the buyer agents are bidders. At the beginning of the auction, the seller agent announces all auctions with a starting price and then takes larger and larger bids from buyer agent until no one will increase the bid. Finally, the buyer agent with the highest bid in the last round will win.

1. Introduction

With the rapid expansion of the Internet, the implementation of agent technology in electronic commerce (e-commerce) becomes very popular, which provides a promising field for the approach of agent and Artificial Intelligent technology. It can exist in different forms including auctions, product exchanges, online shopping markets and e-catalogs.

Agent is reusable component, adapted, mobile, knowledge, collaborative and persistence. Combination of agents is web-based multi-agent system in the variety of application domains.

Auctions are important mechanisms for allocating resources and services among agents. English auctions are widely used in markets of services or unique items and in on line auction houses. The wide spread research on automated English auctions deals mostly with models where price is the unique strategic dimension. However, in many situations, it is necessary to conduct negotiations or multiple attributes of a deal. In the auto-mobile auction, the attributes of an item include the model, make, year, price etc. This system presents the issue of buyer comparison in online auction.

The rest of the paper is organized as follow; section 2 discuss the Related work for the Multi-agent System, section 3 presents Agent and Multi–agent System, the online auction and types of auctions, section 4 describes the implementation of the system and sequence diagram, section 5 describes the proposed system, section 6 is the section is the conclusion of the system.

2. Related work

Negotiation et.al [5] introduced the basic structure of Intelligent Tutoring System (ITS) as well as common problems being experienced within the ITS community. The author [6] indicated architecture of multi-agent based system as a virtual classroom creation toolkit. This environment facilitated the collaborative and active learning through remote experience.

Although there has been much recent interest in the design of bidding agents for online auctions, most of this work has concentrated on an agent operating in a single auction (be it Dutch [8], continuous double [5] or any other protocol without a clearly computable dominant strategy). While this work is clearly important, we believe the multiple auction content is likely to become more efficient and stable marketplaces [4]. Given this, it is surprising that the multiple auction case is not dealt with to any great extent in the economics literature and in the agent-based context work on purchasing multiple items has typically focused on combinatorial auctions (e.g., [7]).While combinatorial auctions are an economically efficient way of dealing with the purchase of combinations of goods, they rely on a centralized marketplace structure. However, for various political, social and cultural reasons we believe that this centralization will not become the dominant paradigm. Thus, coordination behavior over multiple simultaneous

auctions is likely to remain a central problem in the field.

3. Background theory

3.1 Agent

Agent is an autonomous entity that acts in the world, interacting with its environment and with other agents. Multi-agent systems are system that may include many agents. First, they offer a metaphor for modeling the reality around us as a world inhabited by such autonomous, active, possibly intelligent elements. Second, they can be used as a methodology that enables design and implementation of large system in a really modular way. Agents can interact with each other to negotiate contracts ad services, participate in auctions or barter. Agent may contain some additional other properties like.
- ability to communicate with other agents
- ability to travel from host to host
- adoption because of former experience
- believable appearance to end-user.

3.2 Agent properties

Agent has the following properties:
Autonomy: agents operate without the direct intervention of humans or others, and have some kind of control over their actions and internal state.
Social ability: agents interact with other agents via some kind of agent-communication language.
Reactivity: agent perceives their environment, and responds in a timely fashion to changes that occur in it.
Pro-activeness: agents do not simply act in response to their environment; they are able to exhibit goal-directed behavior by taking the initiative.

3.3 Multi-agent systems

Various definitions from different disciplines have been proposed for the term multi-agent system (MAS). A multi-agent system is a loosely couple network of problem-solver agent entities that work together to find answers to problems that are beyond the individual capabilities or knowledge of each entity. More recently, the term multi-agent system has been given a more general meaning, and it is now used for all types of systems composed of multiple autonomous components showing the following characteristics. The concept of multi-agent system (MAS) is an outgrowth of the Distributed Artificial Intelligence. MAS is defined as a loosely coupled network of problems that are beyond their individual capacities. These problem solvers are called 'agent' and are essentially autonomous, distributed and may be heterogeneous in nature characterized by various degrees of problems solving capabilities and usually have a single locus of control and/or intention.

3.4 Online auctions

Online auctions mimic auctions in the physical world and differ according to many parameters like the role of the sellers or buyers and the sort of pricing or bargaining. They are the largest class of electronic marketplaces. Online auction sites give buyers a virtual market with new and used merchandise from around the world. They give sellers a global storefront from which to market their goods. Because of many online auctions can be regarded as multi-agent e-marketplace. Internet auctions are online bazaars. Some are the scenes of business-to-person activity, where a Web site operator physically controls the merchandise for sale and accepts payment for the goods. The process of online auction is done efficiently by co-operating and negotiation of agents.
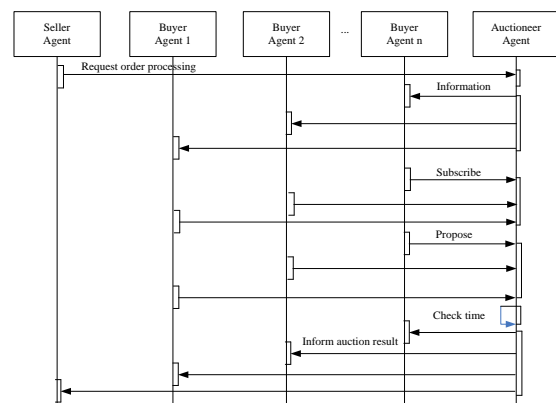

Figure1. General auction framework

3.5 Types of auctions

There are various types of online auctions, namely English, Dutch and Sealed-bid auctions.
- English auction is the most frequently used and common method and is known also as the open-outcry auction or the ascending-price auctions. The auctioneer begins here with the lowest acceptable price, which is not secret, and proceeds to solicit successively higher bids from the buyer agents, and ends with a timeout. The item is sold to the highest bidder agent at the price of her last bid.
- Dutch auction is also known as the descending-price auction. It has an iterative format. Bidding

starts at a relatively his price and is progressively lowered. The agent that accepts the lowered price gets the item. All of the buyer have the same chance to get the item, but the ones that hesitate too long miss it. When the goods are exhausted, the bidding is over.
- In sealed-bid auctions, each bidder submits one bid without knowledge of all other bids. Each agent can bid only once and the other agents do not know the buying strategy or the budget of their competitors.
- A reverse auction is a type of auction in which the role of the buyer and seller are reversed, with the primary objective to drive purchase prices downward. In an ordinary auction or a forward auction, buyers compete to obtain a good or service. In a reverse auction, sellers compete to sell their product.
- Reverse English auction has one buyer and many sellers. Bidders offer decreasing prices to be able to sell their product to the buyer. The price of bids decreases until an item can be sold.

3.6 Negotiation

Negotiation can be defined as a process by which a group of agents communicate with each other to come to a mutually acceptable agreement in a price. Auctions are a very useful for allocating goods to agents. Negotiation has three components:
One-to-One negotiation: In which one agent negotiates with just one other agent.
Many-to-One negotiation: In this setting, a single agent negotiates with a number of other agents. Auctions are example of many-to-one negotiation.
Many-to-Many negotiation: Many agents negotiate with many other agents simultaneously.

4. System Implementation

This system is implemented as agent-based e-commerce model for online auction and the implementation will be architecture of a multi-agent model in virtual environment. In this system, we have implemented different types of automobile and reused machinery and equipments as a tool. In this system, there is one auctioneer agent and many customer agents. The auctioneer agent creates an auction and announces the values and the scores of attributes what he wants. When customer provides his/her preferences, item type and affordable price, auctioneer agent checks the price in the auction. Customer selects the one he/she likes and auctioneer agent performs negotiation with customer agent and auctioning process.

The process of auctioneer agent is generating relevant information for the selected auction item type. If the customer selects the car auction, attributes related with the car auction will be populated. If the customer agent selects the machinery auction, attributes related with machinery information will be populated. Examples of auction attributes in the system are shown in table 1.

After selecting the relevant products, customer chooses the one his/her likes and the rest of auctioning process is performed by customer agent. Auctioning process includes negotiation and reaching to an agreement.

Table 1 Examples of auction attributes of the system

Item ID	Item Name	Auction ID	Cate gory	Model	Manufac ture	Floor Price
1	Toyota CELICA	1	1	CELICA	Toyota	20000000
2	SubaruImpreza	1	1	Impreza	Subaru	30000000
3	JaguarXJR 4	1	1	XJR	Jaguar	30000000
4	ToyotaYaris 1999	1	1	Yaris 1999	Toyata	25000000
5	MatseriaGhibi	1	2	Ghibi 1995	Matseria	35000000
6	Chamberlain	2	2	4290	Chamber lain	19800000
7	Fiat 566DT	2	2	566DT	Fiat	18400000
8	Ford TWS	2	2	TWS	Ford	15400000
9	TohnDeere317ss	2	2	317ss	Tohn	35200000

4.1 Sequence Diagram

Processing sequence of the system is as follows. The seller creates an auction with his preferences. Sellers are informed about the auction and are called for bid. The best bid is selected for each round. The customers send the bids to the auction and the new bid is set for each round until there is no competitive customer or the deadline of the auction isreached.
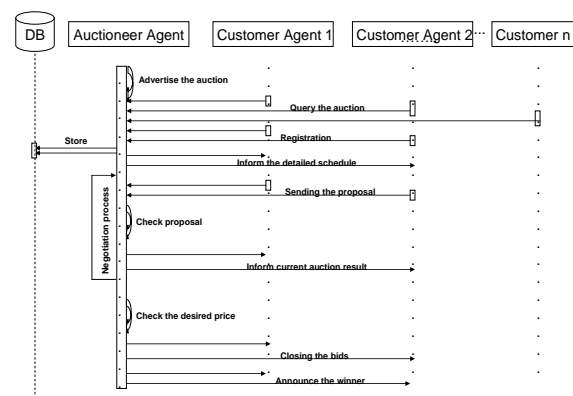

Figure 2. Sequence diagram of the system

5. Proposed System

This system presents an approach to develop agent capable of participating in electronic auctions. The approach is used English auctions protocol where the item for sales is described by both price and non-price attributes. In this system, the seller agent is the auctioneer, the customer agents are the bidder. At the beginning of the auction, the auctioneer announces the auction that displays the selling goods. Customers who want to participate in auctions must first register with an auction site. Auction site used to provide all the products for auction to the customers (bidders). Timing of the action is defined with a deadline. Customers send the desired proposal when the auction process is active. Auction is closed when the auction process is accepting its desired price or its deadline is reached. Winner is announced after the auction process ends.
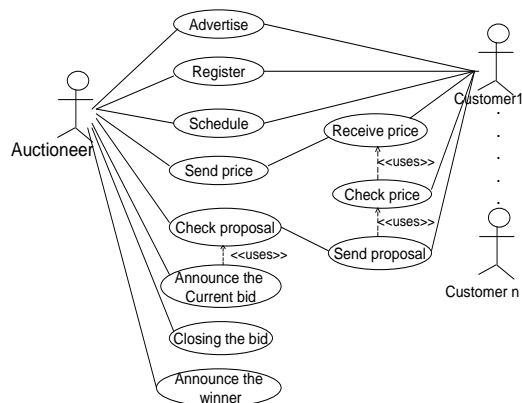

Figure 3.Use case Diagram of the proposed System

5.1 Interface Design of the System

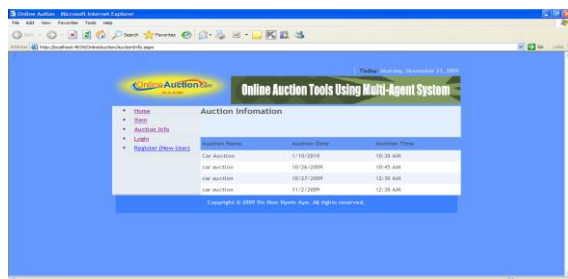The interface design of the system is demonstrated as follows:

Figure 4. Page Auction Information

If the customer chooses to participate auction, click Auction Info, he can see a list of auction information as shown in figure 4.
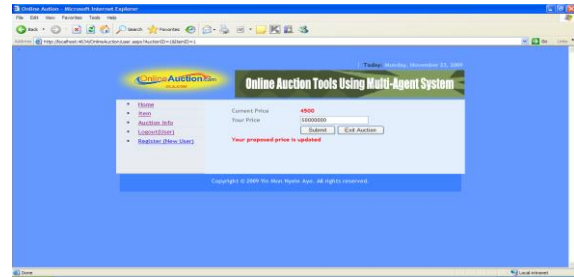

Figure 5. Proposal Form

In the auction site, the auctioneer checks the proposal. The customer can post the proposal price shown in figure 5.

6. Conclusion

This system is an implementation of online auction system using multi-agent technology. Using the agent technology, it can reduce a lot of human work and time consuming. This system is an implemented as buyer-seller negotiated auction based on English auction mechanism for buying automobiles and reused machinery and equipments. The goal of this system is to encourage online auctioneer to interact with the bidder and to improve the agent-based E-commerce. This system provides the efficient auction system for E-commerce modeling multi-agent system to help customers in buying things. Auctioneer agent is created for each buying auction.

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