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An Internet Trading Platform for Testing Auction and Exchange Mechanisms

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ABSTRACT

In this paper, we present a generic electronic market platform that is designed to run different kinds of auctions and exchanges. Researchers can use the platform to implement different electronic market mechanisms, simulate the market behavior of their interests, and experiment with it. A generic OR/XOR bidding language that can express different OR/XOR combinations is implemented for Web interfaces. Different auctions, including combinatorial auctions, multiple-round reverse auctions, and multiple homogeneous good auctions, have been built and run successfully on the platform.

Keywords: electronic trading; intelligent agents; Web-based supply chain management; XML

INTRODUCTION

The Internet and information technologies (IT) have brought dramatic changes to the traditional auction marketplace. Many companies are using online channels for buying and selling goods and services, sometimes referred to as e-procurement in the areas of supply chain management. With the widespread online auction practices to meet different requirements of the electronic marketplaces, the success of an online auctioneer such as eBay.com also has been attracting more research on online auctions.

One big advantage of an auction is that a successful auction can reveal the market values according to the bidders' and auction items' values. Even for the goods whose value cannot be determined easily in advance, auctions have a particularly convenient property to find the market values of the goods (i.e., auctions can be adopted to discover the equilibrium price of the supply and demand). Under some simplified assumptions, auction theories can prove that some basic auctions are efficient and have equilibriums. For example, Milgrom and Webber (1982) developed a model of competitive bidding under the assumption that the winning bidder's payoff may depend upon his or her personal preferences, the preferences of others, and the intrinsic qualities of the items being sold. However, some of the assumptions may not be held in the real world, as pointed out by Banks et al. (2005). More often than not, the winner is determined not only by the price but also by other attributes, such as quality or transportation service (i.e., arrival time, dispatch time, weight, volume, etc.), which make auctions more complicated to solve theoretically. Lucking-Reiley's (1999) experiment on the Internet auction shows that more extensive research needs to be done for the trading behaviors of an Internet auction. Among them, two critical issues are worth addressing here:

1. For particular goods or types of goods, the market structure and mechanism should be carefully designed to make sure that the real market values are obtained through the auction and the goods are allocated to the bidders efficiently. A bad market design not only could result in inefficiency, winner's curse, and reduced revenue, but also legal problems, if fairness is not well maintained. Different auction mechanisms may be designed for different auction items. The auction could be a single item auction, multiple homogeneous items, or multiple heterogeneous items auction. Although a heterogeneous items auction is a generalization of the other auctions, the inherent difficulty of a combinatorial auction has forced researchers to find other alternative ways.
2. Information revelation mechanism is another important part of an auction design. For example, according to Milgrom and Webber (1982), under some circumstances, the English auction generates higher average prices than the second-price auction, since the bidders have more information of the auction.

As we mentioned previously, it is hard to predict the bidding behaviors and auction results theoretically due to the complexity of the problem. Therefore, many researchers turn to experiments or simulations. For example, McCabe et al. (1991) tested traditional Vickrey's and other simultaneous multiple unit versions of the English auction. Banks et al. (2005) ran an experiment on the FCC spectrum auctions.

A challenging problem of these experiments and simulation is that customized auction software has to be developed for each of them. A reusable auction soft-