Chapter XIV
An Internet Trading Platform for Testing Auction and Exchange Mechanisms

Haiying Qiao
University of Maryland, USA

Hui Jie
Shanghai Jiao Tong University, China

Dong-Qing Yao
Towson University, USA

ABSTRACT

In this chapter 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.

INTRODUCTION

The Internet and information technologies (IT) have brought in dramatic changes to the traditional auction marketplace. Many companies are using online channels for buying and selling goods/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 market-
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places, the success of online auctioneer such as eBay.com also has been attracting more research on online auctions.

One big advantage of 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 easily determined 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 personal preferences, the preferences of others and the intrinsic qualities of 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 (arrival time, dispatch time, weight, volume etc), which make auction more complicated to solve theoretically. Lucking-Reiley’s (1999) experiment on the Internet auction shows more extensive research needs to be done for the trading behaviors of 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 could not only result in inefficiency, winner’s curse, 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 heterogeneous items auction is a generalization of the other auctions, the inherent difficulty of 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 before, it is hard to predict the bidding behaviors and auction results theoretically due to 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 software platform is needed for researchers to quickly design prototype and develop different auction mechanisms to test and experiment different research ideas. So far, some research auction software has been developed on the Internet. For example, FM 96.5 (Rodriguez-Aguilar et al., 1997) is an electronic auction house that is a complete implementation of the trading conventions of the fish market, which allows for a real-time concurrent operation of the complete fish market auction process. The Michigan Internet AuctionBot (Wurman et al., 1998) is a configurable auction server, where classic auctions such as English auction, Dutch auction, Vickery auction and Sealed auction can be implemented by different configurations. eAuctionHouse (Sandholm, 2002) is an auction server based on the eMediator server.
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