RECURRENT AUCTIONS IN E-COMMERCE

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An Abstract of a Thesis Submitted to the Graduate
Faculty of Rensselaer Polytechnic Institute
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
Major Subject: Computer Science

The original of the complete thesis is on file
in the Rensselaer Polytechnic Institute Library

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Troy, New York

December 2007

ABSTRACT

Recent developments of information technologies are causing shift from fixed pricing to dynamic pricing mechanisms in electronic marketplaces. The latter can improve revenue and resource utilization. However, the dynamism makes seller's price decision and buyer's budget planning difficult. Auction based dynamic pricing and negotiation mechanism can resolve such difficulties because price emerges from buyer's (i.e., bidder's) willingness to pay. Thanks to these advantages and inherent negotiation nature, the application domain of auction as dynamic pricing and negotiation mechanism covers service oriented electronic short-term contract marketplaces. Auctions in such markets are recurring since the contracts must be offered repeatedly for specific time intervals. In such recurring auction, uneven wealth distribution of bidders causes the least wealthy bidders to persistently lose auction rounds that motivate them to drop out of recurring auction. This bidder drop problem arises also in the traditional combinatorial winner selection strategy that only focuses on revenue maximization. The bidders dropping out of an auction decrease price competition and may cause a collapse of market price. At the same time, all available resources for fulfillment of electronic services must be sold in each auction round to avoid waste of resources. For these reasons, the previously designed traditional basic auction mechanisms may not be efficient in such service oriented electronic marketplaces.

To overcome these problems, this thesis proposes and evaluates novel auction mechanisms for selling short-term contracts in service oriented electronic marketplaces. For homogeneous market structure in which bidders' requirements are homogeneous, we propose a Participation Incentive Optimal Recurring Auction (PI-ORA) mechanism that is incentive compatible and a Discriminatory Price Optimal Recurring Auction mechanism that is not incentive compatible. Compared to the traditional basic auction mechanisms, the proposed mechanisms (i.e., PI-ORA and DP-ORA) stabilize the market prices and increase the auctioneer's revenue by preventing the bidder drop problem and avoiding the resource waste problem. Additionally, the proposed mechanisms achieve better long-term fairness of resource allocations. For markets in which bidders'

requirements are heterogeneous, we propose and evaluate a Participation Incentive Generalized Vickery Auction (PI-GVA) mechanism. Compared to the traditional Generalized Vickery Auction mechanism, the proposed PI-GVA mechanism prevents market price collapse and stabilizes the market by a novel combinatorial winner selection strategy in which bidder's participation is directly rewarded.

The three proposed mechanisms also achieve other desirable properties for auction mechanism such as light communication overhead needed to reach agreement between auctioneer and bidders, the simple bidder's optimal strategy that is desirable for implementing an auction in electronic environments, and the distributed resource allocation.