The Performance of Grey System Agent and ANN Agent in Predicting Closing Prices for Online Auctions

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ABSTRACT

The introduction of online auction has resulted in a rich collection of problems and issues especially in the bidding process. During the bidding process, bidders have to monitor multiple auction houses, pick from the many auctions to participate in and make the right bid. If bidders are able to predict the closing price for each auction, then they are able to make a better decision making on the time, place and the amount they can bid for an item. However, predicting closing price for an auction is not easy since it is dependent on many factors such as the behavior of each bidder, the number of the bidders participating in that auction as well as each bidder’s reservation price. This paper reports on the development of a predictor agent that utilizes Grey System Theory GM (1, 1) to predict the online auction closing price in order to maximize the bidder’s profit. The performance of this agent is compared with an Artificial Neural Network Predictor Agent (using Feed-Forward Back-Propagation Prediction Model). The effectiveness of these two agents is evaluated in a simulated auction environment as well as using real eBay auction’s data.

Keywords: Artificial Neural Network Predictor Agent, Grey System Theory Predictor Agent, Online Auction, Prediction Model

1. INTRODUCTION

Auction markets provide centralized procedures for the exposure of purchase and sale orders to all market participants simultaneously (Lee, 1996). In fact, auctions are not a new topic but have been widely used for centuries (Cassady, 1968). The design and conduct of auctioning institutions has caught the attention of many people over thousands of years. One of the earliest reports of an auction was used to allocate scarce resources in Babylon from about 500 B.C. (Shubik, 1983).

Nowadays, most transactions are conducted online via the Internet. To date, many traditional auction businesses are moving into
the online auctions space and joining winners in this market place as a consequence of rapid growth of advance computer technology (Akula & Menasce, 2004). The major difference between these two types is the additional degree of flexibility, multiplicity as well as convenience in the way the online auction is conducted.

Previously, auction has to be conducted face to face. Hence, it requires a venue to gather all auctioneers as well as the auction participants. This requires a fairly high commission since a place needs to be rented, the auction needs to be advertised, and the auctioneer and other employees need to be paid. Since bidders must usually come to the auction site, many potential bidders are excluded. Similarly, it may be difficult for the sellers to move goods to the auction site. However, this does not exist as online auction allows clients to buy and sell items anytime and anywhere they like. Moreover, traditional auction has several limitations and deficiencies on the active period of bid submission. For example, an item only lasts for a few minutes before it is sold. This rapid process gives the bidders little time to make a decision. Online auction removes these deficiencies by providing bidders more flexibility on the time to submit their bids since online auctions are usually active for days or even weeks. Besides that, online auction can be more effective as there is no geographical limitation since both sellers and buyers will be trading in a “virtual” environment and payments can be made via online banking. Having a relatively low price and wider market in products and services, it had made the online auction more successful where it attracts many bidders and sellers as well. Online auctions also allow sellers to sell their goods efficiently and with little action or effort required. With all the benefits and advantages, auctions on the Internet have become a fascinating new type of exchange mechanism as well as an extremely effective way of allocating resources to the individuals who value them most highly.

According to Bapna et al. (2001), online auction is one of the most popular and effective ways of trading by bidding for products and services over the Internet. Nowadays, online auctions become an increasingly popular and effective medium for transacting businesses as well, either procuring goods or services, both between individuals over the Internet and between business and their suppliers. According to He et al. (2004) online auctions are increasingly being used for a variety of e-commerce applications. Over the last few years, a big number of online auction houses have emerged and the number is still increasing rapidly. According to the Internet auction (http://www.internetauctionlist.com/) there are currently more than 2600 auction company listings over the world. Some examples of popular online auction houses include eBay, Amazon, Yahoo!Auction and UBid. In addition, over 10 million items such as antiques, books, electronic appliances, agricultural products can be found daily for sale at online auctions. For example, in the popular auction house - eBay alone, there are often hundreds or sometimes even thousands of concurrent auctions running worldwide. According to David et al. (2005) online auctions continue to attract many customers and currently sell goods worth over $30 billion annually. For example the total revenue of e-Bay increased by more than $4.4 billion from 2004 ($3, 271,309) until 2007 ($7, 672,329).

When bidding in an auction, bidders may face a lot of problems such as picking and monitoring multiple auctions, and making the right bid on an exact time step. A consumer needs to consider how much time is available for him to spend before getting the desired item. Based on the available time, consumers have to select an auction to participate in since all the interested bidders should submit their bids within the given start and end times. Consumer also needs to decide on which auction to bid from among hundreds of auctions offering the same goods concurrently. The consumer can bid in a single auction but he may lose a chance to receive a better price offer in another auction. Besides, in selecting an auction, bidders have to make sure they submit the right bid amount
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