



Dynamic Bidding Platform for Enhanced E-commerce Products

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ABSTRACT

Real-time bidding (RTB) is one of the most striking advances in online advertising, where the websites can sell each ad impression through a public auction, and the advertisers can participate in bidding the impression based on its estimated value. In RTB, the bidding strategy is an essential component for advertisers to maximize their revenues (e.g., clicks and conversions). However, most existing bidding strategies may not work well when the RTB environment changes dramatically between the historical and the new ad delivery periods since they regard the bidding decision as a static optimization problem and derive the bidding function only based on historical data. Thus, the latest research suggests using the reinforcement learning (RL) framework to learn the optimal bidding strategy suitable for the highly dynamic RTB environment. In this paper, we focus on using model-free reinforcement learning to optimize the bidding strategy. Specifically, we divide an ad delivery period into several time slots. The bidding agent decides each impression's bidding price depending on its estimated value and the bidding factor of its arriving time slot. Therefore, the bidding strategy is simplified to solve each time slot's optimal bidding factor, which can adapt dynamically to the RTB environment. We exploit the Twin Delayed Deep Deterministic policy gradient (TD3) algorithm to learn each time slot's optimal bidding factor. Finally, the empirical study on a public dataset demonstrates the superior performance and high efficiency of the proposed bidding strategy compared with other state-of-the-art baselines.

Keywords: Auction, Ecommerce, Real time bidding

1 Introduction

The evolution of the internet has transformed many elements of trade, including the purchasing and selling of items. Online auctions have grown as a popular and simple way for individuals and businesses to conduct business afar. This introduction presents a thorough review of the online auction system, emphasising its significance, functionality, and inherent advantages. The online auction system is a virtual platform that seamlessly connects sellers and buyers, providing a digital marketplace for conducting internet auctions. This method streamlines the entire auction process by utilising new technical capabilities, making it efficient, transparent, and accessible to a diverse variety of participants. Furthermore, the online auction system includes a number of elements meant to ensure fairness and security. Participants may precisely track their bids and stay up to date on the current highest bid thanks to robust bid tracking



features. Timely notifications and alerts provide real-time information on the status of current auctions, allowing participants to place larger bids if requested. Furthermore, the system features strong authentication and verification mechanisms to protect the platform's integrity, reducing the danger of fraudulent actions and instilling trust in users. In summation, the online auction system has fundamentally transformed the traditional auction process, transmuting it into a streamlined and accessible online marketplace. This platform affords sellers the convenience of reaching a broad customer base while enabling buyers to engage in auctions unrestricted by temporal or spatial constraints. Characterized by transparency, competition promotion, and stringent security measures, the online auction system has emerged as an indispensable facet of the e-commerce landscape, empowering individuals and enterprises alike to participate in efficient and trustworthy buying and selling endeavours.

2 Recent Works

Several research papers on the electronic auction system have been published, and the following work can be summarised: Manoj Kumar and Stuart I. Feldman described an application for Internet auctioning that supports a variety of auction processes, security needs, pre-auction procedures, and post-auction procedures exchanges as well as the operations that compose the auction application. They also offer the ability to archive closed auctions for record-keeping, as well as support for electronic bidding and quote agents, to make auctions more appealing to real-world business customers. In [9], Nara presented a study for developing scalable, robust, and flexible online auction system to meet the growing requirements for relevant legal security and transaction efficiency. A three-tiered architecture system was proposed by the authors to enhance the reliability and flexibility of online auctions. This system aims to facilitate smooth and efficient transactions between buyers and sellers. In their study [2], Md. Imranul Sazzad and Mutasim Billah developed a two-part system comprising the customer interface and the administration interface. The customer interface enables users to upload products for sale and place bids, while the administration interface empowers the administrator to control the entire bidding system through a control panel. The administrator can categorize and approve products submitted by customers and manage registered users. Furthermore, Michael Ostrovsky [8] pioneered check-screen auctions in European countries, allowing clients to choose their preferred search engine through the Android platform. The research highlighted the significant influence of subtle auction design details on the characteristics of auction winners and their bidding decisions.

3 Proposed Work Explanation

The methodology section of online auction system would outline the approach and methods used to conduct the study. Here is a sample outline of the methodology section on the online auction system:

3.1 Research Design

This study on the online auction system uses a mixed- methodologies approach that



incorporates both quantitative and qualitative methods. This design enables a thorough examination of the research objectives, combining the advantages of descriptive and exploratory research.

3.2 Data Collection Methods

Data collection will involve a combination of surveys and interviews. Surveys will be distributed to online auction users to gather quantitative data on their demographics, usage patterns, satisfaction levels, and preferences. Interviews will be conducted with sellers and buyers to obtain qualitative insights into their motivations, perceptions, and challenges within the online auction system.

3.3 Sample Selection and Data Analysis Techniques

Purposive sampling will be used to choose the sample, which will target active consumers of online auction platforms. The sample size will be determined by the research objectives and the level of representation needed. Statistical approaches such as descriptive statistics and inferential analysis will be used to analyse quantitative data from surveys. Thematic analysis will be used to find patterns and themes in the replies to qualitative data from interviews.

3.4 Ethical Considerations

In this investigation, ethical considerations are critical. Participants' informed consent will be sought, ensuring their voluntary involvement and confidentiality. The confidentiality of participants will be maintained throughout the research procedure. Data collected will be securely stored, and only authorised researchers will have access to it. The study will follow ethical norms and regulations, with participants' well-being and rights being prioritised. This methodology uses a mixed-methods approach to conduct a thorough assessment of the online auction system, integrating quantitative data for statistical analysis and qualitative insights for a better understanding of user experiences. Throughout the study process, ethical considerations assure the integrity and preservation of participant rights.

Use case diagram – A use case diagram provides a high-level visual representation of the interactions between actors (users or external systems) and the system itself. In the case of an online auction system, the use case diagram illustrates the various actions and functionalities available to different actors. Here is a description of the key elements in an online auction system use case diagram:

3.5 Auctors

- a. Buyer- Represents individuals or entities interested in acquiring products via the online auction system. They use the system to look for things, submit bids, and execute transactions.
- b. Seller - Individuals or companies who offer products for sale on the online auction platform are represented as sellers. They use the system to create listings, administer auctions, and collect money.



- c. Administrator- System administrators or moderators who have special access to control and monitor the online auction system are represented by this title. They may also include features such as user administration, content moderation, and system setup.

3.6 Use Cases

- Search items- Buyers can look for things using a variety of parameters, such as keywords, categories, or specific features.
- Bid- purchasers can submit bids on things of interest, competing with other purchasers for the highest bid.
- Create List in- Sellers can create new listings for products they want to sell, including item specifications, pricing information, and the length of the auction.
- Auction Management- Sellers can manage live auctions by monitoring bids, tending auction time, or cancelling auctions.
- Payment Processing- After an auction concludes, the system facilitates payment between the buyer and seller, assuring a secure and smooth transaction.
- User Registration- Actors can register on the site as buyers or sellers, submitting the relevant information and creating user accounts.

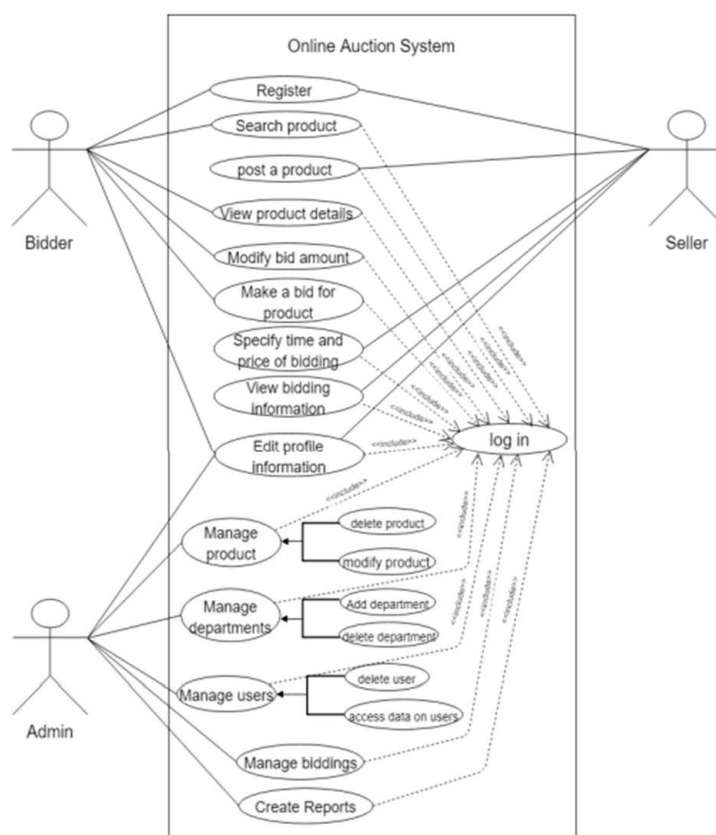


Figure 1: The use case diagram.



4 Results and Discussion

The online auction system offers numerous benefits to both buyers and sellers, as well as the overall marketplace. Here are some key benefits of an online auction system.

4.1 Increased Market Reach

Online auctions provide a platform for sellers to reach a larger audience beyond their local or traditional market. They can attract buyers from different geographical locations, expanding their customer base and potentially increasing sales.

4.2 Competitive Bidding

Online auctions foster a competitive environment where multiple buyers can bid on an item, driving up its price. This can result in sellers obtaining higher prices for their items compared to fixed-price sales or traditional auctions.

4.3 Time and Cost Efficiency

Online auctions eliminate the need for physical venues and reduce associated costs such as renting space, transportation, and staffing. Buyers can conveniently browse and bid on items from the comfort of their own homes or offices, saving time and travel expenses.

4.4 Wide Variety of Item

Online auctions offer a vast array of items available for sale, ranging from rare collectibles to everyday commodities. This diversity attracts buyers with different interests, allowing them to find unique or specialized items that may not be easily accessible in traditional markets.

4.5 Transparency and Trust

Online auction platforms often provide transparency by displaying bid histories and seller ratings. This builds trust among buyers, as they can assess the reputation and reliability of sellers before engaging in transactions. Additionally, dispute resolution mechanisms offered by the platform help resolve conflicts and maintain trust within the online community.



Fig.- Login interface



Fig.- View product interface

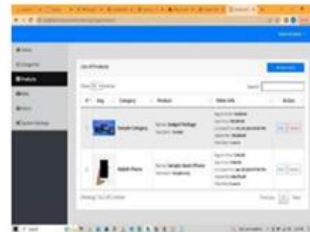


Fig- List of products

5 Conclusions

The online auction system has transformed the way goods are bought and sold, offering benefits such as increased market transparency, global access, and cost-effective market research. As technology continues to advance, online auctions are expected to further evolve, providing even more opportunities for buyers and sellers to engage in efficient and profitable transactions.

References

1. N. Majadi; J. Trevathan; N. Bergmann, Year: 2016, "Auction: Analysis, Design, and Implementation of a Secure Online Auction System," In Dependable, Autonomic and Secure Computing, 14th Intl Conf on Pervasive Intelligence and Computing, 2nd Intl Conf on Big Data Intelligence and Computing and Cyber Science and Technology, pp. 278-285.
2. J. Hillston; L. Kloul, Year: 2001, "Performance investigation of an on-line auction system", Concurrency and Computation: Practice and Experience, Vol: 13, no: 1, pp. 23-41.
3. M. Bichler, Year: 2000, "An experimental analysis of multi attribute auctions," Decision Support Systems, Vol: 29, no: 3, pp. 249-268.
4. T. Sandholm, Year: 2000, "Approaches to winner determination in combinatorial auctions. Decision Support Systems", Vol: 28, no: 1-2, pp. 165-176.



5. F. T. Sheldon; K. Jerath; Y. J. Kwon; Y.W. Baik, Year: 2002, "Case study: Implementing a web based auction system using UML and component-based programming", In Computer Software and Applications Conference, 2002. COMPSAC 2002. Proceedings. 26th Annual International, pp. 211-216.
6. C. Ren, Year: 2009, "Research and Design of Online Auction System Based on the Campus Network Using UML", In 2009 Second Pacific-Asia Conference on Web Mining and Web-based Application, no: 6-7, pp. 129-133.
7. Ibrahim Abood Almrashdah; Noraidah Sahari; Nor Azan Hj Mat Zin; Mutasem Alsmadi, Year: 2010, "Instructors acceptance of distance learning management system. In Information Technology (ITSim)", 2010 International Symposium in, pp. 1-6.
8. F. Haddad; J. Alfaro; K. Alsmadi, Year: 2015, "Hotelling's T^2 Charts Using Winsorized Modified One Step Mestimator for Individual Non Normal Data. Journal of Theoretical & Applied Information Technology, Vol: 72, no: 2.
9. I. Almarashdeh; M. K. Alsmadi, "How to make them use it Citizens acceptance of M- government," Applied Computing and Informatics.
10. I. Almarashdeh; M. Alsmadi, Year: 2016, "Investigating the acceptance of technology in distance learning program," In 2016 International Conference on Information Science and Communications Technologies (ICISCT), no: 2-4, pp. 1-5.
11. I. A. Almrashdeh; N. Sahari; N. A. M. Zin, M. Alsmadi, Year: 2011, "Instructor's success measures of Learning Management System," In Electrical Engineering and Informatics (ICEEI), 2011 International Conference on, pp. 1-7.
12. F. Haddad; M. K. Alsmadi, Year: 2018, "Improvement of The Hotelling's T^2 Charts Using Robust Location Winsorized One Step M-Estimator (WMOM)," Journal of Mathematics (ISSN 1016- 2526), Vol: 50, no: 1, pp. 97-112.
13. I. Almarashdeh; M. Alsmadi, Year: 2016, "Heuristic evaluation of mobile government portal services: An experts' review", In Internet Technology and Secured Transactions (ICITST), 2016 11th International Conference for, pp. 427-431.
14. Mutasem Alsmadi; Usama Badawi; Hatem M. Moharram, Year: 2014, "Server Failures Enabled Java spaces service", Journal of Computer Science, Vol: 10, no: 4, pp. 671-679.
15. Ibrahim Abood Almarashdeh; Noraidah Sahari; Nor Azan Mat Zin; Mutasem Alsmadi, Year: 2011, "Acceptance of learning management system: A comparison between distance learners and instructors", Advances in Information Sciences and Service Sciences, Vol: 3, no: 5, pp. 1-9.



16. Ibrahim Abood Almarashdeh; Noraidah Sahari; Nor Azan Mat Zin; Mutasem Alsmadi, Year: 2010, "The Success Of Learning Management System Among Distance Learners In Malaysian Universities", Journal of Theoretical & Applied Information Technology, Vol: 21, no: 2.
17. T. H. Farag; W. A. Hassan; H.A. Ayad; A.S. Al Bahussain; U. A. Badawi; M. K. Alsmadi, Year: 2017, "Extended Absolute Fuzzy Connectedness Segmentation Algorithm Utilizing Region and Boundary-Based Information. Arabian Journal for Science and Engineering", pp. 1-11.
18. Z. Thalji; M. Alsmadi, Year: 2013, "Iris Recognition using robust algorithm for eyelid, eyelash and shadow avoiding", World Applied Sciences Journal, Vol: 25, no: 6, pp. 858-865.
19. M. K. Alsmadi, Year: 2018, "A hybrid Fuzzy C-Means and Neutrosophic for jaw lesions segmentation. Ain Shams Engineering Journal", pp. 697-706.
20. U. A. Badawi; M. K. S. Alsmadi, Year: 2013, "A Hybrid Memetic Algorithm (Genetic Algorithm and Great Deluge Local Search) With Back-Propagation Classifier for Fish recognition", International Journal of Computer Science Issues, Vol: 10, no: 2, pp. 348-356.