International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 01 | Jan - 2026 SJIF Rating: 8.586 ISSN: 2582-3930

Real –Time Auction Web Application

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Abstract

The online auction-based system offers a powerful solution to improve online bidding and sales with machine-learned and implemented features to predict instant bidding behavior, personalize products/history alerts, and adjust pricing strategies. Inbuilt conversational agents provide real-time auction updates and explain marketplace operations, and an easy-to-use seller dashboard makes it simple to list items, specify categories, and finalize secure transactions by way of the users' favorite online payment systems. Users make their biddings across the real-time bidding interface. (offers) and monitor the trend of the bidding as per the type of product and seller. trustiness, and their proximity to bidders. Selective location based Product fulfilment and freight rationalisation is possible through services. Architecture of real-time information scramble, foreseeable auction. predictions, secure payment roads and an easy interface to different. levels of experience. The campaign will create awareness both in the local and state project whilst promoting further involvement, and establishment. a seamless experience to the bidders under a single site.

Key Features Pattern recognition engines Intelligent in dialogue agent. The control site of Vendor Live auction Customizable item suggestions. Secured deals Location-driven services. Keywords: AI in machine learning, chatbot assistant, sellers. real-time bidding, personalized items, dashboard, safe payment, geographical location based services.

1. INTRODUCTION

The eBay auction is alive and well, it is, despite its ways of change that are very fast. turns out.Online real time auction web applications have become an important. player, breaking the barriers of the location-based restrictions with providing. unrivalled convenience and access by both shoppers and sellers. This transformation of the physical into the digital space has radically modified the mode of exchange of goods and services making it more competitive interesting and open market place. They provide a sense of needs and rivalry that do not exist in stagnant e-commerce websites. This could assist in getting the market price nearer to its underlying value,and it is entertaining to the users. Scale The major problem facing an ability to manage vast amount of dynamic is in the auction platform. data and offering the users with recent and valuable information. However, even now such platforms are frequently troubled by auction problems. rigging, bad pricing, and disengagement. Bidders frequently find it it is difficult to measure the competitive landscape and that the sellers might be unaware of doing so to set their prices in a manner that would get them a maximum profit. Also, recommendation systems that have one-size-fits-all approach to suggesting items can. face a low retention of users and inefficient market. To solve these problems, this paper suggests how a real-time design should be created. machine- based auction web application learning algorithms. The system would use predictive analytics in order to provide live prediction of bids.

This will not only be beneficial to the bidders but also add to the fair competition in the market. It will also use the collaborative filtering and other recommendation systems, to give personalised item recommendation to users so that they could see items that have reflected their interests and their bid history.

1. The Real-Time Bidding Interface

Explanation: The wrapper is the heart of the system the interface to real time bidding. It allows bidders to place bids live on an auction, and controls all the aspects of the live cycle including new bids, and bid approaching the highest bid. The interface needs to be highly user-friendly and hyper responsive

that captures the urgency and impetus of auctions. **Important Characteristics and their Significances:.**

Live Bid Updates: You can always know what is happening with your bid in an auction and therefore everyone is aware of the high bid. This will prevent a sniping of the user at the last moment when no one can even react to it.

Auction Timer: The count dow timer should be clear and accurate on every auction. It creates the urgency and encourages the users to use the auction as it approaches its end.

Self-Propagating Bidding: This allows users to specify a maximum bid with the system automatically generating the smaller repeated bids to the maximum criteria. This is a convenience weapon particularly to the items of precious value and to never leave the auctioneer without wanting more even a user is not concerned about their activity anymore.

2. Machine Learning in Bidding and Pricing

Additional explanation: Machine learning is one of the fundamental innovations in that system. And through intelligent suggestions, it makes your platform a data marketplace that is equally beneficial to both the buyer and the seller.

Detailed Breakdown of ML Applications:

Real-Time Bid Predictions: The ML model takes into consideration the historical histories and characteristics of an item and a user, as well as the bidding information to determine the final price that a user is going to bid. This can be utilised in a number of ways:

For Bidders: It can give a user a “smart bid” that will

increase their odds of winning.

For Sellers: It will enable them to set the right reserve price or starting bid.

For the Platform: You might use it for dynamic pricing techniques as scheduling or minimum bid reduction according to expected demand.

Personalized Item Recommendations: That's a standard feature of e- commerce, but hasn't been seen before in auctions. Based on the user's previous bids and views, as well as their general behavior, the ML model recommends other auctions they might like. This leads to a higher user engagement as well as crosssellings since when a user bids on a specific collectible then the user may be shown other collectibles to be auctioned that are alike to that of the last one.

Dynamic Pricing Strategies: The system can also examine to. dynamically change the prices on-the-fly. For instance, if an auction is tending down to low activity, the system can automatically decrease the initial price or floor price to arouse trading. Inversely, if then something is attracting much attention then the increments of bids can. dynamically can be increased to ensure that the seller is receiving the most money.

3. The Chatbot Assistant

The Chatbot Assistant Elaboration: The chatbot offers round time support. and satisfies the requirement to provide better user experience. It is a virtual agent which answers the frequently asked questions and provides real-time. without any human intervention.

Key Functions of the Chatbot:

Auction Related Query Handling: In the case of auction app, the chatbot. would be in charge of questions related to auction. For instance: "What's the bid at for item #123?" How long in the auction, or "How do I place a bid?“

Real-Time Bidding Information: The chatbot has the ability to send proactive. user messages such as: You are being out bid in item number 456. or "5 minutes left! Get your bids in!". This is what makes the users entertained and up-to-date.

Assisted Navigation: The chatbot can assist new users to navigate. the system or identifying objects or in learning how to make a bid.

4.The Seller's Dashboard

Description: The dashboard that the seller uses is functional and has data. to provide effective control of the auction. A strong and transparent marketplace is crucial in order to win over and retain sellers.

Key Features:

Item Listing and Categorization: Seller Efficient Post Function to. load item information, pictures and videos. Accurate categorization is important on search and personalization. **Performance Analytics:** Both real-time and historical data on their listings. is visible on the dashboard. This is between the number of views, unique bid. number, bid/off, to final sale. It is invaluable information in. will be offered to sellers to make modifications to their future auctions and prices. strategies.

Safe Transactions and Payments: The dashboard. gives an immediate summary of payments, sales and secure transactions. It provides a clear picture of the sales and payouts, determining the sales payouts. a huge openness with the seller.

2 .LITERATURE REVIEW

The previous bid processes have been overtaken by the introduction of web bid sites. turned into an entertaining and painless online experience. They are allowing people to connect anywhere in the world at the moment. Although of course bids are of different types including English (call out bids) and Dutch. Sealed-bid, Vickrey (second-price sealed-bid) as well as (drop in price). Each one is concerning a balancing process of work and buyer demand. Each has its tough parts and particularly in making everything clear, fair and fast. And there are obstacles that accompany the desire to work live - such as handling all the bids simultaneously, decreasing a wait time about a work item and stopping with much of it when it has a large number of bids simultaneously.

1)Role-Based Access in Auction Applications:Auction sites are typically made of diverse user categories comprising of auctioneers and bidders and administrators and various other categories of users possessing different levels of access. Such multirole systems have to be managed well by users so that functionality is smooth without disturbing its integrity and security. Role-based access control (RBAC) systems are widely employed in dealing with authentication and authorization of powerful control of sensitive operations (i.e., validation of every bid, registration of users, approval of transactions, etc.). The RBAC in web applications has had comparisons to compare how flexibility, scalability and security in the access management are managed differently across various systems.

2) Auction Web Technologies in real-time: The modern auction systems on the internet are powered by the efficient web technologies to enable a user friendly solution and high level of scalability.. The MERN stack (MongoDB, Express. js, React, Node. js) has become a popular way to develop powerful, scalable applications and WebSockets enable continuous, bidirectional communication that's necessary for real-time bidding. In live bidding scenarios, performance matters, including serving lower latency, load-balancing servers, and falut tolerance are necessary to ensure that the bidding is fair and exciting.

3) Artificial Intelligence in Auction Systems: AI is increasingly used in auction platforms to make bidding decisions that are not immediately obvious to the user. Predictive analytics can predict bidding behaviour where auctioneers plan their strategy, and AIenabled decision support tools can help bidders on selecting the most suitable amount and time to carry out bidding. Prior work emphasises that intelligent systems can increase efficiency, build trust, and provide adaptive pricing mechanisms for auctions.

4) Chatbots in E-commerce and Auctions: SIMILIAR Named entities-A conversational agents or chatbots for auction and ecommerce systems have been introduced to help users, to response questions, and to increase interactivity. They are decision aids by supporting instantaneous support and advice and, by doing so, lessening bidders' cognitive loading. Machine learning-based chatbots are also capable of customising to dynamic pricing and predicting user intent for increasing both satisfaction and bidding activity in auction-based environments.

5) Bidding Prediction Models: The precise prediction of bidders' behavior is an enduring problem in auctions. Historical research and statistical methods in the early age are now transformed by regression models, classification algorithms, and deep learning in the new age. Adaptive strategies have been studied too with reinforcement learning algorithms learning optimal bidding strategies in an environment that processes dynamically.

6) Human-Computer Interaction of Auctions: User experience is a crucial factor of success of online auction systems. The interface design, ease of navigation, and clarity of real-time updates are among the challenges that have direct impacts on the bidder participation. The most important issues are trust, transparency, and fairness, particularly when AI-driven mechanisms are involved to affect the outcomes. Auction platforms have tried to enhance engagement, and user retention through gamification applications, namely, rewards, badge systems, and interactive bidding functionality.

7) Security and Ethical Considerations: This issue is critical because of the security in online auction and, as there are threats like frivolous bidders, account hijacking and shill bidding, we have employed the reputation information to overcome this threat. Identity validation and abnormal activity detection are some of the fraud detection features that serve as preventive measures to safe-guard members and transactions. Ethical issues also arise regarding AI-generated suggestions and recommendations, and their fairness as far as making financial decisions are concerned or may result in a biased outcome

3. METHODOLOGY (Proposed Work & Implementation):

The system that will be created is a REAL Time AUCTION. WEB APPLICATION was introduced on Uniq Source. js, Scalable, secure, and interactive: React. js, and Node. js) online auctioning. The strategy focuses on development of the real-time communication, role based access. control, authenticated and optimal auction data. transformation to offer a fair and transparent bidding. process. It enables three types of users viz. auctions, bidders or. administrators to real time coordination, in a dynamic. location in which the bids pulses and they are current.

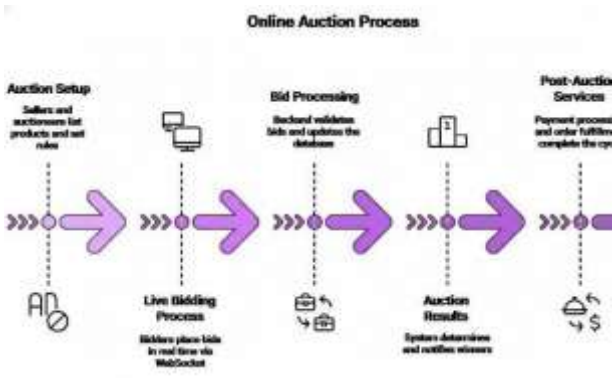

Fig.1.Online Auction Process

a. Proposed Work: The system will be segmented into a few. functional modules to have smooth operation::

User Registration and Authentication Users (bidders) both win/lose-auctioneers, admins) register on the log in and platform using JavaScript Web Tokens (JWT) authentication. Role-based access ensures, that only. user type has certain rights

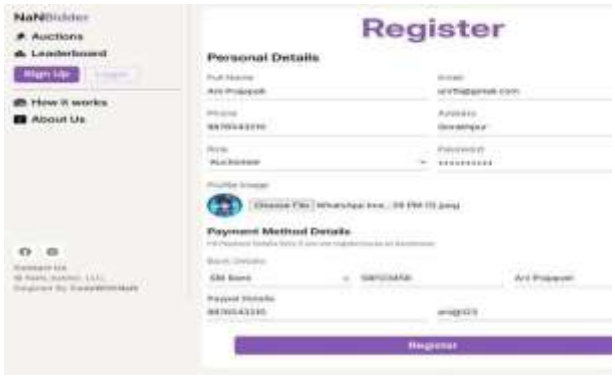

Fig.2. Registeration Page

Auction Creation & Management: Setting up and running of auctions: Auctioneers possess the alternatives of tabling items to bid, setting regulations of the auction, and by appointing a time. Auction data is archived in a safe MongoDB data-store, which offers a schema-driven. but elastic mode of storing of various kinds of auctions..

Fig.3. Create Auction

Real-Time Bidding: The WebSockets are used to have realtime communication between the clients and the server. Hello, This ensures that whenever a new bid is posted it is instantly visible to all other users without having to wait long before the page loads.

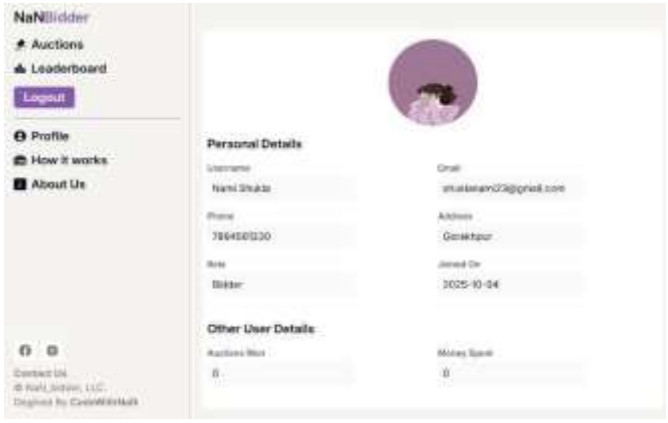

Fig.4. Bidder

Bid Validation & Storage: The server checks every bid against auction rulesets when they are written to the database (e.g. minimum increments, timed out). This will reduce non - genuine or invalid bidding.

Auction Closure & Result Declaration: At the end of the auction, the system automatically establishes the highest bidder and sends notice to all the participants. Payment options and validation are also included into this phase.

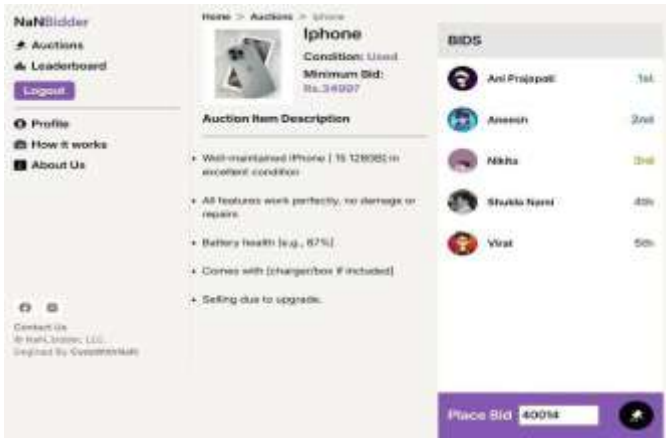

Fig.5.Bid Result

Security & Data Protection: In order to preserve the trust, the system relies on encryption mechanisms for sensitive data, secure APIs, and access control policies to avoid either unauthorized access or fraudulent bidding.

a.Working Flow of the System

The working of the real-time auction web application can be represented in the following phases:

User Signup/Login: User log in or secure account signup. JWT is used for Authenticating and secured with role-based access controls.

Auction Setup: Sellers of the product receive bids from sellers and auctioneers receive Acri Applicons from auctioneers.

Live Bidding Process: The bidders can join a live auction where they real-time push their bids through WebSockets.

Bid Processing: The backend does bid checking/validation and database updates. Others watching the item can instantly view the top bidding on their screen.

Auction Results: The highest bidder wins the item after the auction timer expires. Both the auctioneer and winning bidder are notified.

Post-Auction Services: Data, payment gateway, transaction record and order fulfillment are connected to form the entire auction life cycle.

4.Result and Discussion

1. Real-Time Bidding Performance: The application effectively delivered dynamic price updates through WebSockets in real-time with all participants being instantly informed of newly placed bids. Performance tests indicated bid update latency stayed below one second even with multiple simultaneous usersrengths Performance tests demonstrated a latency of bid updates of less than one second limited the number of concurrent users in an equivalent simulation. This indicates that the interaction between the apps is dynamic without delays, therefore, competitive fairness in subsequent bidding among the apps can be guaranteed.

2. User Interface and Experience They user access to claims may be smooth and almost real time. feedback in live auctions without manual page refresh. The two major factors were improved in terms of interface design which made it more interactive and operable. to the satisfaction of the user of the online auction system. Authentication and authorization

3. Role-Based Access and Security had been quite well implemented in JWT (JSON Web Tokens). Access control was rolebased and only specific users (i.e. administrators, auctioneers, or bidder) could carry out some activities. This was strengthening the security of the system and prevented any. bad interventions occurring in auctions. Users' sensitive encryption of information was also done.

4. Scalability and Data Management: MongoDB was used. contributory role within company business especially in the regions of user information and profiles, product information and auction history. The use was also beneficial to the NoSQL model in handling varieties. items that are auctioned that do not require a single schema. The stress test revealed the capability of the system to support multiple auctions, and are also horizontally replicable on demand.

5. Auction Process Accuracy: This is the back-end that is built using Node. js and Express. js checked that every bid satisfied auction constraints (e.g., minimum increment, time expiration). This lead to a correct processing of Bids and made it impossible to register invalid or duplicate Bids. It had accurately revealed winning bids at the close of the auction, increasing the trust among users.

6. Limitations and Future Enhancements: Although this system worked well and was reliable, problems were encountered with a very large amount of concurrent loads. Server side will become less performant with very large scale scenario, so please follow it up with future version that should include load balancing and distribution. Moreover, the platform might be improved by incorporating more advanced AI components (e.g., for ad-bidding prediction and fraud detection).

5. CONCLUSION

One of the evidences of how is the Real-Time Auction Web Application. the help could be to create powerful and scalable a bidding web site today. of recent web related technologies. By using the (MongoDB, Express. React. js, js, and Node. js + Websockets so as to make it real time. communication - the site can provide real time bid updates, smooth. customer experiences and auction services. Participation was encrypted with the help of RBAC and json web tokensbased authentication, and MongoDB was. used to store and provide huge volumes of auction data. The experiment findings revealed that the application is receptive. when used concurrently with lowlatency and correct bid validation. the internet auction is enabled by the system with user-friendly interface. high information security, and honest biding model. While there were certain problems experienced with large-scale synchronous auctions. and handling load on servers, that is also a matter of enhancement by with such technologies as load balancing, distributed architectures and other functions that may be AI driven such as predicting bids and detecting. fraud. Overall, it can be stated that the system offered here successfully brings the real-time, open and safe internet auction system. It serves as a solid base to go on with the progress and can be generalized to be larger. e-commerce environment in which real-time querying and user is accurate. interaction are involved

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