Cross Platform Online Auction System

Suhasini N
School of Computer Science And Engineering
REVA University
Bengaluru, India
suhasini.n@reva.edu.in

Rahul Kumar Jha
School of Computer Science And Engineering
REVA University
Bengaluru, India
R18CS320@cit.reva.edu.in

Rinjan Chatterjee
School of Computer Science And Engineering
REVA University
Bengaluru, India
R18CS329@cit.reva.edu.in

Saikumar Kamthane
School of Computer Science And Engineering
REVA University
Bengaluru, India
R18CS359@cit.reva.edu.in

Abstract—An online auction which is also known as e-auction (electronic auction) is basically an auction which is conducted over the internet. These auctions can include a variety of items on which people bid and the person with the highest bid wins. As of today, the largest such site is eBay which was the first site which supported P2P (Person to Person) auctions. However, with time the site UI (User Interface) is quite outdated and does not have proper support across all platforms. This implementation hereby uses Google's latest Flutter Software Development Kit which provides native widgets and similar performance to native apps and uses a single codebase to run across different platforms such as Android, IOS, Web, Windows, Linux, and Mac. This cross-platform auction system can be accessed by all users regardless of the device they use and will provide the best performance and synchronized UI and any user can participate both as a buyer and a seller.

Keywords—Cross Platform, Flutter, e-Auction.

I. INTRODUCTION

Online auctions, like offline auctions in general, can be organized in a number of different ways, including ascending English auctions, descending Dutch auctions, first price sealed-bid, Vickrey auctions, and more.[4] The extent and impact of these auctions were boosted even more by a tremendous rise in Internet users, which was unanticipated.[5] One of the key reasons for this rise is that these auctions break down traditional barriers such as geography, presence, time, space, and target audience.[5] This increase in accessibility has also made it much easier to engage in illegal activities during an auction.[6] In recent years such kind of auctions have constituted of around 30 to 40 percent of all online e-commerce due to rapid increase in popularity.[7] Business to business (B2B), business to consumer (B2C), and consumer to consumer (C2C) auctions are all types of online auctions.[8] There are multiple number of platforms present for online auctions but most of them are limited to being web based and in some cases are available for Android or IOS. Furthermore, technological stack used by them have become outdated and there is no proper similarity between there UI across all platforms which may prove as a hinderance for some users. This solution aims to sort these issues and provide a newly built platform using Flutter framework which is provides tools for fast and effective development and debugging and a single codebase can be used for development across all well-known platforms. Users will be provided with options to sign-up or login and after logging in they can view all current or upcoming auctions which can be sorted by categories. They can also list items on auction portal and a nominal charge of 1% will be charged by the platform of sale price of the item. Due to use of Flutter performance will be identical across all platforms with utmost precession.

II. LITERATURE SURVEY

Over time, online auctions have become a common e-commerce transaction method. Because eBay is the world's largest online marketplace, it's an intriguing case study since it offers researchers to determine online auctions using collected from actual individuals and transactions. In this paper, we examine concerns with large online auction platforms in depth.

In recent years, the development of the World Wide Web has led to a rise in the number of online public auctions. One of the hallmarks of online auctions is that they require many buyers and sellers to be effective. As a direct result, auction sites with a massive volume of visitors generally have an advantage over those with a low volume of visitors. As a result, consumers and sellers become even more polarized towards a specific site. In several online and telecommunication applications involving interactions among multiple entities, which known as the network effect. While it is widely acknowledged that this effect raises the value of the entire system, it has not been thoroughly modelled or evaluated.[9] Popular auction platforms face an issue of inconsistent UI across different platforms as each one is developed using a different technological stack and there might be different issue with each of them which have to be resolved separately which requires multiple developers of different proficiencies and significantly increases time consumed even when a simple feature is added. Another issue that bidders may confront is the issue of exposure. When purchasers want a bundle of commodities but may only engage in single-item auctions, exposure difficulties arise, according to Bykowsky et al. 1 For Instance, if Alice rates a gaming console at $200, a video game at $30, and both a console and a game at $250, she needs to figure out how much of the $20 in synergy value she should include in her console-only bid. Sequential auctions of single products, along with patient bidders with substitutes or complimentary valuations, produce both difficulties on eBay.[10] Furthermore issues such as no presence of automated notifications and no proper categorization as sorting also need to be addressed. Along with these there is problem for users where they cannot participate in overseas auctions and no proper currency conversions.

EachNet is a famous Chinese consumer to consumer online auction site and is alternative to E-Bay in China, fueled by the Chinese online auction industry's quick expansion and expanding demand. Based on auction processes of the platform, a basic framework has been built to aid in the investigation of numerous seller and buyer-specific factors impacting the final outcomes of online auctions, as well as the interdependencies between these elements Instead of judging the successes and failures of an online auction primarily on the final price, which might vary dramatically across product categories, three product-independent performance criteria were suggested: success-or-failure, efficacy, and satisfaction. The findings imply that the overall number of bids made by all competing bidders during the auction somewhat mediates the impact of seller characteristics and auction features defined by the seller on auction performance. The study's implications are also explored to encourage more research in this field.[14]

There have been several concerns with auction length and bid placements in recent online auction research. The duration of an online auction is set by the seller, and the pattern of bid arrivals is assumed to reflect bidders' bidding tactics and behavior. The most well-known occurrence in bid arrival process is late bidding, which provides a bidding strategy that many bidders often utilize frequently. Compared the duration distributions and bid arrival patterns of eBay auctions from numerous global websites at the same time, identifying a gap in the growing body of literature on online auctions in comparative studies of participants' behavior across similar but different platforms. The statistical findings suggest that this

comparison study is worthwhile. Finally, it is suggested that in future research, more complex data mining technologies may be required for analysis of online auction data.[12]

Bonsai is an example of a standard electronic auction system (www.bonsai.com). In Bonsai, new members must fill out a particular registration form. When a user joins the system, he or she can watch auctions, participate in auctions, and sell one or more things. Someone fills out a form with product details and the desired (minimum) price to sell something. Bids are collected for a defined period of time, following which the top offer and eventual winner are announced to bidders. An auction usually takes a long time to finish. Jerome J. Manning & Co.: Real Estate Auctions and Copart Salvage Auto Auctions are two similar systems. The emergence of eBay, however, has accelerated the growth of the real-time auction concept.[13].

From the literature survey its identified that there are lot of issues persisting with online auction systems with lack of cross platform support and uniformity being one of them.

III. PROBLEM DEFINITION

Some major Problems with current systems are as follows:
- Major platforms have an outdated UI/UX.
- Lack of synchronized User Interface across different platforms as user interface changes with change in platform.
- No system for bidding in native currency for an item listed in a different currency.

IV. OBJECTIVES

This solution has the following objectives:
- Create a sustainable cross platform auction system with optimized performance.
- Address notification and personalizing issues faced by users.
- Provide Uniform User Interface across all the platforms.

V. COMPARISON TABLE

Current Implementation	Proposed Model
• No Cross Platform Support or Optimization.	• Cross Platform Support and Optimization across all devices.
• Minimal Security System or Security approach.	• Implementation of Secure Sealed-Bid Auction System
• Minimal or No use of Cryptography as the central security system.	• Implementation of Cryptography as the backbone of security.
• No implementation of converting to native currencies and higher conversion rates.	• International Auction in native currencies at best conversion rates.

• Minimal Notifications and contacts with the user only using machine generated texts.	• Personalized notification and communication with the users.

VI. METHODOLOGY

The project will first start with the launch and auto login step, through which it will be verified that whether the user is already logged or not. If the function returns true user will be redirected to Homepage else Start page. Then options will be given for either login or signing up for account.

After the designated selection by the user, Homepage or the primary page will be loaded where the user can browse through the current and upcoming auctions which will be implemented by fetching data from back-end services and can list and auction as well.

After the desired action, auction page will be responsible for conduction of proper and smooth auction services. After the user selected their desired unit, they will be sent to the payment gateway which will be done using Razorpay. And at last backend services will be responsible for storing data and other assets for the website which will be done using Firebase and Rest API.
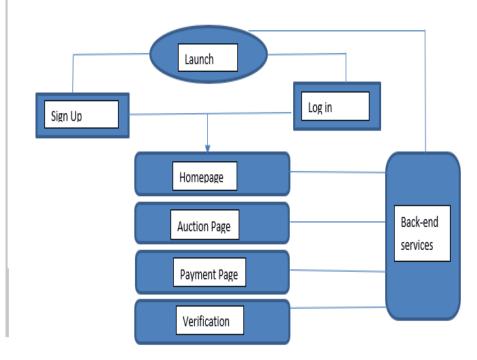

Fig 1: Flow Diagram

VII. MODULES IDENTIFIED

The modules can be hereby split into following:
- **Launch And Autologin**: On launch it will be verified that whether the user is already logged or not. If function returns true user will be redirected to Homepage else Start Page.
- **Sign Up Page**: This page will be helping the user to sign up on the platform by providing all the needed details.
- **Start Page**: This will contain options for signing up or logging in and functions will be executed as user wants

- **Home screen:** This is the primary page after logging in where user can browse through current and upcoming auctions which will be implemented by fetching data from backend services and can list an auction as well.
- **Auction Screen:** This is one of the main modules which will be responsible for conduction of proper and smooth auctions.
- **Payment Gateway:** A proper gateway for making payments for users need to be provided which will be done using Razorpay.
- **Backend:** Backend services will be responsible for storing user data and other assets for the websites which will be done using Firebase and REST API.
- **Authentication:** Authentication Services will be provided by Google Firebase API.

VIII.   IMPLEMENTATION

As the project uses Flutter SDK all the code written will be in dart and will run across various platforms without much need for changing the codebase.

1) Launch and Autologin : Whenever the application is started the application makes a Firebase Authentication call to check if a user was already logged in into the applicatio, if the condition satisfies user data is fetched from Firestore Database and user is automatically logged in.

2) Sign Up Page: This page will consist of all the required fields a user needs to provide in order to register on the platform. Once a user signs up all there details are verified and stored on Firestore Database.

3) Start Page: This contains option to login and user can hereby provide credentials to sign in in case they have already registered. Whenever login button is pressed Firestore instance will make a call to database and locally store all details of user temporarily.

4) HomeScreen: This screen hereby contains two options with navigation bar at the bottom the user can navigate among different screens from the Bottom Navigation Bar. On the homescreen there are namely two main sections one is for creating a new listing and another which displays featured active listings. When a new listing is to be created a modal bottom sheet appears with various required parameters for the listing and when submitted details are verified and listing is created in the database using Firestore API. In same manner active listings are displayed on the home page for listings which are active.

5) AuctionScreen: This displays the selected active listing and the user can bid on the item from here. This fetches the current details of the listing from Firebase Firestore API.

6) Payment Page: The payment for this application is a wallet based payment system. Every user is assigned a virtual wallet where they can add money from almost every payment methods. This wallet money can later be used to make payments for various transactions and will be used to receive amount for sold items as well. User can hereby use it to withdraw money it a bank account. All these activities are being facilitated by use of Razorpay payment gateway API's.

7) Profile Page: On this screen user can hereby check all his personal details. Details here are being displayed by accessing the user data which is saved in the local memory on event of login or Autologin.

8) Listings Screen: This contains two options one for displaying listings added by user and other for listings users has selected as intrested in or has participated in. This is from where user can start the auctions from there lisitings. These are achieved by accessing the database and matching with the listings present in user profile details.

IX. CODE AND DATABASE STRUCTURE

The database structure is in a JSON (JavaScript Object Notation) format due to its easy usage and parsing capabilities.

The database for user data is as follows:

{
"Balance": This indicates users current wallet balance,
"DOB": This stores the users DOB.,
"Email": Stores the name of item.,
"FirstName": This fields contains first name of user.,
"Gender": This field stores user Gender.,
"LastName": This fields contains last name of user.,
"Mobile": This fields contains contact number of user.,
"LastName": This stores the URL of profile picture.

}

The database format for listing is as follows:

{
"About Item": This contains details about item,
"Item Category": This contains the category of the item.,
"Item Name": Stores the name of item.,
"Item Price": This fields contains current price of the listing.,
"isActive": This field indicates whether the listing is live.,
"url": This stores the url associated with the listing.
}

Based on the parameters mentioned a unique identifier is generated for each listing to top find it in the vast database.
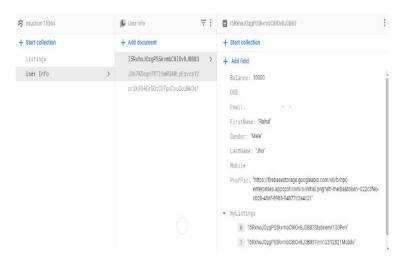
Fig 2: Database Structure for User Details

Fig 3: Database Structure for Listings


```dart
}

@override
void initState() {
  super.initState();
  _razorpay = Razorpay();
  _razorpay.on(Razorpay.EVENT_PAYMENT_SUCCESS, _handlePaymentSuccess);
  _razorpay.on(Razorpay.EVENT_PAYMENT_ERROR, _handlePaymentError);
  _razorpay.on(Razorpay.EVENT_EXTERNAL_WALLET, _handleExternalWallet);
}

@override
void dispose() {
  super.dispose();
  _razorpay.clear();
}

void openCheckout() async {
  var options = {
    'amount':widget.amount*100,
    |    // For testing purposes
    'name': 'EAuction ',
    'description': 'Add Money To Wallet',
    'prefill': {'contact': '', 'email': ''},
    'theme':{
      "color":"#800080",
    },
  };

  try {
    _razorpay.open(options);
  } catch (e) {
    debugPrint(e.toString());
```

Fig 4: Code Snippet For performing payments.

Fig 5: Code Snippet for logging in and running queries to save user data

Fig 6: Code snippet for running queries to find user listings to display

X. CONCLUSION

It can be hereby concluded that using Flutter SDK an optimized auction system can be implemented which can address a lot of issues and challenges with current major platforms. Furthermore, challenges such as inconsistency across various Operating Systems are also fixed and various algorithms for efficient auctions will be implemented.

REFERENCES

[1] Kleusberg, Peter (2009). E-Collaboration und E-Reverse Auctions. Saarbrücken. pp. 16–25.

[2] Engelbrecht-Wiggans, Peter (2006). E-Sourcing in Procurement. Management Science. p. 581.

[3] Wyld, David C. (2012). REVERSE AUCTIONS 101. Louisiana: Southeastern Louisiana University.

[4] *Friedrich, Michael; Ignatov, Dmitry (2019). "General Game Playing B-to-B Price Negotiations"* (PDF). *CEUR Workshop Proceedings. 2479: 89–99.*

[5] *Bapna, R.; Goes, P.; Gupta, A. (2001). "Insights and analyses of online auctions". Communications of the ACM. 44 (11): 42.*

[6] *Albert, M. R. (2002). "E-Buyer Beware: Why Online Auction Fraud Should Be Regulated". American Business Law Journal. 39(4): 575–644.*

[7] *Vakrat, Y.; Seidmann, A. (2000). "Implications of the bidders' arrival process on the design of online auctions". Proceedings of the 33rd Annual Hawaii International Conference on System Sciences. p. 7*

[8] *"What is an Online Auction? - Definition from Techopedia". Techopedia.com.* Retrieved 12 November 2021..

[9] Online Auction Manasi Bhamare1 Arati Chame2 Gaurav More3 Prof. Amol Rindhe4 1,2,3UG Student 4Assistant Professor 1,2,3,4Department of Computer Engineering 1,2,3,4JSPM's Bhivrabai Sawant Institute of Technology & Research Wagholi, Pune, MH, India

[10] The Sequential Auction Problem on eBay: An Empirical Analysis and a Solution . Adam I. Juda Division of Engineering and Applied Sciences Harvard University, Harvard Business School, David C. Parkes Division of Engineering and Applied Sciences Harvard University.

[11] Basha, S. M., Poluru, R. K., & Ahmed, S. T. (2022, April). A Comprehensive Study on Learning Strategies of Optimization Algorithms and its Applications. In 2022 8th International Conference on Smart Structures and Systems (ICSSS) (pp. 1-4). IEEE.

[12] Research on Duration and Bid Arrivals in eBay online Auctions in the Internet. Zhang Jie, Zhang Yaping, Department of Economics, Shandong University, Jinan ,China. Department of Economic and Management, SUST, Qingdao, China. Department of Accounting, Henan Business College, Zhengzhou, China.

[13] A Real-Time Auction System Over The WWW. Christos Bouganis, Dimitrios Koukopoulos and Dimitrios Kalles Computer Technology Institute, Patras, Greece.

[14] Empirical Investigation of EachNet: The eBay Model of C2C Online Auction in China, Helen S. Du, Hai Yu, Yulin Fang, and Shouyang Wang.