Original Article

Secure Real Estate Transaction Platform using BlockChain and AngularJS

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Abstract - The main aim of this research work is to develop a unique and secure platform where several verified sellers list their properties on a public ledger-like blockchain-based application and verified buyers can choose to buy any of the publicly displayed properties according to their needs and capabilities. The objective of this research is to remove the need for intermediate agents and brokers who charge a lot just to show these properties and make the whole experience smooth and free of cost to both the parties. The fact that the application has filters for locations, budget range, size of the property and so on while selecting the properties on the buyer's side makes the process a whole lot easier and faster.

The research application is built using AngularJS which is a structural, open-source front-end JavaScript framework to design functional, dynamic web and mobile applications. The whole backend is managed by the Firebase by Google, which is a flexible and scalable online database. This combination of frameworks and platforms used makes the application modern, dynamic and fully functional and also helps in the scaling-up of the application for a wider range of use-cases.

Keywords - Blockchain, AngularJS, Seller, Buyers and firebase.

I. INTRODUCTION

A Real Estate business deals with buying, selling ,managing, or investing on properties, land and buildings. there are some categories of real estate like residential, commercial, industrial, open plots(raw lands) for special usage. According to studies and real experiences from persons known that identifying correct dealer or property owner is very difficult task in the present scenario. so this process of buying/selling of property can be automated with secure blockchain technology.

Blockchain's inherent system of trust makes it the ideal technology for real estate.

A. Problem Definition

The whole application is intended to make the whole process of buying and selling the properties easier and more convenient for both the buyers as well as the sellers.

The main problem or the drawback of the present situation in real estate marketing is that there are a lot of intermediate people and companies involved. This not only is time consuming as many people are involved, but also causes a large chunk of the property's cost or price to be transferred to those intermediate people and companies. This application intends to remove this middleware from the system and include only buyers and sellers and no one else.

The purpose of using blockchain is to make the whole process transparent and visible to everyone and this property helps us to maintain reliability throughout the system and application and also helps the system to be hack-proof because of the decentralization of the blockchain.

B. Existing System

The existing system is nothing but websites and applications which allow the users to buy and sell like 99acres or magic bricks to name a few. Another aspect of the system is the current real estate business and marketing.

- This system is not open for everyone because the costs are way too high and not everyone in the society can afford this kind of transactions and costs.
- There is also a lack of transparency in the whole process where there is a lot of possibility for the occurrence of fraudulent activities.
- The intermediate people and companies involved will be charging a lot of money for the work that they do. There are a lot of intermediate fees like broker fees, attorney fees, taxes etc. This will either only add up the money for the buyer or reduce the money received for the seller.
- There is a lack of liquidity and the whole lot of types of currencies involved and types of transactions involved make the process very slow as all of them need to be converted back into a common and a generalized one.
- This and also the involvement of a lot of middlemen increase the time of the overall process and drastically reduce the speed of the transactions.

C. Proposed System

With the drawbacks of the existing system in mind, the proposed system solves most of the problems caused by the existing system.

- In this system, anyone can be involved in the business and there is no restriction whatsoever.
- The whole process and the data is decentralized and secured because of the use of blockchain.
- As there is no involvement of any middlemen and intermediate companies, there is no wastage of money unnecessarily.
- As the currency used is the cryptocurrency, the whole system is under the common form of currency. There is no need for any conversions and the transactions are of very high speeds due to the existence of only a single form of currency. The fact that cryptocurrency is a digital must be noted as this is a main reason for the high transaction speeds when compared to the existing counterparts.

II. LITERATURE SURVEY

Many literature reviews and surveys have led to the making of this application. Most of them are related to the blockchain concepts, research and developments and some include the real estate applications separately. Some of them are as follows.

A. "NutBaaS: A Blockchain as a service platform" by Weilin Zheng, Zibin Zheng, Xiangping Chen (2019).

This application named NutBaaS is a blockchain as a service which maintains and does transactions and stores them in a blockchain. These transaction details are visible to the public and increase transparency of the whole system overall. The users however remain anonymous and the persistency of the data is remarkable in this application. But the whole system is very costly to build and is a complex model to build and understand.

B. "Online Food Court Payment System using Blockchain" by Arun Yadav, Divakar Yadav, Sonam Gupta (2018).

This application is the source for the architecture of the system that is being built in this project.

It is a very simple application which makes it easier to understand and develop and it also drastically reduce the labour cost involved and is a lot faster than the traditional modes of food court services. But in the long run it is sometimes hard to maintain the whole application and requires someone to be present with the device on which the application is being run. In other words the application is not fully automatic and needs some manual inputs as well.[1]

C. "Enterprise Blockchain for Grid Modernization", by Claudio Lima (2019).

This is a model for the grid type of networks in which a blockchain could work. It is a research level thesis and a potential model and concept for the use of blockchain at an enterprise level. The whole aim of the model is to optimize and to make the whole grid system efficient in its functioning. But in order to achieve this level of usage there should be a large number of nodes to form the grid network for it to run smoothly. [2]

D. "Internet Geography and Real Estate Market" by Dan Komosny, Martin Bulin, Petr Ilgner (2017)

This is a study on how the market actually functions with respect to the real estate business and rise and fall of the costs of the properties. According to the research, the internet geography i.e the map of places where the real estate business is high and low, can be tracked and stored and analyzed in a simple and easy way. There are some situations to keep in mind where the servers may not work and there are a lot of transactions happening at the time of server breakdown.

E. "Estimating the Willingness to Pay for Urban Housing in Chinese Cities" by Fenjie Long, Ming Juo, Siqi Jheng (2009)

This is also a study on the Chinese people and cities where estimation and surveys are done to find out how many people are actually willing to buy a house or sell a house i.e indirectly participate in a real estate transaction. This analysis is done extensively to get the most accurate results possible. But one downside to all this analysis is that the collected data could be private and the data could be misused when it is in wrong hands,

F. "Business Process Models of Blockchain and Real Estate Transactions" by Jack Laurie Tilbury, Karl van der Schyff (2019)

This is a quick study and analysis of the available and best process model for a blockchain powered application and also the study of how the real time transactions work in enterprise level and consumer facing applications. This study reduces the reliance on the third parties and increases the overall efficiency of the process because the best practices and models are already studies here in this analysis. But the review and validation process of these concepts and methods is a bit challenging because judging one process over another requires a lot of expertise in both the fields.

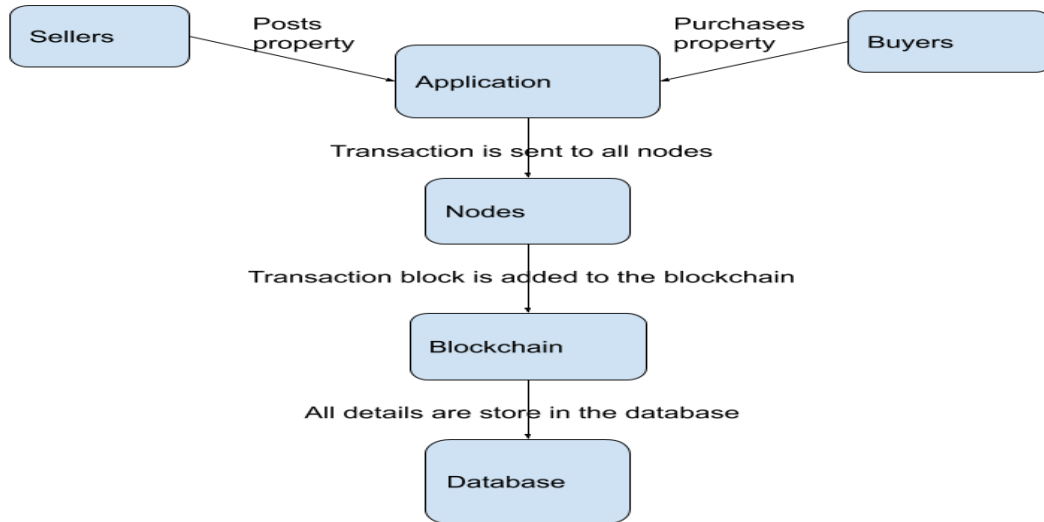## III. DESIGN AND METHODOLOGY

A. System Architecture

Fig. 1 System Architecture of the Application

The above Fig.1 System Architecture, describes about various components in the system including sellers, buyers, nodes (everyone), the blockchain, the database to store all the data.

B. Framework Used

The MEAN stack framework is organized into a series of layers, with each layer building upon the previous layer. This framework is explained in the below figure Fig. 2.
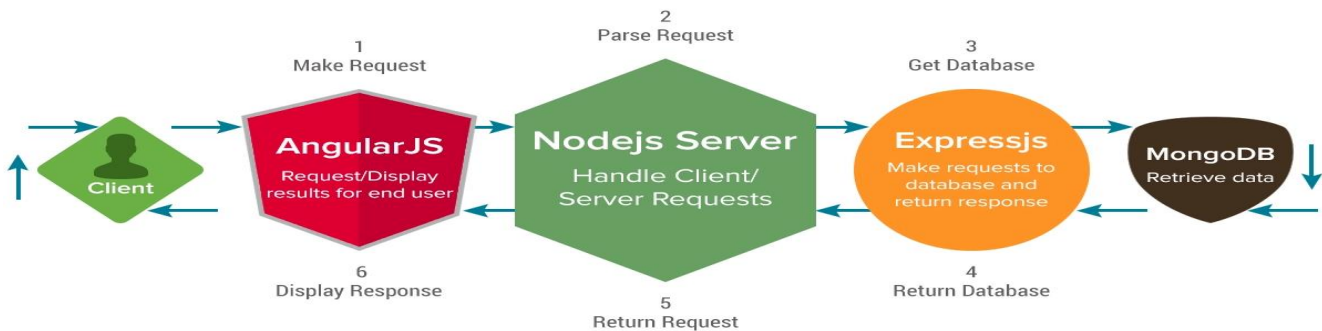

Fig. 2 MEAN stack development

MEAN Stack development consists of collection of javascript technologies to develop the web application.

a) AngularJS simplifies application development by presenting a higher level of abstraction to the developer.
b) Node.js is an open source, cross-platform runtime environment for developing server-side and networking applications.
c) ExpressJS is a web application framework that provides you with a simple API to build websites, web apps and back ends.
d) MongoDB is a NoSQL database which stores the data in form of key-value pairs. It is an Open Source, Document Database which provides high performance and scalability along with data modeling and data management of huge sets of data in an enterprise application.
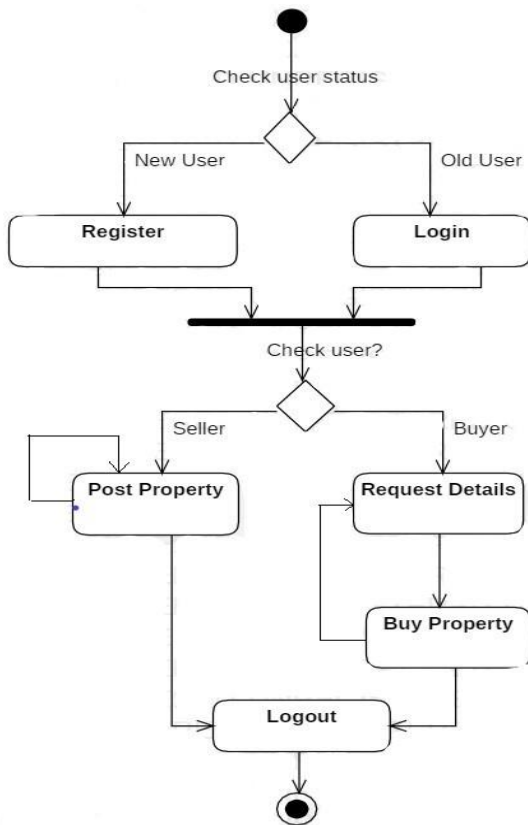
C. Activity Diagram

Fig. 3 Flow of activities in the system

The above figure Fig.3 shows the flow of activities of the whole application in a nutshell. The application begins by checking the status of the user, which could be a New User or Existing User.

If the user is new, he/she is taken to the registration page where basic details are taken from the registration form and then the user is taken forward to the home page.

If the user is an existing one, he/she is taken to the login page where login credentials need to be entered in order to access the application. Once this is done, the user is then taken to the home page.

On the home page, the user will be displayed with various data depending upon the user type which can be buyer or seller. The seller will be given options such as posting new properties and details about the existing properties and the buyer will be shown all the available properties depending upon the place and the budget that the user has selected. All the properties are shown as per the filters that the user has applied.

The buyer can then request more details of the property in case he/she is interested in it. So a request can be made to which the seller responds appropriately. The buyer can then buy the property using the existing wallet or in other words, the cryptocurrency of the application.

These operations can happen as many times as the users want to and once they are done, all the users, buyers and sellers alike, can log out of the application.

IV. MODULES IMPLEMENTATION

A. Authentication and Registration

From the below figure Fig. 4 we can find two types of users i.e New Unregistered user and an already registered user. The new user uses the signup system where he needs to enter details like name, email, password (for the app) and phone number. Upon entering those details, these are sent to the backend database, and the new user is created. Once the user is created he is taken into another screen which is the home screen.

When the user is not a new user i.e he is already registered, he uses the login system/login page where he enters the email and password for authentication. When these credentials are correct, he is taken into the home screen.
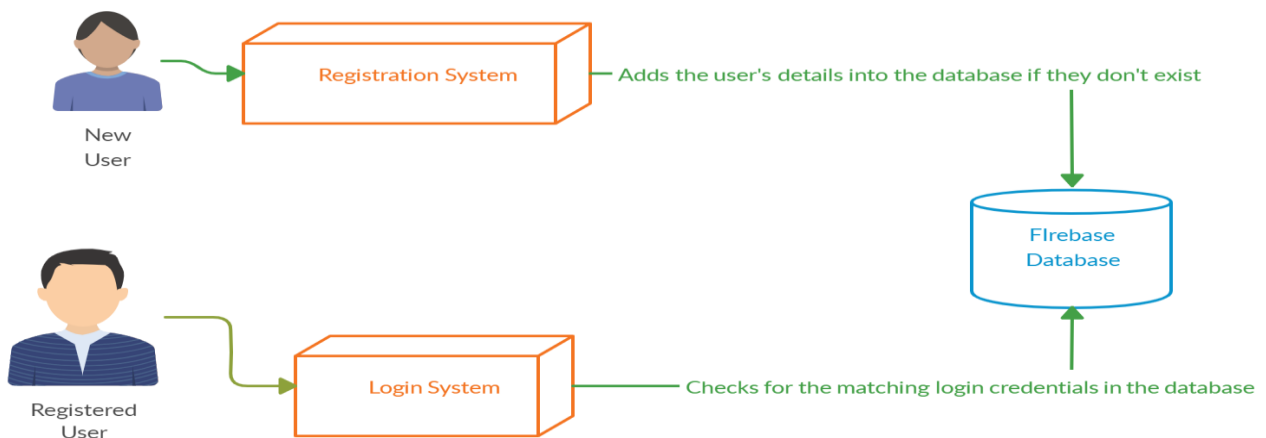

Fig. 4 Authentication System

In both these registration and login systems, there is a validation going on where empty fields are not accepted. In the login system, when the password is incorrect, the user is shown an error message that the password was incorrect. Similarly, if the user doesn't even exist, that error is shown and the user is suggested to move to the registration screen. In the registration, if the user already exists and is trying to re-register, that error is shown to the user. So in all these systems, proper validation is taken care of.

B. Viewing and Posting
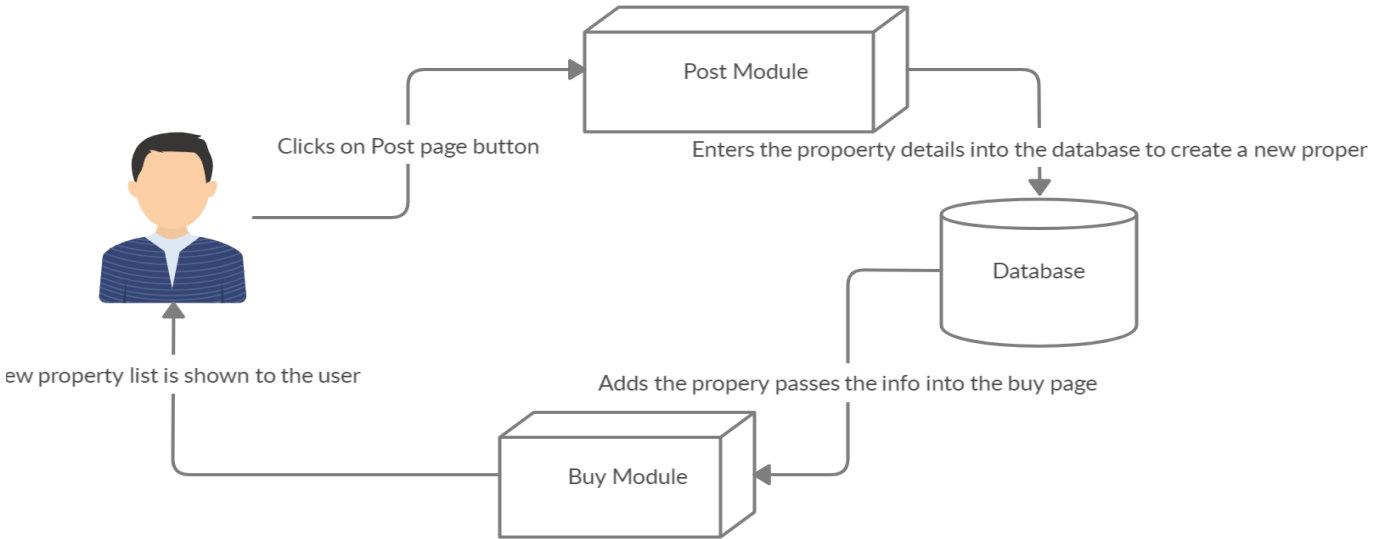
Fig. 5 Viewing and Posting

From the above figure Fig.5 which explains the buying and posting mechanism, users can view the existing properties which are put on sale. These users are the potential buyers. In the buying page i.e the property viewing page, various aspects / details of the properties are displayed which include name, description, area of the property, owner of the property and the address of the property. The user now has options "Buy Now" to buy the property, "Request Details" to get more details of the property and "Delete Property" if the user has posted the property and wants to remove the property from sale.

The post module allows us to post the details about the property that we want to put on sale. This data entered in the form and then submitted. This property can now be viewed in the buying/viewing page of the application.
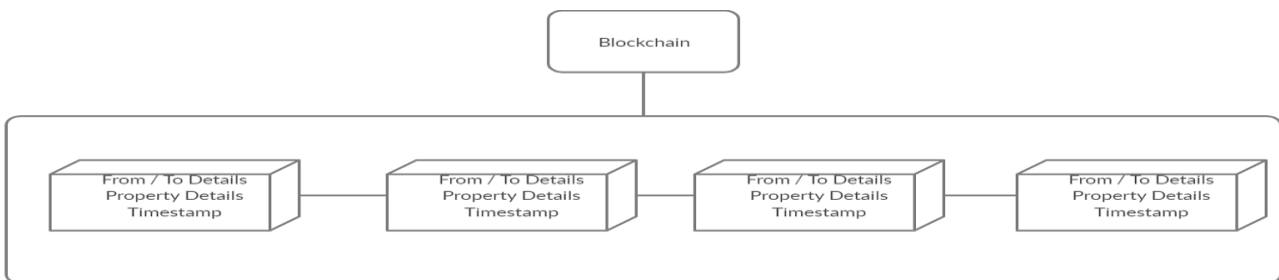
C. Blockchain Module

Fig. 6 Blockchain Module

The above figure Fig.6 shows us how the blockchain concept comes into play in the system. Whenever the users interact i.e buy or sell the properties, the details are stored up in a separate place in the database allotted for the blockchain. The main purpose of the blockchain is transparency as well as anonymity at the same time. User details and transaction private details are hashed out and displayed to the whole network of users in the application. They are displayed according to the exact timestamps in order for the other users to know that the property is sold and also to prevent the system from hacking. The blockchain component contains details like from, to, timestamp, cost of the property(optional) and so on.

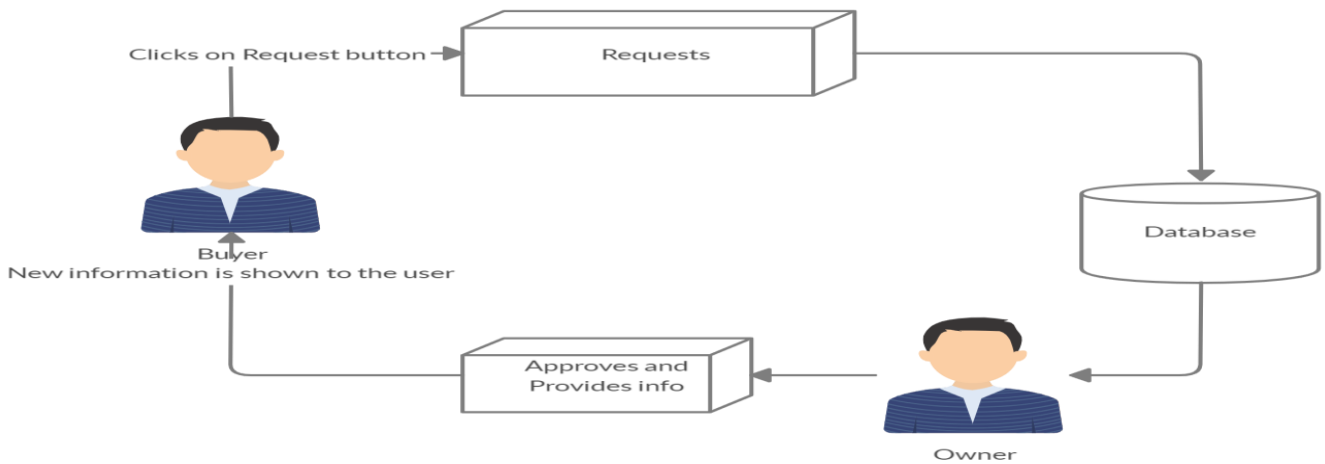### D. Notifications module

Fig. 7 Notification module

The above figure Fig:7 shows us the notification module and how it works, Whenever any user requests any information regarding any property in the available list of properties using "Request Details" button alongside the property details, a request is sent to the owner of the property that certain user wants to know more details about the property. The owner on the other end can approve the request and then enter more details like number of rooms, any extra details like lawn size, number of trees around etc. When the owner sends this additional information, the user who requested this information gets another notification that the owner has approved and sent some more information and this user can view all the additional data from his notifications area.

V. RESULTS

A. Login Page

The below shown figure Fig.8 is the login page where the user can enter his registered email and the matching password. Upon entering those details in the text fields provided, the user can then click on the login button provided below the text fields. This is used to take the user into the application and shows the home screen of the application.
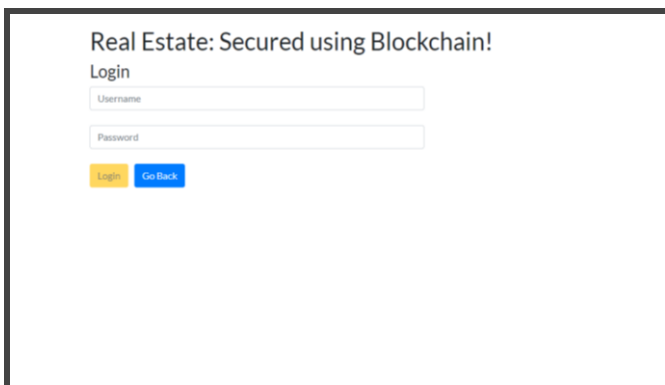

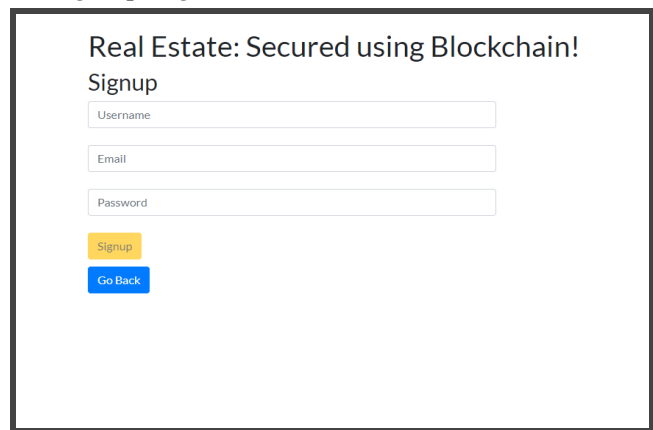**Fig. 8 Login Page**

B. Sign Up Page

Fig. 9 Sign up page

The above shown figure Fig.9 is the sign up screen that is provided. We are provided with four text fields for the sign up page namely, email of the user, password for the account, phone number and finally the name of the user. Upon entering all the details in the appropriate text fields, we can click on the sign up button provided below the text fields. This allows the new user to enter into the home screen or the main screen.
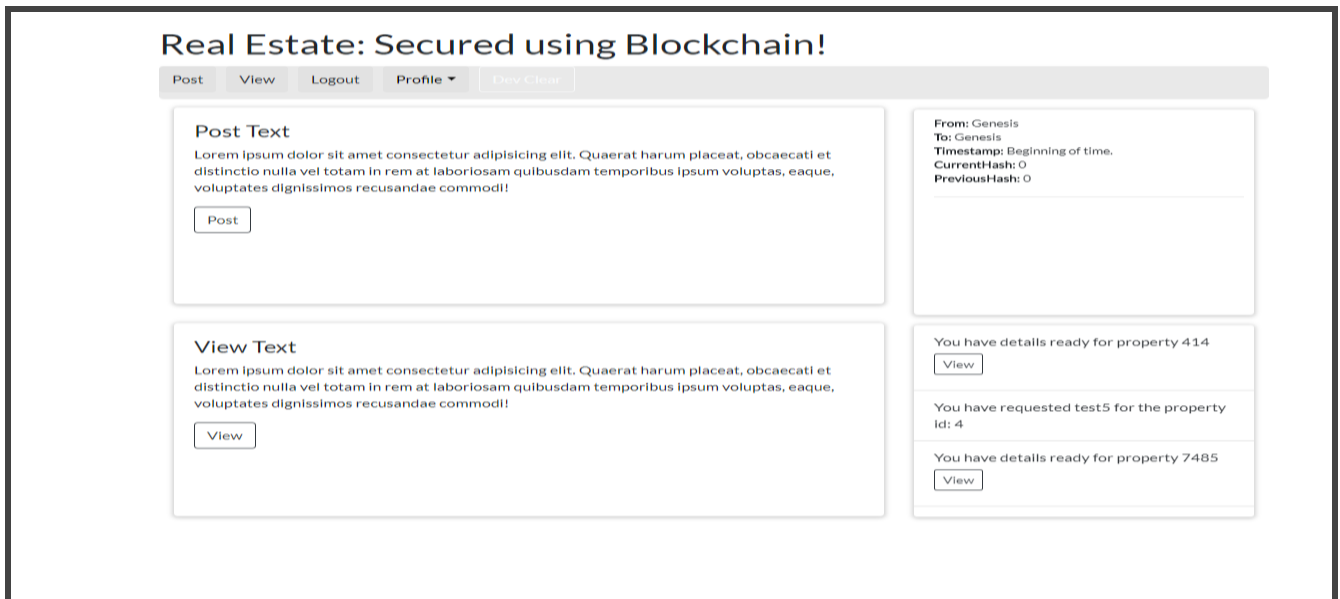
C. Home Page

Fig. 10 Home Page

The above shown figure Fig. 10 is the home page of the application which contains blockchain which is a transparent one and notification component as well. There are also options for posting and viewing the properties which are accessible from the homepage. There are options to view profile and also for logging out from the home page itself.

D. Buyer Page

The below figure Fig.11 shows the buyer page of the application where the users can view all the available properties which were put on sale and are available to buy. there are details about the properties like name, description, area, owner, address of the property etc. There are options like "Buy" , "Request Details" , "Delete Property".

User can also search for the properties and also can filter the properties based on the price which in turn helps the user in getting desired properties quickly and in an easy way.
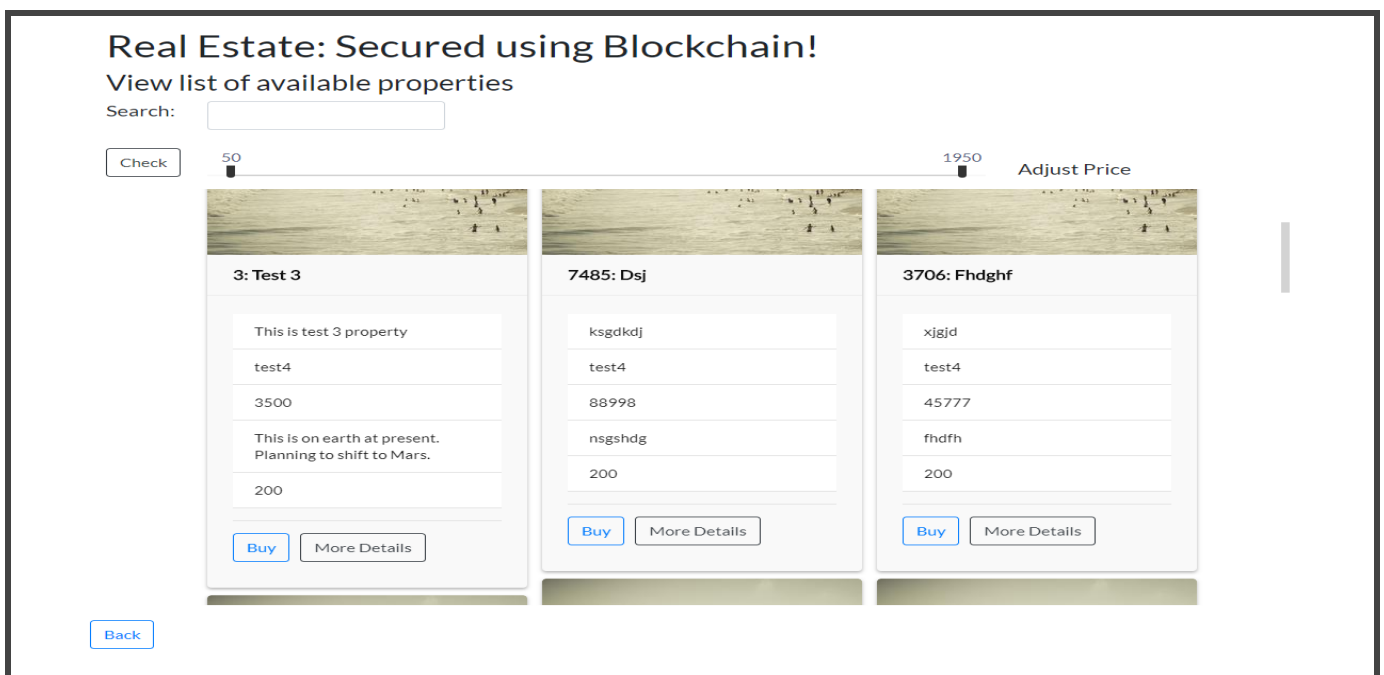

Fig. 11 Buyer Page

E. Post Page

The below shown figure Fig.12 is the post page of the application where the user can fill in the details like owner of the property, name and description, area of the property, address where the property is located. The details are sent to the database and store upon proper validation in the front-end and backend as well.
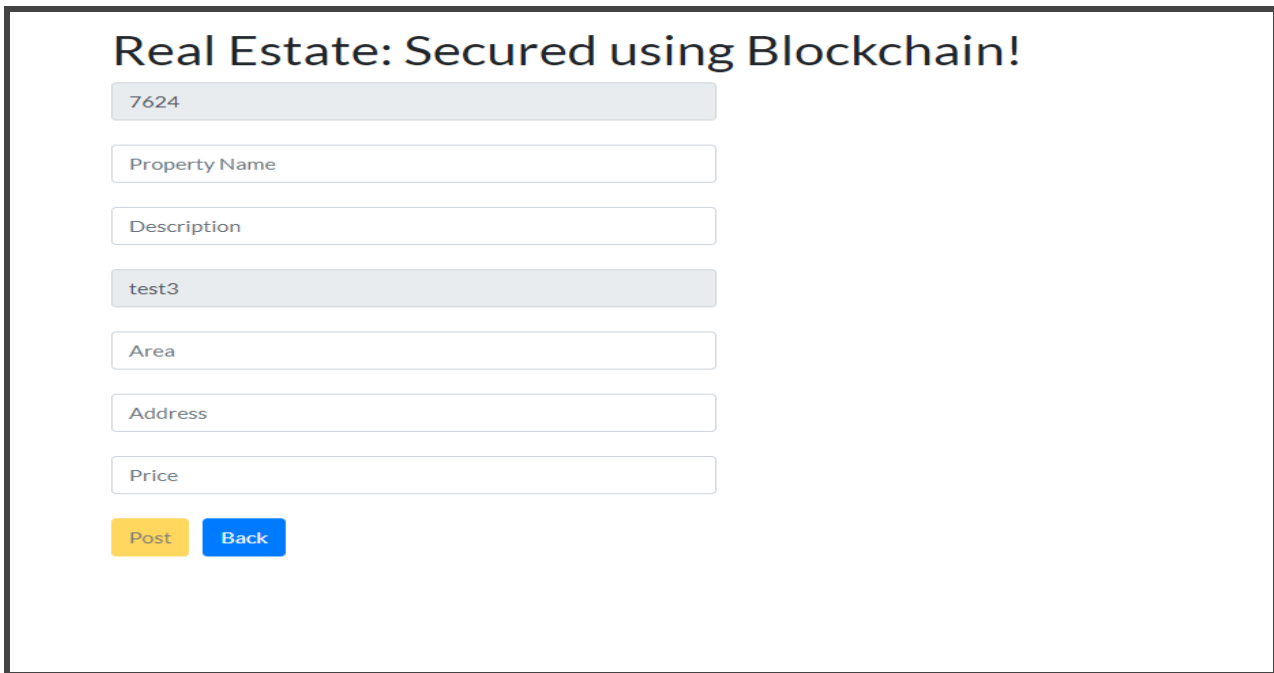

Fig. 12 Post Page
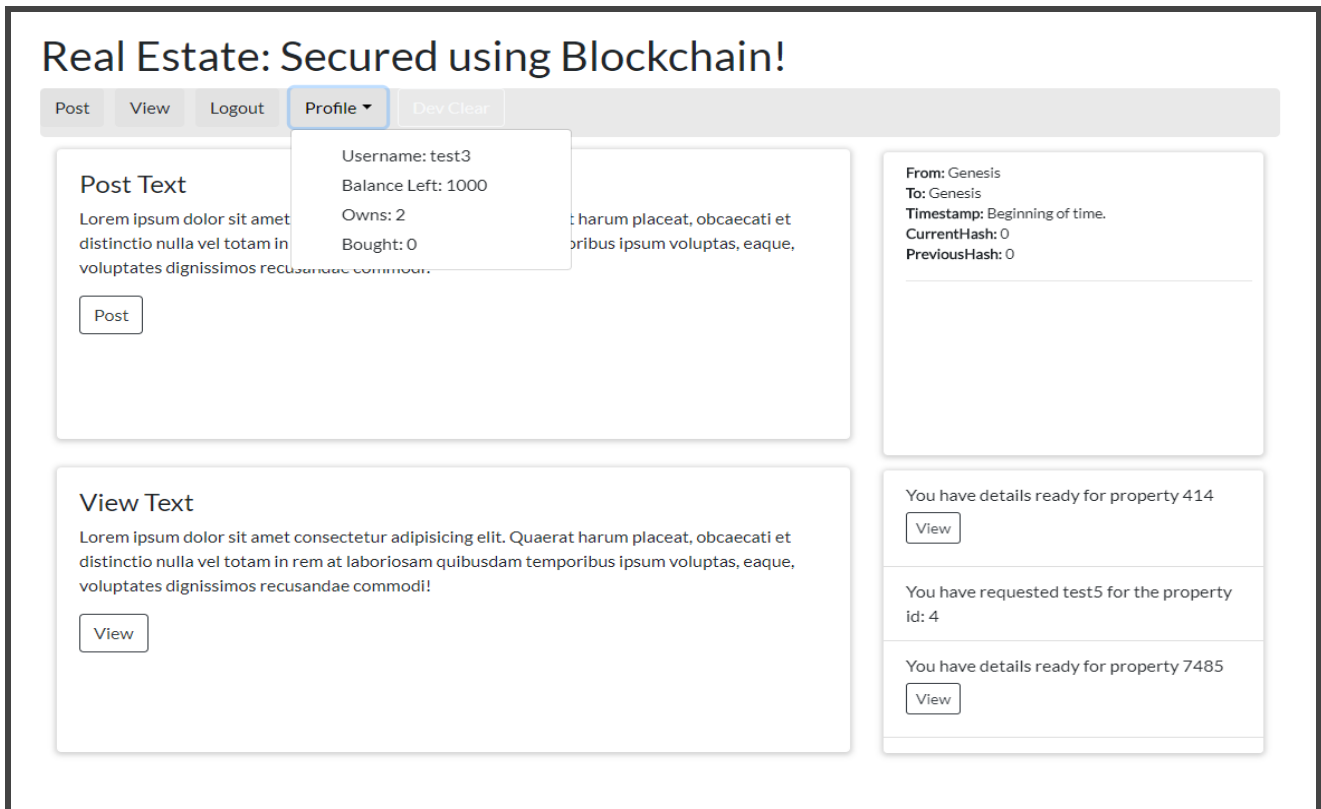
F. Profile Component

Fig. 13 Profile Component

The above figure Fig. 13 shows the profile component of the application. This gives us information about the logged in user and his information like email, balance left in his wallet, number of properties bought and number of properties sold and owned etc.

VI. CONCLUSION

This research application called 'Secure Real Estate Transaction Platform using Blockchain and AngularJS' is an application which simplifies and minimizes the work to be done for buying and selling properties online and securely.

As the title indicates the application is very secure as the technology at it core is blockchain and is well-known to be tamper proof and there is no chance of fraudulent activities happening in the application.

The application has a simple UI which makes it easier for people with any or no expertise also. Viewing and buying is very simple and so is posting a new property.

There is no restriction on who should and should not use the application. Anyone with the cryptocurrency used in the application can use it. It is mainly designed and developed for the people who want to exclude the intermediate people and companies.

VII. FUTURE SCOPE

There is a lot of future scope for this particular application research and this kind of technology in general because there is a lot of transparency as well as reliable and anonymous as well.

There can be many improvements made in the application such as adding more filters to filter the properties and adding recharging of the wallet amount in our account.

More functionalities could be added to the applications like downloading the blockchain and saving the properties for later and real time notifications using email or SMS, authentication can be improved using the email authentication and also OTP number sent to the mobile using SMS.

An ML model can be created and deployed which displays the properties based on the users history of buying and selling and the amount of money left in the wallet, which will personalize the experience even more.

Chatbots can also be included to make the whole process intuitive and interactive.

REFERENCES

[1] NutBaaS: A Blockchain as a service platform by Weilin Zheng, Zibin Zheng, Xiangping Chen(2019).
[2] Online Food Court Payment System using Blockchain by Arun Yadav, Divakar Yadav, Sonam Gupta (2018).
[3] Enterprise Blockchain for Grid Modernization, by Claudio Lima(2019).
[4] Flutter for cross platform development by Lukas Dagne 2019 by Dan Komosny, Martin Bulin, Petr Ilgner (2017).
[5] Estimating the Willingness to Pay for Urban Housing in Chinese Cities by Fenjie Long, Ming Juo, Siqi Jheng(2009).
[6] Business Process Models of Blockchain and Real Estate Transactions by Jack Laurie Tilbury, Karl van der Schyff(2019).