MAJOR PROJECT REPORT
ON

BLOCKCHAIN IN REAL ESTATE

Submitted in partial fulfillment of the requirements
For the award of the degree of

BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY

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CERTIFICATE

I/We hereby certify that the work that is being presented in the project report entitled **Blockchain In Real-estate** to the partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Information Technology from Dr. Akhilesh Das Gupta Institute of Technology & Management**, New Delhi. This is an authentic record of our own work carried out during a period from March 2022 to July 2022 under the guidance of **Mr. Dhyanendra Jain, Assistant professor, IT department.**

The matter presented in this project has not been submitted by us for the award of any other degree elsewhere.

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge. He/She/They are permitted to appear in the Major Project External Examination.

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ABSTRACT

Technology has affected every part of our lives and that also includes our day-to-day activities. Terms like blockchain and cryptocurrency are more popular than ever. People try to learn more and more about technologies that are trending and emerging. This project is aimed at implementing an Ethereum based web application by implementing smart contracts to assist users in selling and buying real estate and provide a more personal experience. This includes frontend and the smart contract's logic. This application aims at making real estate as a non-fungible token and deducting amount from users account automatically once the requirements that are already defined by the smart contracts are met.

This project discusses blockchain technology as a public record keeping system, linking record keeping to power of authority, veneration (temples), and control (prisons) that configure and reconfigure social, economic, and political relations. We discuss blockchain technology as being constructed as a mechanism to counter institutions and social actors that currently hold power, but whom are nowadays often viewed with mistrust. It explores claims for blockchain as a record keeping force of resistance to those powers using an archival theoretic analytic lens. Evaluates claims that blockchain technology can support the creation and preservation of trustworthy records able to serve as alternative sources of evidence of rights, entitlements and actions with the potential to unseat the institutional power of the nation-state.

Previously, transacting high value assets such as real estate exclusively through digital channels has never been the norm. Real estate transactions are often conducted offline involving face-to-face engagements with various entities. Blockchain, however, opened up ways to change this. The introduction of smart contract in blockchain platforms now allows assets like real estate to be tokenized and be traded like cryptocurrencies like bitcoin and ether.

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Chapter 1: Introduction

We can define Blockchain as a distributed ledger technology (DLT) of information (not controlled by a single entity) collected through a network that sits on top of the internet. It is how this information is recorded that gives blockchain its innovative qualities and potential. In particular, the information is time-stamped and recorded in the ledger as a block of data. This block is verified by thousands or millions of computers distributed across the network (peer-to-peer).

After the block is verified, it is added to the chain, creating a unique record with a unique history (Timestamp). If someone wants to modify the value of this record, it will mean that they have to alter the entire blockchain in millions of instances which is practically impossible. If you think of a normal Database, you will be able to do so just modifying the specific entry in the table.

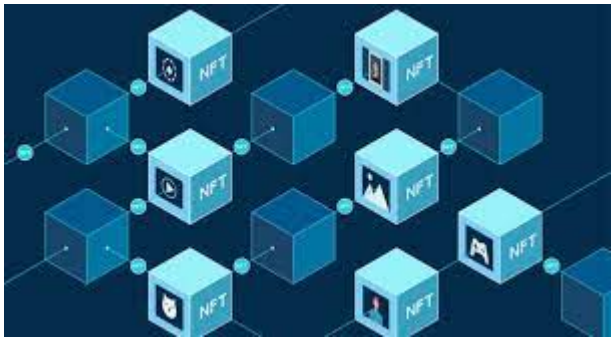

Figure: 1.1 Blockchain

DLT simply means a ledger, a verify ordering of all transaction, stored in multiple locations. Every location stores an identical immutable copy of the same ledger.

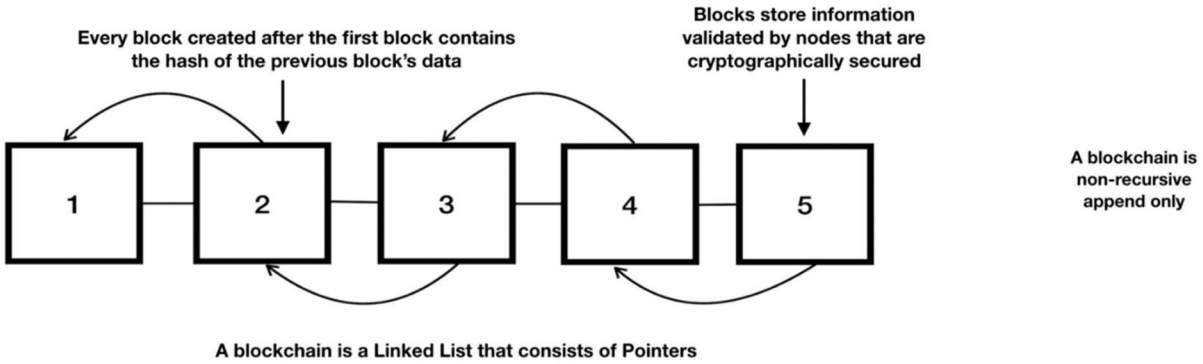

Figure: 1.2 linkedlist in blockchain

1.1 Motivation:

Real Estate is one of very few assets that manage to provide the same degree of passive income and capital appreciation over time. However, the problem with Real Estate is that it is not open to everyone. There are barriers of entering the real estate market. (Citizenship, international bank accounts, credit score, financing, cash requirements, accreditation).

Lack of transparency: Corruption, tax evasion, and money laundering.

Intermediary fees: When you buy a new place (investment or first home buyer) there are many fees you will incur to finalize your asset purchase. Exchange fees, transfer fees, broker fees, attorney fees, taxes, investment fees, lawyers, accountants etc.

Lack of Liquidity: Liquidity of an asset is directly proportional to the supply of the buyers. If you own a property and you are thinking of selling you might wait sometime until you will be able to convert the asset into cash. First you need to find a buyer and later you will need to deal with multiple third parties involved in the transaction.[1]

1.2 Why Blockchain and Smart Contract in Real Estate:

The blockchain model can bring several utilities into the real estate ecosystem:

1.2.1 Smart Contracts: They are self-executing automated contracts with specific instructions written on its code which get executed when certain conditions are made (similar to IFTTT logic).

1.2.2 Tokenization: A token is a digital representation of a real-world asset, value, or function. One of the most exciting use-cases of blockchain technology is that it helps in the tokenization of real-world assets.

The use of blockchain and smart contracts will help to possibly cut off all the middlemen (brokers, banks and lawyers) however, will not remove local government regulations. Moreover, Real Estate transactions can be very slow and take months, mainly because of the vast amount of bureaucracy, middlemen, and lack of transparency that you need to go through. Again, in a hypothetical scenario with transactions running over a blockchain network, we will be able to speed up this process.[12]

With smart-contracts it is possible to link the digital ownership of the property, documents, and contracts directly into the blockchain. The owner is protected because once inside the blockchain, it is impossible to be tampered with or altered the data.

Chapter 2: Literature Review

Ioannis Karamitsos et al. (2018) explained work process and functions of each use [6] case which were beneficial for current real estate problems and offered a design for the secure paperless transactions for better management of assets within a smart city. Smart contracts with his design provide a secure ledger distributed along with decentralized ledger of each transaction and all assets between buyer and seller.
how the system for buying and selling of property buildings and real estate can be implemented using the blockchain and smart contracts.[7]

Konsatantinos Christidis (2017) wrote a paper to describe the work process of blockchain and feature of smart contracts. It explained the benefits and drawbacks of using this technology in the system and how can we implement it in.

Avi Spielman (2016) compared blockchain technology with the current system and discusses benefits and challenges linked with it. He also explained how blockchain is the future of record keeping due to its rapid growth and benefits of blockchain technologies over current traditional systems.[6]

CHAPTER 3: METHODOLOGY ADOPTED

The spiral model combines the idea of iterative development with the systematic, controlled aspects of the waterfall model. This Spiral model is a combination of iterative development process model and sequential linear development model i.e. the waterfall model with a very high emphasis on risk analysis. It allows incremental releases of the product or incremental refinement through each iteration around the spiral.[3]

3.1 Spiral Model – Design

The spiral model has four phases. A software project repeatedly passes through these phases in iterations called Spirals.
Identification
This phase starts with gathering the business requirements in the baseline spiral. In the subsequent spirals as the product matures, identification of system requirements, subsystem requirements and unit requirements are all done in this phase.
This phase also includes understanding the system requirements by continuous communication between the customer and the system analyst. At the end of the spiral, the product is deployed in the identified market.[13]

3.1.1 Design

The Design phase starts with the conceptual design in the baseline spiral and involves architectural design, logical design of modules, physical product design and the final design in the subsequent spirals.

3.1.2Construct or Build

The Construct phase refers to production of the actual software product at every spiral. In the baseline spiral, when the product is just thought of and the design is being developed a POC (Proof of Concept) is developed in this phase to get customer feedback.
Then in the subsequent spirals with higher clarity on requirements and design details a working model of the software called build is produced with a version number. These builds are sent to the customer for feedback.

3.1.3Evaluation

Risk Analysis includes identifying, estimating and monitoring the technical feasibility and management risks, such as schedule slippage and cost overrun. After testing the build, at the end of first iteration, the customer evaluates the software and provides feedback.
The following illustration is a representation of the Spiral Model, listing the activities in each phase.[13]

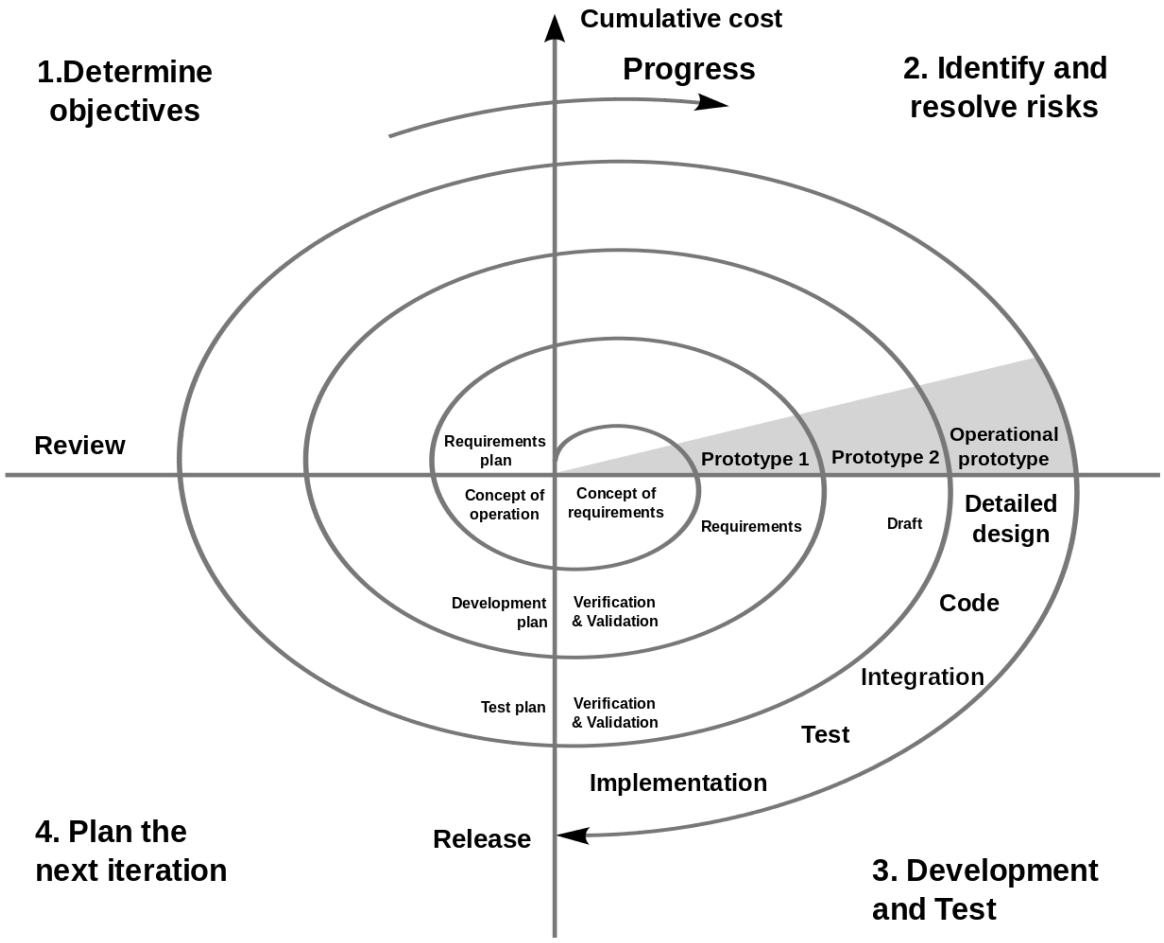

Figure:3.1 spiral model

Based on the customer evaluation, the software development process enters the next iteration and subsequently follows the linear approach to implement the feedback suggested by the customer. The process of iterations along the spiral continues throughout the life of the software.
Spiral Model Application
The Spiral Model is widely used in the software industry as it is in sync with the natural development process of any product, i.e. learning with maturity which involves minimum risk for the customer as well as the development firms.
The following pointers explain the typical uses of a Spiral Model –

- When there is a budget constraint and risk evaluation is important.
- For medium to high-risk projects.

- Long-term project commitment because of potential changes to economic priorities as the requirements change with time.
- Customer is not sure of their requirements which is usually the case.
- Requirements are complex and need evaluation to get clarity.
- New product line which should be released in phases to get enough customer feedback.
- Significant changes are expected in the product during the development cycle.

3.2 Spiral Model - Pros and Cons

The advantage of spiral lifecycle model is that it allows elements of the product to be added in, when they become available or known. This assures that there is no conflict with previous requirements and design.
This method is consistent with approaches that have multiple software builds and releases which allows making an orderly transition to a maintenance activity. Another positive aspect of this method is that the spiral model forces an early user involvement in the system development effort. On the other side, it takes a very strict management to complete such products and there is a risk of running the spiral in an indefinite loop. So, the discipline of change and the extent of taking change requests is very important to develop and deploy the product successfully.[10]

The advantages of the Spiral SDLC Model are as follows –

- Changing requirements can be accommodated.
- Allows extensive use of prototypes.
- Requirements can be captured more accurately.
- Users see the system early.
- Spiral may go on indefinitely.
- Development can be divided into smaller parts and the risky parts can be developed earlier which helps in better risk management.

The disadvantages of the Spiral SDLC Model are as follows –

- Management is more complex.
- End of the project may not be known early.
- Not suitable for small or low risk projects and could be expensive for small projects.
- Process is complex
- Spiral may go on indefinitely.
- Large number of intermediate stages requires excessive documentation
- Requirements can be captured more accurately.
- Users see the system early.
- Changing requirements can be accommodated.
- Development can be divided into smaller parts and the risky parts can be developed earlier which helps in better risk management.

Our web based application aims at transforming your real estate property into a non-fungible token and hence, making it's transaction easier and safer without any hassle. It also aims at reducing or ruling out any extra cost that any third party may require in offline selling of property, in turn ruling out the involvement of any third party, making only the two parties aware of the transaction who are involved in the transaction

CHAPTER4: DESIGNING AND RESULT ANALYSIS

4.1 DESIGNING:

Solidity: Solidity is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behavior of accounts within the Ethereum state.

Solidity is a curly-bracket language designed to target the Ethereum Virtual Machine (EVM). It is influenced by C++, Python and JavaScript. You can find more details about which languages Solidity has been inspired by in the language influences section.

Solidity is statically typed, supports inheritance, libraries and complex user-defined types among other features.

With Solidity you can create contracts for uses such as voting, crowdfunding, blind auctions, and multi-signature wallets.[3][4]

React Js: Finally, to create my front-end, and to make full use of stack it would be best to use a JavaScript library for generating UI components. I chose to try ReactJS, a library by Facebook that is increasingly gaining popularity since its release. React was used to create the UI for this whole project. In comparison to Angular, which is a very complex framework, react is quite minimal because it is just plain JavaScript, whereas Angular leverages the benefits of templates. React itself is quite a unique library in its field. It has an object-oriented approach and builds UI by breaking them into classes and instances, and each component inherits from super classes similar to other OO languages.

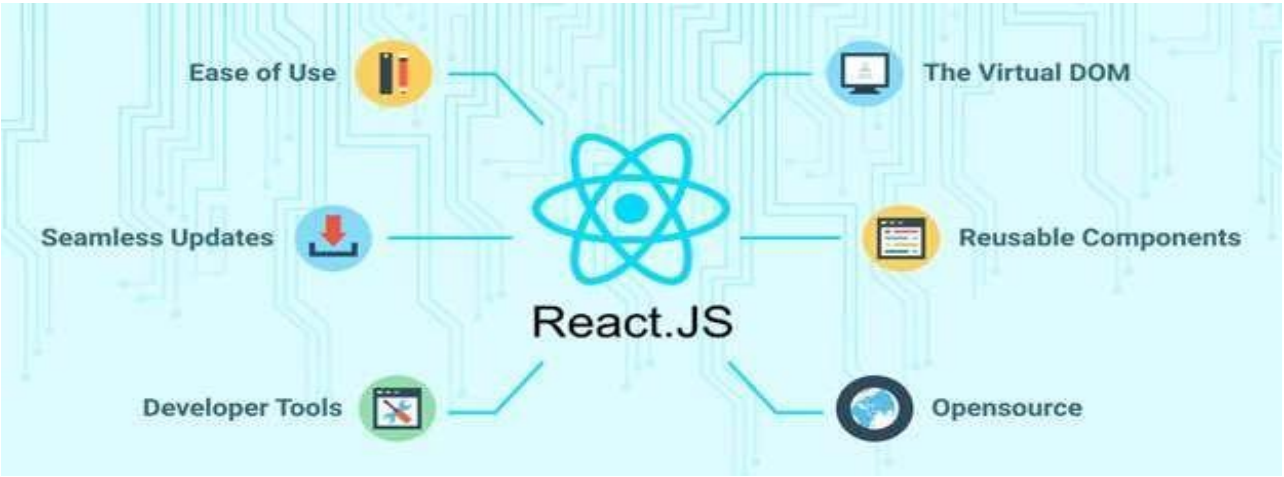

Figure: 4.1 React

It also relies on methodologies used by game engines to update the UI in real-time. React has its own virtual DOM loaded with the current state of the browser DOM. After an interaction, or an update to a component in React, a Diff operation between new state of the object and the one in the virtual DOM is called -similar to that of Git, which checks the shortest path to apply this change, and then patches the browser DOM. This is extremely important because native DOM operations are very slow, while the JavaScript implementation of the DOM used by React is superiorly faster, and this operation should be as efficient as possible.

React difference and update process React is very responsive because of this, and its syntax allows for great abstraction in the structure of the code and enables easier debugging because decoupling is easy. Also, since React allows for a convenient way to control the state completely on the client- side, it can act as a complete MVC model on its own, where the view is compared to the virtual DOM -model- by the controller that is React within functions like Should Component Render.

- Easy creation of dynamic applications: React makes it easier to create dynamic web applications because it requires less coding and offers more functionality, as opposed to JavaScript, where coding often gets complex very quickly.
- Improved performance: React uses Virtual DOM, thereby creating web applications faster. Virtual DOM compares the components' previous states and updates only the items in the Real DOM that were changed, instead of updating all of the components again, as conventional web applications do.
- Reusable components: Components are the building blocks of any React application, and a single app usually consists of multiple components. These components have their logic and controls, and they can be reused throughout the application, which in turn dramatically reduces the application's development time.
- Unidirectional data flow: React follows a unidirectional data flow. This means that when designing a React app, developers often nest child components within parent components. Since the data flows in a single direction, it becomes easier to debug errors and know where a problem occurs in an application at the moment in question.

4.2 Result :

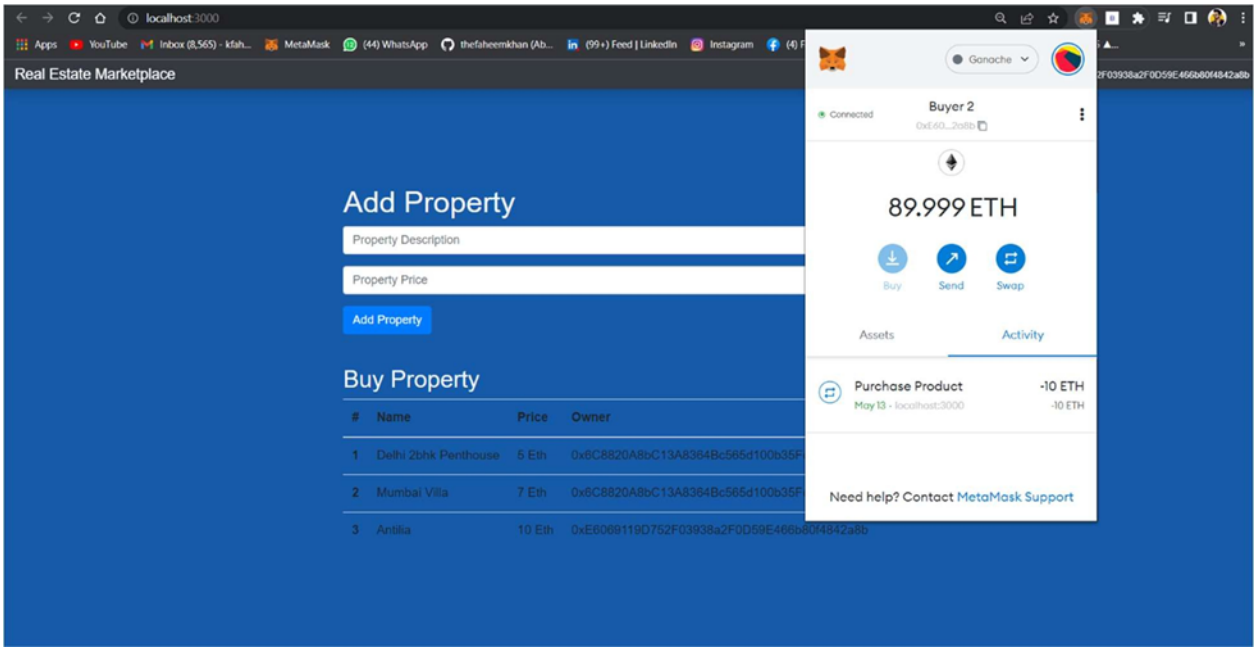

Figure:4.2 Interface-1

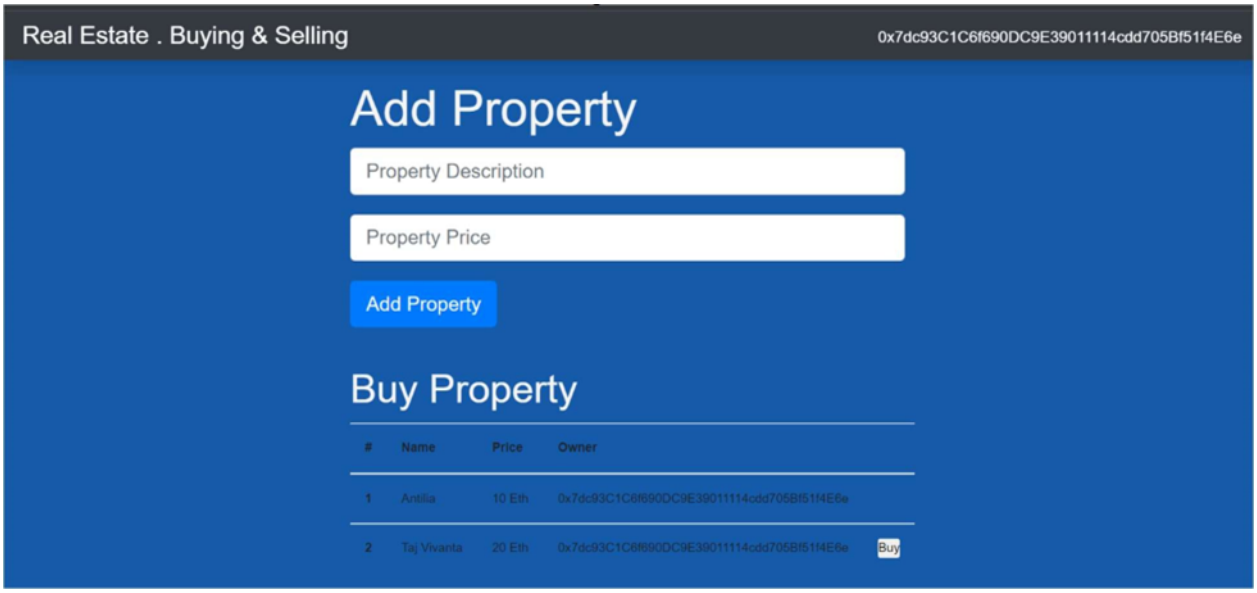

Figure:4.3 Interface-2

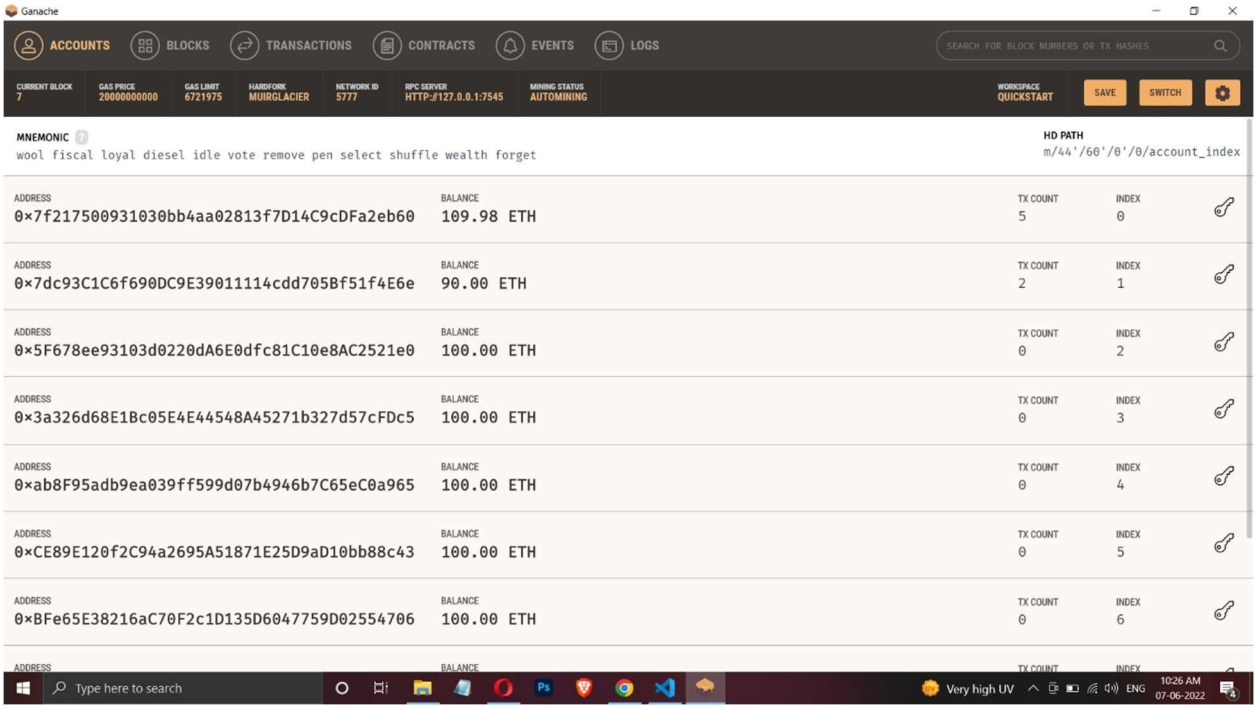

Figure : 4.4 Ganash

Chapter 5: Merits, Demerits and Applications

5.1 Merits:

Real estate hasn't escaped blockchain disruption either. Previously, transacting high value assets such as real estate exclusively through digital channels has never been the norm. Real estate transactions are often conducted offline involving face-to-face engagements with various entities. Blockchain, however, opened up ways to change this. The introduction of smart contracts in blockchain platforms now allows assets like real estate to be tokenized and be traded like cryptocurrencies like bitcoin and ether.

No Intermediaries:
Brokers, lawyers, and banks have long been part of the real estate ecosystem. However, blockchain may soon usher in a shift in their roles and participation in real estate transactions, according to a report by Deloitte.1 New platforms can eventually assume functions such as listings, payments, and legal documentation. Cutting out the intermediaries will result in buyers and sellers getting more out of their money as they save on commissions and fees charged by these intermediaries. This also makes the process much quicker as the back-and-forth between these middlemen gets cut.

Decentralization:
Blockchain commands trust and security as a decentralized technology. Information stored in the blockchain is accessible to all peers on the network, making data transparent and immutable. One only has to go back to the housing bubble crash in 2008 to see how greed and the lack of transparency in the part of institutions can have catastrophic consequences. A decentralized exchange has trust built into the system. Since information can be verifiable to peers, buyers and sellers can have more confidence in conducting transactions. Fraud attempts would also be lessened.[10]

Costs:
The transparency associated with a decentralized network can also trim down costs associated with real estate transactions. Beyond the savings made by cutting out intermediaries' professional fees and commissions, there are other costs such as inspections costs, registration fees, loan fees, and taxes associated with real estate. These costs even vary depending on the territory that has jurisdiction. Like intermediaries, these can be reduced or even eliminated from the equation as platforms automate these processes and make them part of the system.

Global real estate is worth hundreds of trillions of dollars, but is dominated by the wealthy and large corporations. Through blockchain technology, it is possible that more people will be able to access the market where transactions can be made more transparent, secure, and equitable. Real estate transactions may eventually become truly peer-to-peer activities with blockchain-powered platforms doing most of the work.[5]

5.2 Demerits:

Difficult to change:
Changing smart contract processes is almost impossible, any error in the code can be time-consuming and expensive to correct.[9]

Possibility of loopholes:
According to the concept of good faith, parties will deal fairly and not get benefits unethically from a contract. However, using smart contracts makes it difficult to ensure that the terms are met according to what was agreed upon.[9]

Third Party:
Although smart contracts seek to eliminate third-party involvement, it is not possible to eliminate them. Third parties assume different roles from the ones they take in traditional contracts. For example, lawyers will not be needed to prepare individual contracts; however, they will be needed by developers to understand the terms to create codes for smart contracts.

Vague terms:
Since contracts include terms that are not always understood, smart contracts are not always able to handle terms and conditions that are vague.

5.3 Application:

The token economy opens a broader range of opportunities when it comes to what is obtainable with real-world assets, creating markets that are readily, easily accessible and offer a broader scope of products than what currently exists.
The token economy changes how commodities are bought and sold and how funding can be raised for big projects.
Currently, if a project is to be built and funding raised, this requires lots of paperwork and time — both increasingly valuable resources in a digitized world. However, using a smart contract for the same process is a matter of clicking a button and signing on to a wallet.
In addition, various parts of an asset can be tokenized in such a way that different people can hold and own portions. They can sell them at any time on designated markets, just like how we've seen non-fungible tokens (NFTs) trading skyrocket.
Properties like real estate can be sold online at any time without the lengthy process and paperwork involved because of a smart contract. This is one of the numerous ways smart contracts create new market opportunities and provide flexibility.
The benefits of using smart contract technology in real estate and crowdfunding include:

- Ease of use
- Tokenization of more tangible goods
- Open, timeless markets
- Flexible global econom

CHAPTER 6: CONCLUSIONS AND FUTURE SCOPE

6.1 Conclusions

Our web-based application aims at transforming your real estate property into a non-fungible token and hence, making its transaction easier and safer without any hassle. It also aims at reducing or ruling out any extra cost that any third party may require in offline selling of property, in turn ruling out the involvement of any third party, making only the two parties aware of the transaction who are involved in the transaction.

6.2 Future Scope

Blockchain in real estate has a lot laid out for its future days than
stated. Below are some of it discussed:

VIEW STATUS OF PROPERTIES- This is an interesting feature that can be added to this web app so that instead of just using it for transferring cryptocurrency for just one account, one can watch how many properties are available and what is actual cost going on.

CAN BE INTEGRATED WITH OTHER APPS: It can be integrated with other apps like discord or Facebook as a separate participant and people can chat about properties and make buying and selling of property easier.

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