



BLOCKCHAIN BASED LAND REGISTRY SYSTEM

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Abstract : The current land registry system faces issues such as fraudulent activities, delayed ownership transfers, and counterfeit land titles, which highlights its inefficiency in providing security and timely settlements. To address these issues, we propose a blockchain-based land registry system. The unique features of blockchain technology, such as transparency, security, persistence, immutability, and decentralization, make it an efficient and cost-effective solution for digital asset management, online payments, remittance transfers, and combating money laundering. Enterprises that use blockchain technology can gain consumer trust due to its secure and transparent nature. This paper proposes a method to create a decentralized application using various trending software technologies.

IndexTerms – Blockchain, Decentralized Blockchain, Ethereum, Land Registry, Smart Contracts.

1. INTRODUCTION

Blockchain was compared to the iPhone in 2007 because it is a revolutionary technology that has the potential to become a common part of everyday life. It has an important application in diligence, where corruption, fatal error or fatal intervention must be avoided. Land registration is a process that involves many intermediaries to build trust in the system, leading to outdated results. Tracking who owns what properties is a daunting task when thousands of land records need to be kept. It is relatively common to encounter disagreements in paperwork, such as false titles, falsified documents and complete loss of documents. The situation has led to costly legal battles between duplicity. Blockchain transparency tracks how ownership changes hands. The inflexible, verifiable, and traceable nature of blockchain is driving governments around the world to apply decentralized technology to the land registration process. Ownership rights can be tracked if we have a distributed system that stores all land history and sharing among interested buyers. This will remove the middleman and merchants will be able to communicate directly with buyers, eliminating unnecessary costs and time that must be spent on middlemen. Ethereum is a free open-source platform that helps inventors make and emplace decentralized operations, such as smart contracts and other complicated legal and fiscal operations. Ethereum is kind of a programmable Bitcoin where inventors can use the underlying blockchain to produce requests, participated checks, digital associations, and other endless results operation to a problem that needs inflexible data and agreements, all without the need for a prolocutor or realtor. Ethereum is best suited for creating a tally that stores deals during the land power transfer process. The end is to produce a tally along with some smart contracts that will trigger the colorful events that are going to be on the system during the process of power transfer.

The places in the system are as follows:

- Buyer: Buyers need to register themselves by furnishing the documents issued by the government. They can also see the land that is available.
- Dealer: The dealer needs to register themselves as a dealer, and they need to upload prints of the land, along with the documents of the land. They also need to put the land on the chart.
- Land Inspector: An official from the land enrollment government agency, the land inspector inspects the documents once any dealer approves the request of the buyer to buy the land.

2. What is Blockchain?

Blockchain technology is a decentralized, digital ledger system that records transactions in a secure and transparent manner. It uses cryptographic algorithms to validate transactions and ensures that once data is entered into the system, it cannot be altered or deleted. This creates a tamper-proof and permanent record of all transactions. The transactions are grouped into blocks, and each block is connected to the previous one using a unique code called a “hash.” This creates a chain of blocks, or a “blockchain,” that is highly secure and resistant to tampering or fraud. The technology operates on a peer-to-peer network of nodes, which means that there is no central authority or intermediary that controls the network. Instead, all participants have equal access to the same information and can validate transactions. One of the key advantages of blockchain technology is that it allows multiple parties to

have access to the same information and to agree on the validity of transactions. This eliminates the need for a central authority or intermediary to validate transactions, reducing the risk of fraud and improving efficiency. The decentralized nature of the technology also makes it more secure, as there is no single point of failure that can be targeted by hackers. Another important feature of blockchain technology is that it enables smart contracts. Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. Once certain conditions are met, the contract automatically executes and the transaction is recorded on the blockchain. This eliminates the need for intermediaries like lawyers or banks to facilitate the agreement, reducing costs and increasing the speed of the transaction. One of the most well-known applications of blockchain technology is cryptocurrency, such as Bitcoin. Cryptocurrency transactions are processed on a blockchain network, enabling fast, secure, and low-cost transfers without the need for intermediaries like banks. Cryptocurrency exchanges also allow users to trade cryptocurrencies and hold them in digital wallets, which provides additional benefits like increased privacy and control over their assets. Other potential uses of blockchain technology include supply chain management, voting systems, real estate transactions, and even digital identity management. By creating a secure and transparent system of record keeping, blockchain technology has the potential to revolutionize a wide range of industries. For example, in the supply chain management industry, the use of blockchain technology can improve transparency and traceability of products as they move through the supply chain. This can help to reduce fraud and counterfeiting, as well as improve efficiency by reducing the time and resources needed to track and verify products. This can help to reduce fraud and increase voter confidence, as the results of the election can be audited and verified by anyone with access to the blockchain. In real estate transactions, blockchain technology can be used to securely and transparently record property ownership and transfer of ownership. This can reduce the risk of fraud and improve the efficiency of the process, as there is no need for intermediaries like banks or lawyers to verify the ownership and transfer of ownership. Digital identity management is another area where blockchain technology can have a significant impact. By creating a decentralized system for storing and verifying identities, blockchain technology can help to improve privacy and security, as well as reduce the risk of identity theft. However, blockchain technology is still in its early stages and there are challenges to overcome, such as scalability and regulation. Despite these challenges, the potential benefits of blockchain technology make it an exciting and rapidly developing area of innovation. One of the main challenges facing blockchain technology is scalability, as current blockchain networks can only handle a limited number of transactions per second. This limits the practical applications of the technology.

2.2 What are Smart Contracts?

Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller directly written into lines of code. They are stored on a blockchain network and automatically execute when certain conditions are met, without the need for intermediaries such as lawyers or banks. The transactions and agreements are recorded on the blockchain, providing a secure, transparent, and tamper-proof record of all interactions. Smart contracts allow for fast, secure, and low-cost transactions as they automate the process of verifying and executing the terms of a contract. This eliminates the need for intermediaries, reducing the risk of fraud, and improving efficiency by reducing the time and resources needed to facilitate the agreement. The use of smart contracts can also increase trust between parties, as the terms of the agreement are clearly defined and automatically enforced. One of the main benefits of smart contracts is their ability to automate complex processes. For example, they can be used to automate the distribution of funds, such as in crowdfunding campaigns, where funds are only released when certain conditions are met. This reduces the risk of fraud and ensures that funds are only released if the project meets its goals. Another potential use of smart contracts is in the financial sector. For example, they can be used to automate the process of stock trading and settlement, eliminating the need for intermediaries and reducing the time and cost associated with the process. Smart contracts can also be used to automate the process of insurance claims, by automatically verifying and paying out claim. This can improve transparency and traceability, reduce fraud and counterfeiting, and increase efficiency by reducing the time and resources needed to track and verify products. In the real estate industry, smart contracts can be used to securely and transparently record property ownership and transfer of ownership.

2.3 Ethereum

Ethereum is a blockchain platform that enables the creation of decentralized applications (dapps) and smart contracts. Unlike Bitcoin, which was designed as a digital currency, Ethereum was created as a general-purpose blockchain platform to support a wide range of decentralized applications. At its core, Ethereum operates on a blockchain, which is a decentralized ledger that records all transactions in a secure and transparent manner. This allows for trustless and secure interactions between parties without the need for intermediaries. Ethereum runs on its own cryptocurrency, Ether (ETH), which acts as fuel for the Ethereum network. Ether is used to pay for transactions and computational services on the network, and its value is tied to the demand for these services. One of the key features of Ethereum is the ability to create and run smart contracts. Smart contracts are self-executing programs that run on the Ethereum blockchain and enforce the terms of an agreement automatically. For example, a smart contract could automatically transfer funds from one party to another when certain conditions are met, such as the successful completion of a project. The Ethereum network also enables the creation of decentralized applications, or dapps, which are applications that run on the blockchain and are not controlled by any single party. Dapps have the potential to disrupt a variety of industries, such as finance, real estate, and gaming, by eliminating intermediaries and providing a more secure and transparent way of doing business. The Ethereum platform is powered by a global network of nodes, which work together to validate transactions and secure the network. This decentralized architecture makes the Ethereum network more resistant to attacks and censorship compared to centralized systems. Ethereum also has a strong developer community, which is constantly working to improve the platform and create new and innovative decentralized applications. The platform has a Turing-complete programming language, which means that developers can write complex programs and dapps on the Ethereum network. In summary, Ethereum is a blockchain platform that offers a wide range of capabilities, including the creation of smart contracts and decentralized applications, a decentralized architecture that provides security and transparency, and a strong developer community that is constantly working to improve the platform. These capabilities make Ethereum a powerful tool for developers and businesses looking to leverage the benefits of blockchain technology.

3. Traditional Land Registry System

A traditional land registry system is a system for recording and maintaining information about ownership and other rights related to land and property. This system is typically based on paper-based records and can be slow and prone to errors, making it difficult to ensure the accuracy of landownership information. The following is a step-by-step explanation of the traditional land registry process:

1. **Record Keeping:** The first step in the traditional land registry system is to keep records of all transactions related to land ownership and other rights. This typically involves maintaining a ledger of all transactions, including the names of the parties involved, the date of the transaction, and a description of the property.
2. **Title Deeds:** A title deed is a legal document that confirms ownership of a property. In a traditional land registry system, title deeds are typically physical documents that are kept in a central repository, such as a government office or a private registry.
3. **Searching:** In order to determine the ownership of a property, a search must be conducted to locate all relevant title deeds and other records related to the property. This can be a time-consuming and labour-intensive process, as the searcher must manually search through all available records to find the information they need.
4. **Indexing:** To make searching for land ownership information easier, a traditional land registry system typically involves the creation of an index of all title deeds and other records related to land ownership. This index is typically maintained by the government or a private registry, and is used to quickly locate the information needed by a searcher.
5. **Valuation:** In some cases, it may be necessary to value a property in order to determine its worth for tax or other purposes. In a traditional land registry system, this typically involves hiring a professional valuer to physically inspect the property and determine its value.
6. **Transfer of Ownership:** When ownership of a property changes hands, the transfer must be recorded in the land registry. This typically involves updating the title deed and other records related to the property to reflect the change of ownership.
7. **Dispute Resolution:** In some cases, disputes may arise over ownership of a property or other rights related to land. In a traditional land registry system, these disputes are typically resolved through the court system, with the court making a decision based on the available evidence.

Overall, the traditional land registry system is slow, manual, and prone to errors. However, it is still used in many countries and is seen as an important part of the legal system, providing a way to maintain accurate records of land ownership and other rights related to land and property.

4. Limitations of Existing System

The existing land registry system in India, despite its long history and widespread use, has a number of limitations that have become increasingly apparent in recent years. Some of the key limitations include:

1. **Inefficiency:** The traditional land registry system in India is often criticized for its inefficiency. The process of registering a land transaction can be time-consuming and complex, requiring multiple visits to government offices, multiple forms to be filled out, and extensive documentation.
2. **Lack of Transparency:** The traditional land registry system is often opaque and can be difficult for ordinary citizens to access and understand. This can make it difficult for people to obtain accurate information about the ownership and transaction history of a particular piece of land.
3. **Susceptibility to Fraud:** The traditional land registry system is vulnerable to fraud and corruption, including the creation of fake land records and the manipulation of land transactions. This can result in disputes over land ownership and can be difficult and costly to resolve.
4. **Limited Accessibility:** The traditional land registry system is often centralized, with records maintained in government offices. This can make it difficult for people to access their land records, especially for those who live in rural areas or are otherwise marginalized.
5. **Inadequate Record Keeping:** The traditional land registry system relies on manual record keeping, which can result in errors, inaccuracies, and inconsistencies in the records. This can make it difficult to establish a complete and accurate picture of land ownership and transactions.
6. **Lack of Integration:** The traditional land registry system operates in isolation from other government systems and lacks integration with other critical infrastructure such as banking and taxation systems. This can result in inefficiencies, inconsistencies, and duplicated efforts.
7. **Resistance to Change:** Despite the limitations of the traditional land registry system, there is often resistance to change and adoption of new technologies. This can make it difficult for the government to modernize the system and to implement reforms that could improve its efficiency and transparency.

In conclusion, the existing land registry system in India has a number of limitations that impact its efficiency, transparency, and overall effectiveness. These limitations include inefficiency, lack of transparency, susceptibility to fraud, limited accessibility, inadequate record keeping, lack of integration, and resistance to change. Despite these limitations, the traditional land registry system remains the primary means of recording land transactions and maintaining records of land ownership in India. Addressing

these limitations is critical to improving the efficiency and transparency of the land registry system and to ensuring the long-term sustainability of the country's land resources.

5. Proposed System

A land registry system using blockchain technology has been proposed as a solution to the issues present in traditional land registry systems, such as lack of transparency, inefficiency, and vulnerability to fraud. A blockchain-based land registry system operates by recording all land transactions on a distributed ledger that is maintained by a network of computers. Each block in the chain contains information about a transaction and is linked to the previous block through cryptographic hashes. This creates a tamper-proof and transparent record of all land transactions that is accessible to all parties involved. One of the key benefits of a blockchain-based land registry system is increased transparency. All parties involved in a transaction have access to the same information, reducing the risk of fraud and errors. The decentralized nature of the blockchain also allows government agencies to verify transactions, reducing the time and cost of transactions. Another advantage is improved efficiency. Transactions can be completed more quickly as the blockchain eliminates the need for manual processes, such as the transfer of paper-based records. This can also reduce the risk of errors and fraud as all transactions are recorded automatically on the blockchain.

The immutability of the blockchain also adds an extra layer of security to the land registry system. Once a transaction is recorded on the blockchain, it cannot be altered, providing a permanent and secure record of all land transactions. In addition, the use of smart contracts on the blockchain allows for automated execution of contractual obligations, such as the transfer of ownership, reducing the need for manual processes and increasing efficiency. Overall, a blockchain-based land registry system has the potential to improve the accuracy, transparency, and efficiency of land transactions while reducing the risk of fraud. However, the implementation of a blockchain-based land registry system also raises some challenges. For example, the system must be able to accurately identify and verify the identities of all parties involved in a transaction to ensure the security of the system. Additionally, the system must also be able to handle a large amount of data, as all land transactions will be recorded on the blockchain. Furthermore, the system must also be able to integrate with existing land registry systems and other relevant government agencies. This requires coordination and cooperation between different organizations, which can be challenging.

In conclusion, a blockchain-based land registry system has the potential to revolutionize the way land transactions are conducted. With increased transparency, efficiency, and security, it offers a solution to the challenges present in traditional land registry systems. However, the implementation of such a system also raises some challenges that must be addressed in order to ensure its success.

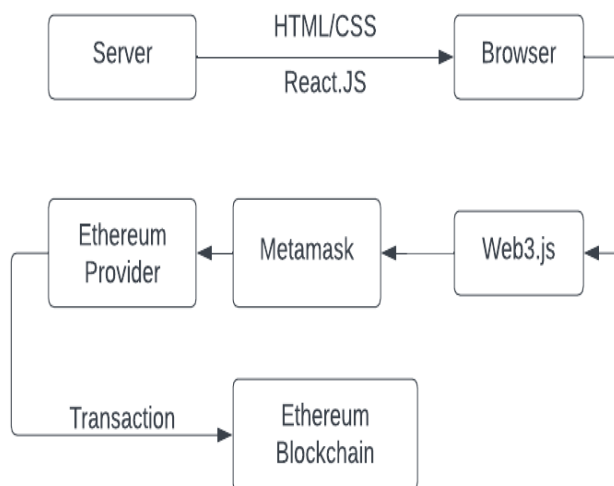


Figure 1. System Architecture

6. Flow of Proposed System:

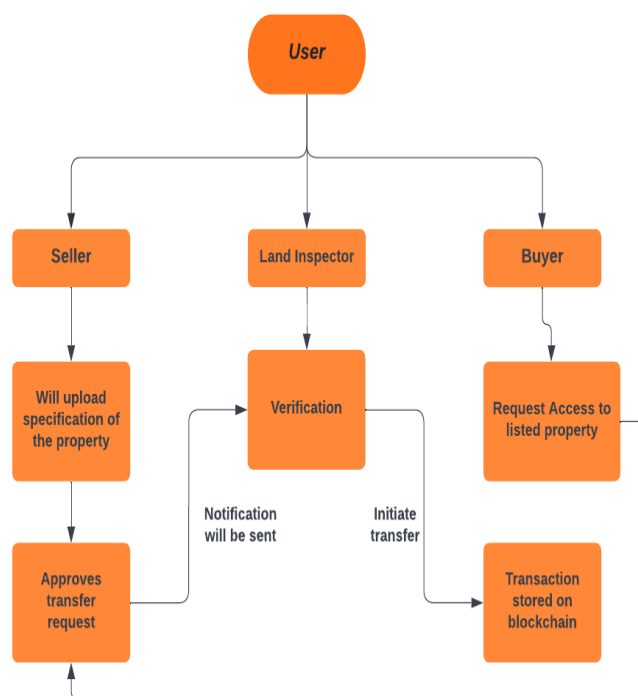


Figure 2. Flowchart of Proposed System

Step 1: Registration on the Platform.

Users who want to buy or sell properties must register on the blockchain based land registry system platform. During registration, they need to provide their name and documents for identity proofs. The identity information provided by the users is registered as a hash on the blockchain to ensure its authenticity and traceability.

Step 2: Uploading of Property Specifications.

Sellers can upload the details of the properties they want to sell, including images and documents, and address of the land. When a seller uploads the property's details, the transaction is recorded on the blockchain. All users who have registered as buyers can access the property's information.

Step 3: Requesting Access to Listed Properties

Request for Access to this particular property is sent by the buyer once the buyer is interested in that land. Sellers receive notifications for property access requests and can either approve or deny them after checking the buyer's profile. Buyers can enquire the ownership records from the past and if satisfied, then can request to purchase it. Transactions related to these requests for property purchase are recorded on the blockchain.

Step 4: Approval and Transfer Alert

The land Inspector is notified once the seller approves the request for transfer of ownership of land and is alerted to begin the transfer of property. Once the transfer of land

begins the smart contracts gets triggered and the documents related to land are provided to Land Inspector. After verification process of the documents, the land inspector arranges the meeting with buyer and seller for the transfer of ownership of land.

Step 5: Verification and Transfer Initiation

The transfer of ownership document is signed by the buyer and seller on the same platform, in the presence of the land inspector. The signed document is saved in the database and the transaction is recorded on the blockchain. Smart contracts are triggered to send finalized amount to the seller and transfer the ownership of property to buyer.

7. Details of Software Used:

Solidity: Solidity is a programming language designed for implementing smart contracts on the Ethereum blockchain. It is a high-level, object-oriented language that is optimized for the Ethereum Virtual Machine (EVM). Solidity is a statically-typed language that supports advanced programming features like inheritance and user-defined data types. Its primary use case is for developing smart contracts on the Ethereum blockchain.

Truffle: Truffle Suite is a development environment that is specifically designed for building decentralized apps on the Ethereum blockchain. Its primary use case is for developing DApps, or distributed applications. Truffle offers a comprehensive

solution for building DApps, including compiling contracts, deploying contracts, injecting them into a web app, creating a front-end for DApps, and testing. Truffle has many built-in features that make it an ideal tool for developing DApps, including smart contract compilation, linking, deployment, and binary management. It also includes an automated contract testing feature that allows for rapid development. Additionally, Truffle provides a scriptable, extensible deployment migrations framework that allows developers to customize the deployment process according to their specific needs.

React.js: React JS is a highly popular app development framework that is widely used by many top-ranking apps, including Facebook, Instagram, Walmart, and SoundCloud Pulse. Many developers in the cryptocurrency, digital wallet, and NFT minting industries use blockchain technology for mobile app development to enhance the security of their app databases and live transactions.

Ganache: It can be used as a private blockchain for development of Ethereum to deploy contracts, develop our applications, and run in local environment.

MetaMask: It is a Crypto wallet which connects with the Ethereum blockchain via browser extension or mobile Android/iOS application.

8. Conclusion:

Above paper presents a platform that can be used to simplify the process of land registration. The current process involves brokers or middlemen and time delays, which can be eliminated using this seamless and user-friendly platform. The paper provides detailed steps on how the platform can be used to register land, and highlights the benefits of going paperless, such as increased security and protection against natural disasters. Blockchain technology is used to ensure that the land registration records are immutable and secure. The platform can be enhanced with additional features, such as the ability to liquidate land assets using cryptocurrency that is linked to the land record created by the seller. This opens up many use cases for the platform beyond just land registration. As land is not a liquid asset, this platform can help bridge that gap and make it easier to buy and sell land.

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