



BLOCKCHAIN-BASED LAND REGISTRY MANAGEMENT SYSTEM

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Abstract— *The land registry management system that utilizes blockchain technology to address the slow and cumbersome process of property registration. The proposed system aims to increase transparency, security, and efficiency while addressing issues such as document integrity, privacy, and lack of common platforms between relevant parties. The system is based on the Ethereum blockchain, which will store all transactions made during the land ownership transfer process and utilize smart contract functionality to automate various actions. This can include information on land prices and market trends for properties that meet specific criteria, such as location and size. The ultimate goal of this paper is to evaluate the typical performance of a blockchain primarily based land revenue and recording automation gadget the use of a peer-to-peer, tamper- evidence and forge-Evidence network and connecting it to the Interplanetary record system for secure report management. With this proposed solution, the device will enable the validation of lands as immutable Transactions are recorded on the public ledger, it can help to increase transparency, efficiency and accuracy in the land market and property recommendations.*

Keywords--- *Land registration management, Ethereum blockchain, Interplanetary File System.*

I. INTRODUCTION

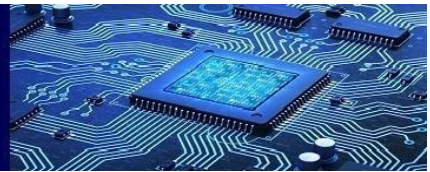
Land, being a treasured asset, requires correct statistics to become aware of the current proprietor and offer proof of ownership. Storing touchy information which includes belongings papers requires a comfortable and intact database. These statistics can be used to protect the owner's rights, prevent sale frauds, resolve disputes, and ensure effective transfer of possession to a new owner. Land registration processes involve many stakeholders and vary according to local laws. Presently, humans depend on 1/3 parties, along with authorities companies, to preserve music of ownership data. This 1/3 party continues all of the statistics in a centralized database. To switch ownership, it could be tough and time-consuming to first find and verify the land and then complete the ownership transfer. A block chain-based ledger may be used to maintain facts of land ownership and proportion it with involved parties. This removes intermediaries and permits the vendor to at once contact the customer. A block chain - based ledger can be used to maintain records of land ownership and share it with interested parties. This eliminates intermediaries and allows the seller to directly contact the buyer. To implement this, the following steps can be taken 1) Storing the data on a blockchain 2) Using protocol regulations for correctness 3) Using public key cryptography to identify the owner.

Blockchain electronics is a new illustration that can help combat deceitfulness and cheapen costs. Ethereum, an open-source platform, lets in builders to construct and set up decentralized operations along with clever contracts and other complex captivity and profitable programs. Ethereum is analogous to a programmable Bitcoin in which builders can use the underpinning block chain to produce requests, participated checks, virtual pots, and different answers to problems that bear inflexible information and agreements, all without the need. For a prolocutor or realtor. Ethereum is presently the alternate- largest cryptocurrency by business cap and is anticipated with the aid of a many to surpass bitcoin as both a valued investment and the Global's maximum notorious cryptocurrency. It's duly applicable to developing a tally that stores deals in the course of the land power transfer system. The intention is to produce a tally with clever contracts that spark multitudinous moves at some point of the manner of possession switch. The system's roles include:

- a) Buyer: Buyers are required to register by submitting official documentation. Later, they can see the available land.
- b) Seller: Sellers must register as a seller, adding photos of the land and the land's documents. They have to also pin the land on a map.
- c) Land inspector: Once a seller approves a buyer's request to purchase the land, a legitimate business enterprise from the land registration authority reviews the files.

II. RELATED WORKS

The use of blockchain technology in land registration has been proposed by several authors. U. M. Ramya (2018) introduced a private-permissioned blockchain system called Multichain, where the authority is with the registrar, making the process more efficient. This system records the land documents into the blockchain and verifies it with the digital locker, reducing the risk of document forgery.[1] Archana Sahai and Rajiv Pandey (2022) suggested using smart contracts for land registry in the blockchain. They highlighted the current process of land records maintenance and registration and the benefits of using smart contracts in this process.[2] Several blockchain application development platforms such as Ethereum, Hyperledger, and R3 Corda have emerged and organizations such as IBM and Facebook are working on developing tools for blockchain applications. IBM and Linux foundations have created frameworks such as Hyperledger Burrow for permissionable smart contracts, Hyperledger Fabric for permissioned channels, Hyperledger Grid for web assembly-



based projects, and Hyperledger Iroha for mobile applications. There are also tools such as Hyperledger Aries, Hyperledger Cello, and Hyperledger Explorer for different blockchain applications.[3] For developing different types of blockchains like public, private, and consortium with permissioned and permissionless, there are various blockchain networks and IDEs such as Ganache and Remix that can be used for testing applications. However, there is a need for a more efficient and reliable method for creating blockchain applications. This project proposes an approach for implementing land registration using blockchain by creating smart contracts and applying them in the Ethereum blockchain network. This ensures that the land records are secure and tamper-proof.

III. PROPOSED SYSTEM

We propose a scientific blockchain-based system that focuses on a smart contract for land ownership and transfer of ownership through subdividing the land. This system aims to efficiently manage all aspects of property ownership, including land redistribution, genetic values, and resolution of disputed land ownership for permanent and community-guaranteed leases.

The intended users of the system are government officials, who will be granted all access rights. All transactions will be carried out by public servants. To register, buy, or sell property, individuals will need to visit the registration office, where the necessary procedures will be carried out by the government. All process-related asset information will be securely encrypted and stored on IPFS for added security.

A. Considerations

There are some concerns to keep in mind whilst it comes to the bodily international and how it interacts with our transportable document-retaining machine.

Token layout Mapping: The system envisioned assigns a certain number of tokens to each region of the world, entirely based on the ERC20 token structure. However, the system does not specify a particular token system.

Non-Compliance Guarantee: The system does not guarantee that the renewal of ownership records by the current owner of a piece of land is done voluntarily or free from foreign interference. The government and stakeholders may choose to examine the data at any moment because it is transparent.

Dependence on Forex Transactions: The transfer of global assets won't guarantee actual monetary transactions in another method as long as tokens are still distributed.

Dependence on important national website: The system is based on the national information machine to transfer ownership of the land to succeeding heirs following a resident's passing. The system isn't always responsible for

any citizen registration violations.

Verification of the figures on land ownership in the present: The proposed device makes the assumption that the information regarding the present ownership of land and residences by citizens is accurate.

Dependence on a useful national website: The system uses the national information system to transfer ownership of the land to succeeding generations once a resident dies. It is not always possible to charge the device for any failure to comply with citizen registration.

Verification of current land ownership data: The proposed device relies on the accuracy of information on current resident ownership of land and structures.

B. Model Structure

The proposed system aims to offer enhanced security and resilience compared to traditional centralized systems. The data is stored in a Directed Acyclic Graph format across all nodes, reducing the risk of a single point of failure. The system uses a hybrid blockchain structure, with a strong focus on data storage and protection. The agreement and time stamping system ensures the validity of all land and property transactions, and follows a free equity scheme. The system is only accessible to blockchain members, with outside members only being able to view properties for sale through the cost of registering with the blockchain.

The system includes a Genesis list of building IDs for acquired land and neighborhood IDs, approved by senior authorities. Land ownership transfers are initiated through a two-way agreement between the new and old owners, without the need for third-party involvement. New members must be verified by the national recording system, and the token production system verifies their nationality.

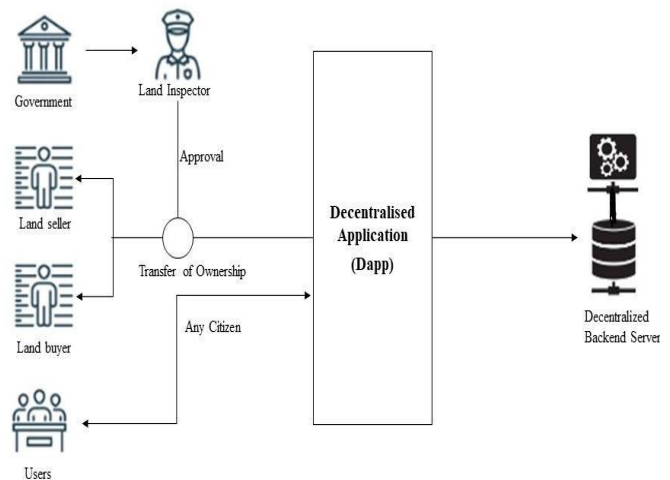
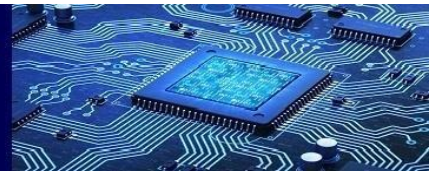


Fig.1 Block view of Proposed Solution

The system has three main components: government authority, land owners, and non-blockchain members. The plan is written in separate code, responsible for making contractual



arrangements and dividing land into 100 million small tokens for transfer. The three key functions of the system are to serve government authority, land owners, and non-blockchain members. The proposed system operates with three distinct roles: government authority, land owner, and non-members of blockchain

Government Authority: This entity has a unique address and holds the responsibility of managing the genesis block and distributing site IDs to respective owners. In the case of disputes or land loss, the government authority has the power to declare the tokens invalid and terminate the system operation if necessary.

Land owner: All property IDs are connected to the owner's contract, and the owner has the ability to transfer ownership of map tokens to other nodes with the consent of the latter or another blockchain participant. The tokens cannot be transferred or parsed if they are mapped to an inactive handle, but the information pertaining to the original owner is still valid.

Non-participants of Blockchain: Any citizen can be part of blockchain after being confirmed through the national report-maintaining gadget. Non-members are only able to access market data on available homes, but after purchasing a token, their address is added to the genesis block, making them the current token owner. Both the buyer and the seller have access to the blockchain record of the transaction.

The above entities work together to maintain the security and efficiency of the system, allowing for the ease of transferring land ownership without the need for any paperwork or legal procedures.

C. Architecture

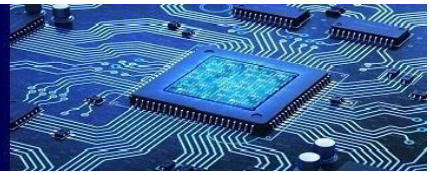
The Solidity language, often known as the Turing language, is responsible for the creation of smart contracts and the precise execution of divisional packages while enforcing a distinct use utility. These contracts carry out tasks such as disruption of system operation, installation, exit, and options for system users. The subsequent are the important things features of a clever agreement and their interplay:

Statistics shape: Statistics on all Blockchain nodes are stored and reflected in an acyclic directed graph. The Genesis block serves as the foundational data structure, and it contains asset acquisition data in the form of a tree. Tokens that represent land fragmentation can be separated, and the new site IDs are kept in the genesis block to enable ownership transfers. The IDs of the token group structure are connected to the ancestral information regarding the identification line of all tokens. The government's current address for managing emergencies and cases of noncompliance with global tokens is the government address. This non-transferable address has the authority to disconnect the system in any situation, whether it be normal or abnormal, or to assign any token a null and void value.

Only this first-order node requires authentication; all other activities are permissible without formal authorization. For each property owner, resident nodes create random addresses that are mapped to token IDs under that particular address. The fields for the current owner's address, the addresses of past owners, the time of day, and flags to denote the status of the world are what make up the data structure. The addresses of all child building IDs and former owners of different kinds of tokens will also be included. To indicate the income status of a specific proportion of tokens, the flag might be given a value of 0 or 1.

Functionality: The below are some of the smart contract's different features:

- a) **Including a Node:** The Blockchain can be joined by any node to view auction properties that has been verified by a specific national recording system. This is crucial for landowners in terms of the security of complicated data collecting controls.
- b) **Splitting the Tokens:** In a settlement, all land transfer actions are taken into account, and each transaction's performance is guaranteed by both parties. There can be no transaction without agreement, lowering the chance of erroneous land transfers.
- c) **Message Token:** The Without requiring manual intervention, the complete token or a series of tokens, i.e. the owner's addresses in relation to asset IDs, can be changed. To prohibit arbitrary sales of the viewable area, it is a constraint that separated tokens must be in sequential order rather than random numbers.
- d) **Dual Entity Verification:** In an agreement, all land transfer conduct are taken into account, and each sale's performance is guaranteed by both parties. No decision can be made without agreement, which lowers the chance of error in land transfers.
- e) **Data Update:** Streamlining information associated with any information on bumps isn't allowed, forcing blockchain members to enter error sale information. This regulation is in place to insure that commemoratives once transferred can only be returned by encouraging the commemoratives to the original proprietor with the concurrence of both parties, to help any controversies that may arise due to detainments in performance or rate of operation trying to attack the system.
- f) **Creation of Time-Stamp Testament or Mortgage:** A significant portion of this process also involves establishing property and title documents for assets that will only need to be done after the deadline. The contract will not be implemented until the national register of citizenship certifies the landowner's demise, regardless of whether a will exists or not. When a mortgage title deed is involved, the contractor will.



D. Methodology

DApp is a decentralized application that utilizes smart contracts on the Ethereum Virtual Machine to create tamper-proof and traceable transactions. It consists of a frontend interface and a backend smart contract, both communicating through the web3.js API. The web3.js API enables the frontend to interact with the Ethereum Blockchain via JSONRPC.

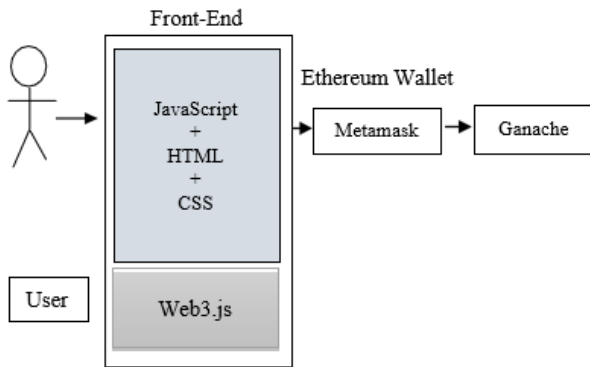
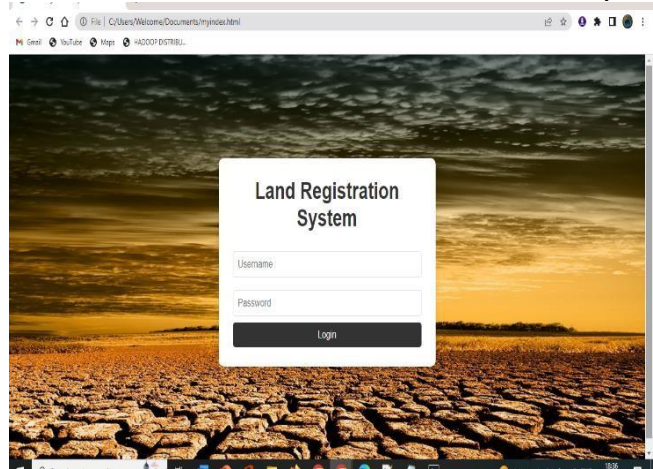


Fig.2 . Dapp Architecture and the flow of interactions between Frontend and Backend

The frontend can also connect with a wallet such as MetaMask, allowing users to access the DApp and perform tasks like sending and receiving Ether. The backend smart contract is tested using tools like Ganache, which provides a private Ethereum Blockchain for testing purposes. A DApp in this context is designed to make land registration and sale transparent and secure without the need for a central authority. The backend contract has two main functions: Registration and Actions. The former allows users to input location details and the latter enables land sale. The process involves making the land available for sale, submitting an acquisition request, and finally transferring ownership after payment. ReactJS is used for the frontend to ensure robustness and reliability.

IV. EXPERIMENTAL RESULTS

The implementation of blockchain technology in land registry has been growing at a moderate pace, but still faces challenges. However, it has the potential to enhance the accuracy of land-related information. The process involves the user submitting their personal information and land details to the administrator for verification. The user has the option to make their land available for purchase if they wish to sell it.



The administrator is responsible for overseeing all aspects of the system and verifying the information provided by the user, including their personal details and the details of the land.

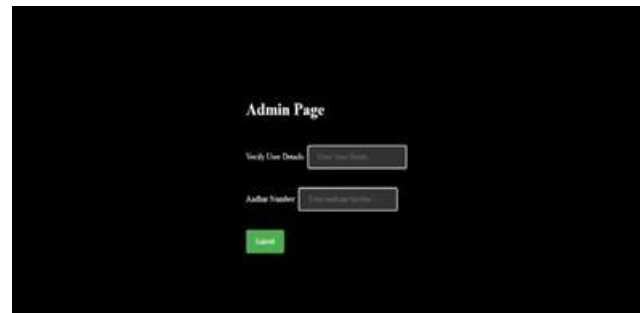


Fig. 4. Admin Page

Super admin can create an admin which tells who can verify the user and the land

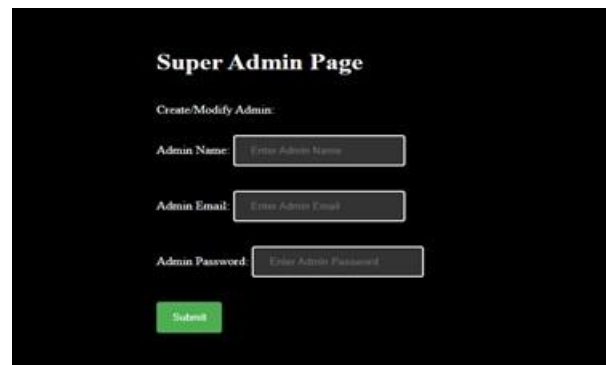


Fig. 5. Super Admin Page

Test page is just to check if everything works on and is getting verified. It is only for the testing purposes

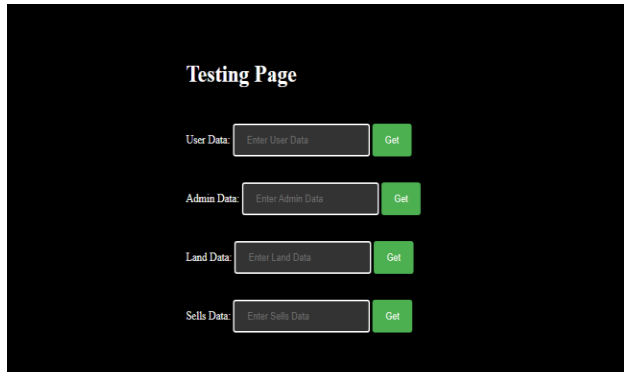
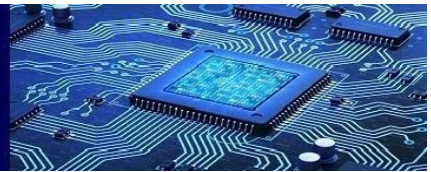


Fig. 6. Testing page for verification purpose

And also adding our proposed land recommendation module to the land registration system. However, here are some expected outcomes that such a module could aim to achieve:

Improved accuracy of data: By using blockchain technology, the land recommendation module can ensure that the data entered is secure and tamper-proof, resulting in improved accuracy of land registration information.

Increased efficiency: By automating many manual processes and reducing the time required for verification and validation, the land recommendation module can help increase the efficiency of the land registration system.

Better decision-making: By providing real-time access to accurate data, the land recommendation module can help users make informed decisions when it comes to buying or selling land.

Reduced fraud: By providing a secure and transparent record of land transactions, the land recommendation module can help reduce the risk of fraud in the land registration system.

Increased transparency: By providing users with a clear record of all land transactions, the land recommendation module can help increase the transparency of the land registration system.

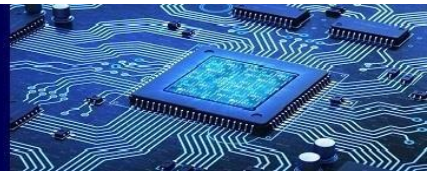
V. CONCLUSION

This paper presents a modern solution to address the issues plaguing the contemporary international statistics management machine in India. With the aid of incorporating blockchain technology, the device becomes secure and tamper-proof, disposing of the chance of fraud. The platform brings together all of the necessary documents for setting up land ownership in a single peer-to-peer community, presenting get admission to all parties concerned in global document keeping. The usage of blockchain era guarantees that the statistics are transparent, verified, and comfy, and can be used as concrete evidence in legal disputes. The proposed platform offers a user-friendly, efficient, and streamlined solution for land registration. It eliminates various troubles which includes supplier engagement and intermediate

involvement, lowering time delays, amongst others. The paper provides a comprehensive evaluation of the stairs concerned inside the land registration procedure. Deregistering land records will now not only make the process simpler, but also also safeguard titles against different man-made and natural disasters. Due to its powerful features, blockchain technology is quickly expanding, making it an excellent choice for maintaining world record transactions. In addition, the platform has the potential for further development and additional use cases, including the use of crypto currency to reflect the sector report created on the platform. However, the main project for this answer is to convince stakeholders to transition from the current world records management system to the proposed one. Seamless acceptance of the technology is crucial for its successful implementation.

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