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Securely Managing Land Registration with the Use of the Ethereum Blockchain

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Abstract: In India, as well as in numerous other countries globally, the process of land registration is highly laborious and time-consuming. Due to the large volume of property records that need to be regularly updated, there has been an increasing number of incidents of fraud, document losses, and court disputes in the existing land registration and verification systems. The purpose of this was to enhance the land registration process and minimize occurrences of fraudulent activities. Due to the presence of unchangeable transactions in the public ledger, the technology also facilitates the process of verifying the authenticity of the land. The blockchain-based land registration system is a decentralized system that will record every transaction that takes place during the property buying process. Furthermore, this will facilitate the acceleration of the registration process, allowing for the seamless transfer of land ownership between sellers, buyers, and government registrars. The land registration system can be effectively resolved by employing blockchain technology. By removing intermediaries from the process, this will decrease corruption. Moreover, it will enhance effectiveness and promote widespread confidence without the need for support from a central entity. A blockchain is an immutable and distributed ledger that records every approved transaction. It maintains the integrity of the transaction history by utilizing hashing techniques, consensus protocols, and cryptographic methods. This ensures the system's integrity and transparency at all times. The objective of this project is to develop a user-friendly land registration system that utilizes blockchain technology, while ensuring the maintenance of security and trust. In regions such as India, where there is a high frequency of relocations, the demand for paper to maintain records is notably substantial. By removing the need for physical documentation, this strategy will not only help the general public become more proficient in technology, but it will also contribute to the preservation of the environment.

Keywords*: Blockchain, Consensus, Decentralization, Immutability, Land Registration, Security.*

1. Introduction

Land record management is an essential component of government and administration, encompassing the precise documentation and upkeep of data pertaining to land ownership, transactions, boundaries, and other relevant particulars. Conventional systems frequently encounter obstacles such as slowness, a lack of transparency, and vulnerability to fraud and corruption. Blockchain technology presents a groundbreaking approach for revolutionizing land record administration through improved security, transparency, and efficiency.

Privacy and security are of utmost importance in land record management systems, as they deal with sensitive information pertaining to property ownership, transactions, and personal data. Blockchain technology offers novel options to successfully tackle these challenges. The distributed ledger guarantees the immutability of recorded data, preventing any retroactive alterations or fraudulent activity. Decentralization mitigates the potential for a solitary point of failure and promotes the robustness of data security. Blockchain transactions are safeguarded using cryptographic measures, ensuring that sensitive information remains inaccessible to unauthorized individuals. Smart contracts are contracts that execute themselves according on predetermined rules and conditions encoded in computer code. They automate land transactions, but only when certain conditions are satisfied. This reduces the risk of fraud or mistakes while also preserving privacy. Permissioned access enables authorized entities to track the complete chronology of land transactions on the blockchain, ensuring transparency while protecting privacy rights. Data resilience is a crucial facet of blockchain technology. It guarantees the replication of data over numerous nodes, providing resistance against data loss or tampering. If there is a system failure or cyberattack, the data will still be available and undamaged, which improves the overall ability of the land record management system to recover and continue functioning. Nevertheless, in order to guarantee the effective integration of blockchain-based solutions in land record administration, it is imperative to tackle obstacles such as regulatory compliance, interoperability, and scalability. The issue statement focuses on improving the effectiveness, clarity, trustworthiness, confidentiality, and protection of land record management systems by implementing blockchain technology and comprehensive reform activities. The

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objective of this strategy is to optimize land administration procedures, reduce conflicts, and cultivate trust and assurance in property ownership, ultimately stimulating economic growth, ensuring fairness, and encouraging sustainable land utilization.

The conventional methods of managing property records encounter numerous obstacles, such as reliance on physical documents, centralized databases, manual procedures, restricted transparency, susceptibility to fraud and corruption, privacy and security issues, and limited availability. These problems emphasize the necessity for modernization and reform efforts to enhance the effectiveness, honesty, and availability of land administration procedures.

The intended approach seeks to rectify these deficiencies by harnessing the potential of blockchain technology. The key component of the proposed system is a ledger based on blockchain technology. This ledger acts as a decentralized and unchangeable storage for land records. Each land transaction is recorded as a block on the blockchain. Smart contracts are employed to automate and enforce property transactions, thereby minimizing errors and improving efficiency. The suggested system functions on a decentralized network of nodes, hence eliminating the necessity for a central authority to oversee and authenticate land transactions. Access to land records is granted through blockchain networks with restricted access, guaranteeing privacy and secrecy while also upholding transparency and responsibility. The land records' personal and sensitive information is subjected to encryption prior to its storage on the blockchain, thereby safeguarding it against unwanted access. Encryption methods are utilized to encode and decode data, guaranteeing that only authorized individuals can retrieve confidential information. A comprehensive and verifiable log of all property transactions is upheld on the blockchain, enabling authorized entities to track the complete chronology of land ownership and transactions. Intuitive interfaces, such as web portals and mobile applications, provide effortless contact with the system, authenticate ownership rights, and facilitate legal transactions.
The suggested system provides a thorough and technologically sophisticated solution for the modernization of land record management systems. The system improves the efficiency, transparency, integrity, privacy, and security of land administration processes by utilizing blockchain technology, smart contracts, and decentralized networks. This eventually promotes trust, accountability, and economic development.

2. Literature survey

The land records system in India is susceptible to fraudulent operations due to irregular registries and a large number of intermediaries. In order to tackle this issue, the government is contemplating the utilization of blockchain technology to enhance transparency and ensure accountability. Through the integration of land records into the blockchain, individuals are able to retrieve visual representations of the data, resulting in enhanced transparency and authentication of land ownership. Nevertheless, the deployment of blockchain necessitates substantial infrastructure and technology investment, which can pose challenges in regions of India with little resources. To guarantee the integrity and confidentiality of land records in a blockchain system, it is necessary to implement strong cybersecurity measures and continuously maintain them. Certain groups of the public may have limited access to and comprehension of blockchain technology, which could hinder general adoption. The concept suggests the implementation of a Land Record Management System (LRMS) based on blockchain technology. The major objectives of this system are to convert traditional paper-based land records into digital format, guarantee privacy using asymmetric cryptography, preserve the accuracy of data, facilitate land trading, and streamline the process of transferring ownership. The proposal also presents a novel character-to-integer mapping mechanism known as the C2I table, which effectively reduces the computational burden of conversion. The experimental findings demonstrate the efficacy of this LRMS compared to current systems. Infrastructure limitations may present implementation difficulties when migrating from paper-based to blockchain-based systems. Despite the implementation of encryption mechanisms, security weaknesses in blockchain technology may still provide potential threats. The dependability of land records may be affected by the extent to which participating entities adhere to the system's protocols. The smooth implementation of new systems in governmental offices may be impeded by integration challenges with existing legacy systems. The acceptance and implementation of new LR management strategies may be hindered by potential pushback from stakeholders who are accustomed to existing approaches. The necessity for ongoing updates and maintenance to accommodate changing technical standards and address emerging security risks.
A proposal is made for a land registration system that ensures security by employing blockchain technology. This system utilizes various components including SHA256 hashing, the Proof of Work (PoW) algorithm, 12 nodes for achieving consensus, elliptic curve cryptography for verifying signatures, and a Merkle tree for linking transactions. It guarantees secure land transactions, decreasing the need for manual record-keeping by 99%. Nevertheless, the expansion of the blockchain system could provide a hurdle in terms of scalability when dealing with a larger volume of land transactions. Relying on the 12 nodes for consensus may lead to potential centralization

issues. Elliptic curve cryptography techniques can be intricate and provide difficulties in their implementation. The ongoing energy usage associated with Proof of Work (PoW) consensus has the potential to raise environmental concerns.

An innovative PHR approach utilizing blockchain technology [4] is suggested to effectively manage health-related data with enhanced security measures. The model leverages the inherent immutability of blockchain to guarantee resistance against tampering and incorporates cryptographic techniques to maintain anonymity. The system includes precise access control, the ability to revoke consent, the capability to audit actions, and strong security measures. By conducting thorough security and performance assessments, the model demonstrates superior efficiency compared to current techniques, rendering it appropriate for utilization in PHR systems. The constrained storage capacity in blockchain technology may present difficulties in storing comprehensive health records. Privacy problems may persist even with the use of cryptographic techniques, particularly in relation to the potential exposure of data during transactions. The immutability of consent could give rise to complications if there is a need to modify data sharing authorization. The energy consumption associated with blockchain processes could potentially affect the overall efficiency and sustainability of the Personal Health Record (PHR) system. Although the suggested paradigm demonstrates enhanced performance, the practical application and scalability may uncover further obstacles.

Blockchain is a highly secure protocol used to transmit data between several parties, guaranteeing that the data cannot be altered or tampered with. It functions via a decentralized model, allowing for peer-to-peer interactions. Due of its reliability and effectiveness, it is extensively utilized in industries such as construction. The main characteristics comprise of decentralization, autonomous governance, and immutable timestamping. The promise of this technology is demonstrated through its use in digitizing Indian land records. Constraints encompass difficulties in scaling, concerns around energy usage, and ambiguities in regulatory frameworks.

The article [6] concludes that the COVID-19 pandemic has led to a surge in online transactions, underscoring the importance of safeguarding privacy. Blockchain technology is regarded as a viable option, but, it encounters obstacles such as user authentication, data confidentiality, and adherence to privacy legislation. The text discusses many strategies for enhancing privacy, such as Zero-Knowledge Proofs (ZKPs) and homomorphic encryption. ZCash and Monero, among other blockchain platforms, incorporate these capabilities; nonetheless, they are subject to certain constraints. The researchers' objective is to boost security by refining current privacy measures. A novel architectural framework incorporating Privacy Enhancement Techniques (PET) has been suggested as a solution to tackle these privacy challenges. The current techniques suffer from limitations, such as susceptibility to privacy breaches or difficulties in scaling up. The absence of compatibility across various blockchain platforms that employ privacy-enhancing measures. Complex cryptographic protocols might give rise to implementation issues. User adoption hurdles arise from usability challenges linked to privacy functionalities. The efficacy of privacy legislation that comply with post-quantum standards is currently questionable. Possible obstacles related to regulations and adherence to changing data protection legislation.

Blockchain is a highly secure protocol for transferring data between several parties, guaranteeing its immutability. The main characteristics comprise of decentralization, self-governance, and immutable timestamping. The use of digitizing Indian land records demonstrates its potential, but it encounters obstacles like scalability challenges, energy consumption issues, and regulatory uncertainties. The paper [8] examines the amalgamation of blockchain technology and IoT to tackle issues related to security and privacy. The content encompasses fundamental ideas, difficulties, techniques used in surveys, results, and classification of applications. The highlighted papers provide detailed analysis of the convergence of blockchain and IoT technology. The study explores the architectural and operational issues of combining blockchain technology with IoT ecosystems. It identifies deficiencies and possible future factors to improve the incorporation of these technologies.

Land registration authorities in several nations, including Pakistan, encounter difficulties associated with the misuse and manipulation of land records as a result of poverty and conflicting claims of authority. This flaw has increased the vulnerability of aggregated data to security threats. Ongoing research is being conducted on blockchain-based decentralized solutions for land record registration in order to rectify the shortcomings of centralized systems and enhance dependability. The suggested conceptual framework is to function as a proof-of-concept system for future deployment, offering possible advantages for Pakistan's land registration office.

The article [10] also examines the potential advantages of utilizing blockchain technology for managing property records and revenue records. The secure, decentralized, and fraud-resistant feature of blockchain technology makes it a promising alternative for improving the management of land and revenue records. The implementation of blockchain technology in land registration can effectively resolve the issues associated with the delayed, intermediary-dependent, and insecure existing procedures. This strategy has the potential to optimize workflows,

increase dependability, and enhance the overall effectiveness of land record management.
The proposal [11] proposes the utilization of blockchain technology to modernize the outdated, paper-based land registration system in India. Through the implementation of a decentralized ledger, the objective is to augment security, dependability, and transparency while diminishing instances of fraud and errors. Eliminating middlemen is anticipated to accelerate ownership verification, save expenses, and streamline the registration procedure.
Nevertheless, the integration of blockchain technology [12] into current land record systems may encounter technological and practical challenges. Implementing innovative technologies such as blockchain in a sector that has traditionally worked in a certain way may encounter opposition and necessitate comprehensive user training. Overcoming barriers to ensure universal access to the required technology and internet infrastructure for blockchain implementation may be challenging. Ensuring precise and current land records within the blockchain system will necessitate meticulous administration and data authentication procedures. Ensuring the protection of confidential land ownership data on a public blockchain may give rise to concerns of privacy and security that must be resolved.

Blockchain technology [13] provides a transparent, immutable, and auditable system that may effectively address issues of discrepancies and fraud in property records, making it a full solution for land registry. Nevertheless, despite its inherent capabilities, blockchain technology has obstacles concerning its ability to handle large-scale operations, its compatibility with other systems, and its adoption within the legal framework governing property registry. The integration of old systems and procedures inside government agencies can be intricate and time-consuming, potentially leading to interruptions throughout the transition phase. Securing widespread support and involvement from all parties involved in the blockchain network could be challenging, particularly in regions with poor digital literacy and technological acceptance. To summarize, the combination of blockchain technology and IoT technologies offers substantial prospects for enhancing security, privacy, and efficiency in the management of land records.

The existing land registration methods [14] are susceptible to fraudulent activities, cyber attacks, and corrupt practices, which has led to the creation of a novel framework that utilizes blockchain technology for the purpose of ensuring secure and transparent management of land data. This system integrates asymmetric key encryption, SHA-256 and SHA-512 hashing, and a comparison analysis involving 200 JSON items. The suggested framework utilizing SHA-512 demonstrates a 29% performance improvement compared to SHA-256, suggesting enhanced efficiency compared to current approaches. Nevertheless, the study may be deficient in terms of real-world testing and practical implementation, which could restrict its relevance in actual land registration scenarios.
The proposed solution [15] aims to handle certain land administration use cases, such as ownership sharing, transfer, and real estate trading constraints, by employing blockchain technology, specifically through a smart contract developed in Solidity. Integrating blockchain technology into current land administration systems may encounter opposition and necessitate substantial procedural modifications. As the size of blockchain systems increases, there may be worries about their ability to handle large amounts of data and perform tasks quickly, which could affect the efficiency of land administration operations. The incorporation of blockchain technology into land administration may need the establishment of novel regulatory and legal frameworks to oversee transactions and guarantee adherence to rules and regulations.
In India, the Land Registry System [16] is characterized by inefficiency and susceptibility to fraud as a result of the involvement of intermediaries. Blockchain technology provides a solution by establishing an unchangeable and secure record for the management of land register. This technology guarantees heightened security, precision, and openness by adhering to government regulations and protocols. The objective is to streamline the registration procedure, eradicate bribery, and minimize inaccuracies in land records. Nevertheless, the process of implementing blockchain is intricate and less efficient compared to centralized systems. It necessitates the involvement of miners to validate transactions, and considerable consideration must be given to selecting consensus techniques to overcome these difficulties.
The proposed implementation of a blockchain-based land registration system [17] seeks to resolve the inefficiencies and security concerns associated with the existing system. The decentralized data storage of blockchain provides enhanced security and removes the possibility of incomplete or incorrect registrations that may result in ownership disputes and legal action. Implementing blockchain technology in land registration can greatly improve the sector's functionality and features, offering a dependable, smooth, and effortless operation.
The existing land registration system [18] encounters difficulties as a result of the fixed character of land, resulting in intricate and susceptible records of ownership transfer. The idea recommends the utilization of a blockchain-based system to establish unchangeable digital records for land ownership, with the objective of resolving problems related to fraud and transparency. The implementation of the system has utilized Ethereum, demonstrating favorable transaction processing times that

are well-suited for real applications. Nevertheless, the use of this technology is hindered by various human-related concerns, such as challenges in ensuring data accuracy, preservation, institutional and regulatory impediments, as well as the digital divide. To overcome these restrictions, it is necessary for the government to invest in digital technology and enhance institutional capacities in order to modernize land management and align it with the Industry 4.0 era. Possible constraints may encompass the accuracy and input of data into the system, the system's capacity to support data preservation, existing institutional and legal obstacles, disparities in digital access among communities, and the necessity for governments to allocate resources towards digital technologies and enhance institutional capabilities.

Blockchain technology [19] has the capacity to transform the healthcare industry by offering a safe means of storing and sharing medical data. However, there are still notable obstacles in terms of privacy and security. This article provides a thorough analysis of research conducted between 2017 and 2022 on the privacy and security aspects of blockchain technology in the healthcare sector. The primary focus is on examining the practical uses of blockchain in healthcare systems and the difficulties encountered in implementing it. The objective of the review is to offer valuable insights for future research trajectories and progress in this field.

One suggested approach [20] proposes utilizing blockchain technology to establish a decentralized e-government peer-to-peer (p2p) system that ensures secure, confidential, and transparent delivery of public services. The objective of this system is to distribute the current centralized e-government services, hence improving the security and privacy of information. Nevertheless, integrating blockchain technology into a decentralized e-government system could encounter scalability obstacles due to the substantial processing demands and energy consumption linked to blockchain networks. Moreover, the incorporation of outdated systems into a distributed blockchain-powered e-government structure may provide technological and compatibility challenges. Implementing regulatory compliance and governance in a decentralized system might pose legal and jurisdictional intricacies. Implementing a new technology like blockchain in e-government systems necessitates significant financial resources and may face opposition from stakeholders who are accustomed to centralized systems. Moreover, the proposed framework's security and privacy implications necessitate thorough real-world testing to confirm its efficacy in minimizing cyber risks and protecting sensitive data.

Blockchain technology [22] is widely employed for establishing trust networks and facilitating value interconnectivity in several domains such as digital currency, Internet of Things (IoT), smart grids, supply chains, and banking. Although widely used, the deployment of this technology is hindered by severe problems related to security and privacy considerations. This article provides a thorough examination of privacy safeguards, security oversight, and data sharing in apps based on blockchain technology.

The research [23] investigates the application of blockchain technology to augment security and privacy in electronic health records (EHR) systems, specifically targeting vulnerabilities in centralized EHR architectures. The study suggests doing a systematic literature review (SLR) that examines 51 publications published from 2018 to December 2022, focusing on the analysis of blockchain-based initiatives in the healthcare sector. The paper explores the advantages of blockchain technology in terms of encryption-enabled privacy and decentralization. It emphasizes how blockchain has the potential to eliminate central failures and attacks in electronic health record (EHR) systems.

Blockchains offer decentralized and immutable ledgers for digital asset transactions in new contexts such as smart cities and eHealth. Blockchains have privacy difficulties such as the ability to handle large amounts of data, ensuring protection against unauthorized access, preventing the tracing of transactions, and adhering to rules such as GDPR. Emerging solutions employ cryptographic privacy approaches to tackle concerns such as the protection of on-chain data and the implementation of self-sovereign identification models. The objective of the study is to comprehend the present condition of privacy-preserving solutions in blockchain and the accompanying difficulties across various sectors.

The proposed framework [25] for "intelligent justice" combines AI advancements such as NLP, ChatGPT, ontological alignment, and the semantic web with blockchain and privacy approaches. The objective is to improve court decisions by establishing a secure and transparent system for handling legal documents, ensuring the privacy of data, and protecting sensitive information. Nevertheless, the proposed framework may have constraints regarding the ethical and legal consequences of using AI and blockchain technology in the legal field.

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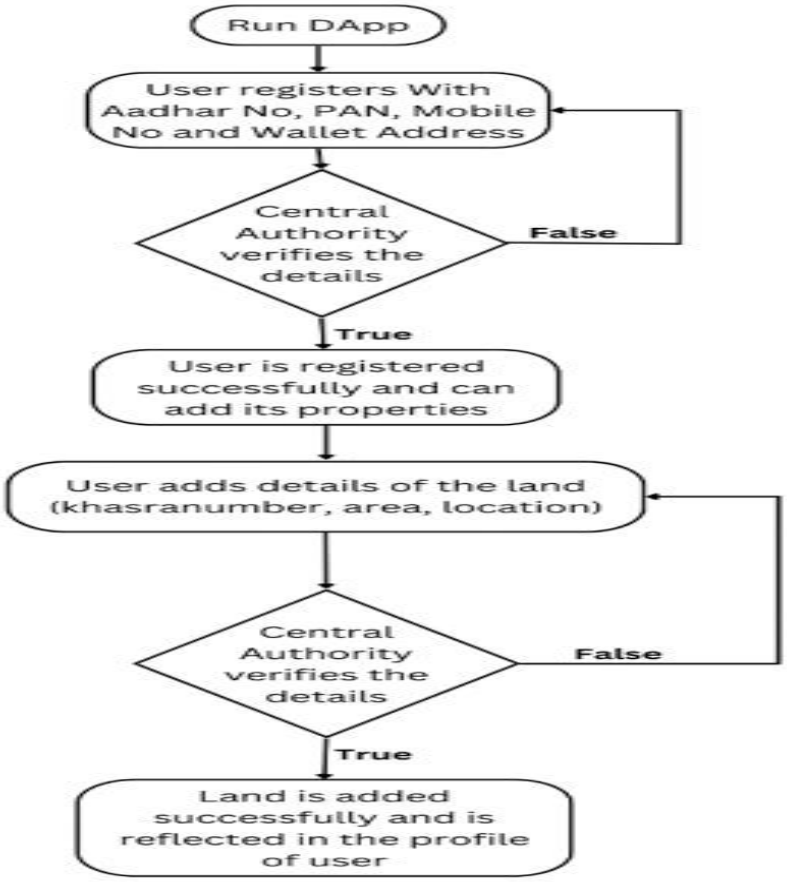

Fig 1: Registration Flow

3. Methodology

In order to create a land registration system that is easy for users to navigate, this system will utilize consensus mechanisms, smart contracts, and cryptographic techniques. Smart contracts, often referred to as self-executing contracts, are generated by encoding the terms of the agreement between the seller and buyer directly into computer code. The agreements included inside the code are disseminated through an open and decentralized blockchain network. Smart contracts enable the execution of reliable transactions and agreements among decentralized and unidentified players, eliminating the requirement for a centralized authentication system, a formal legal framework, or an external compliance mechanism. Transactions are endowed with the qualities of traceability, irreversibility, and clarity. This solution utilizes the Ethereum Blockchain as the underlying technology for the backend, while employing React for the frontend. Additionally, it incorporates Solidity smart contracts. By utilizing the javascript API, we establish a connection between the front end and the back end (smart contracts), allowing us to interact with the Ethereum nodes that form the blockchain. The smart contracts have been coded using the Solidity programming language. In addition, we utilize ganache to facilitate communication and testing of the smart contracts on our private blockchain network, so establishing a private Ethereum blockchain environment. The smart contracts are constructed using the Ethereum network.

Ethereum, a decentralized network, executes smart contracts. Contracts can be executed on the Ethereum Virtual Machine (EVM). Once installed, it can be accessed worldwide. These contracts must be enforced and validated by the parties referred to as miners. A group of computers, referred to as "miners," contribute transactions, which are additions or updates to the state, to a collective record known as a block. A blockchain consists of several blocks. The expenses associated with maintaining a contract are funded through the remuneration received by these miners in the form of gas, which is a valuable resource. When you deploy a smart contract, invoke a smart contract, or transfer funds to another account, you are required to provide a certain amount of ether which is then turned into gas.

The system is comprised of two main components, which will be detailed in the following sections.

Registration

The initial and crucial element of the proposed system is this. The system will be transferred to a centralized authority responsible for supervising and administering transactions. This organization will assume the

responsibility of being the administrator, managing user verification and ensuring the system's integrity. During the registration process, the user must furnish their telephone number, Aadhar card, PAN card, and cryptocurrency wallet address. In the future, the Aadhar card will serve the purpose of verifying property ownership, as well as verifying the user's identity and address. The utilization of a PAN card is necessary for taxes purposes, as the transfer of land ownership incurs tax liabilities. The mobile number will serve the dual purpose of generating and recovering passwords, as well as providing access to the portal. The federal agency would cross-check government data with authentication credentials such as PAN and Aadhar to verify the user's information. A cryptocurrency wallet is necessary as all transactions on the platform will exclusively utilize cryptocurrencies. This approach incorporates the use of the meta-mask cryptocurrency wallet. Meta Mask is a simple web-based cryptocurrency wallet that facilitates the sending and receiving of digital currencies such as Ether and Bitcoin. Figure 1 illustrates the sequential process of user registration. Upon successful registration, the user has the ability to add land by inputting the land's Khasra number. By cross-referencing user data with official government documents, the central authority will verify ownership. If the ownership details submitted by the user correspond to the information in government records, land will be credited to their account.

Transactions

The procedure of transferring property ownership entails multiple sequential stages. The system's configuration ensures that no intermediaries are required to complete the transaction. Furthermore, the landowner possesses the authority to sell not only the complete piece of property but also a fraction of it. Figure 2 illustrates the many stages of the transaction process.

The procedure consists of the following steps: **Inclusion of property by the seller:** To list a property for sale, the user is required to include it in their profile. The central agency will regulate this process to determine if the user is the rightful owner of the land or not.

Ownership verification: During this stage, the central agency will authenticate the land ownership by cross-referencing the khasra number, a distinctive identifier for land, with the owner's credentials. After verification, this piece of land will be displayed in the property area of the user's account, allowing the user to freely sell it.

Purchase request: Assume a user desires to acquire a parcel of land. Prior to anything else, the individual must complete the registration process on the site as previously described. After the verification of their account, users can utilize the khasra number to seek for land. Once he has identified the property he wants, he will make a formal request to purchase either the entire piece of land or a portion of it, specifying the exact amount of money he is willing to pay for the acquisition.

Transaction process: The central agency will authenticate this request at the seller's end. Once the seller confirms the request, the transfer will be initiated. Once the transaction is properly finalized, the buyer's account will be debited and the seller's account will be credited with the corresponding amount. If only a portion of the land registered under a specific khasra number is purchased, the central agency will assign a new khasra number for the newly acquired area. The central agency will also revise the data regarding the remaining land recorded under the seller's khasra number. Upon the conclusion of this procedure, the newly acquired land will be displayed in the buyer's account under the property section, while it will be removed from the seller's account.

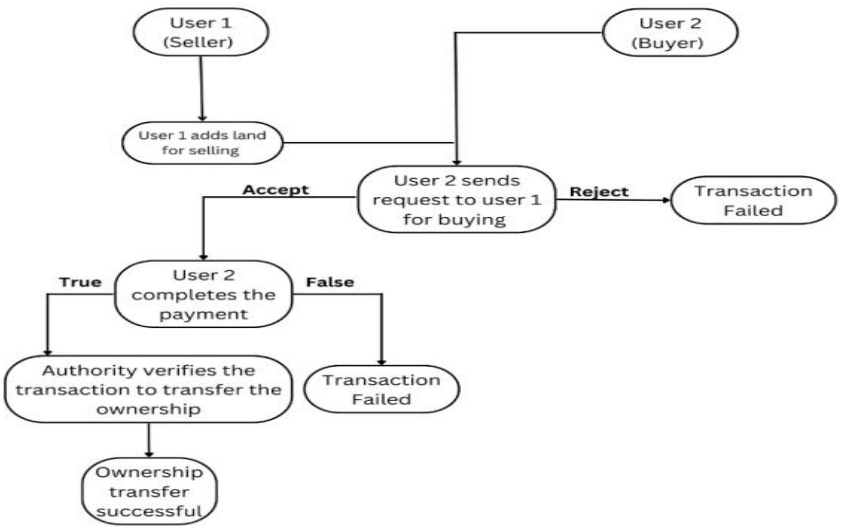

Fig 2. Transaction Flow

Algorithm 1: Registration

Input: Aadhar number, PAN, mobile number, wallet address

Output: Confirmation of user registration Begin

Step 1: Run the dApp

Step 2: Enter the required details and register

Step 3: Verification of details by central authority

Step 4: If (details are correct, user is registered, move to next step) Else (Goto step 2)

Step 5: Add land details

Step 6: Verification of land by central authority

Step 7: If (verification is successful, move to next step) Else (Goto step 5)

Step 8: Land is added successfully and ready for sale

End.

Algorithm 2: Transaction

Input: Khasra number of required lands.

Output: Transfer of land ownership.

Begin

Step 1: Enter the khasra number of desired properties.

Step 2: Send a buy request.

Step 3: If the request is accepted by the seller, go to the next step.

Step 4: Initiate a payment request.

Step 5: Verification by the central authority.

Step 6: If verification is successful, go to the next step; otherwise, go to step 4.

Step 7: Ownership transfers successful

End.

4. Results

A smart contract is a computerized system created to digitally facilitate and oversee the execution of a contract. They are commonly employed to automate the implementation of a contract, ensuring that all parties can promptly ascertain the result without the need for any middleman or delay. A smart contract (EVM) is a contract that is executed on an Ethereum virtual computer. This encompasses multiple functions that enable the portal to execute a wide range of actions.

The system primarily utilizes the following key functions:

1) newRegistration(): This function will receive user information in the form of a pan number, Aadhar number, and bitcoin wallet address, and will generate a user account as a result.

2) The addProperty() function will accept input for the land specifics, including the Khasra number, property measurements, property address, pin code, etc.
3) The propertyVerification() function will validate the property details provided by comparing them with the data kept at the central agency. Upon successful verification, this property will be displayed in the properties area.
4) The searchProperty() function accepts the unique khasra number as an input and retrieves the property owner's information, as well as details on the property's measurements, location, and past owners.
5) The buyProperty() function will receive the khasra number, property measurements, and the buyer's desired payment amount, and subsequently inform the seller. Upon receiving confirmation from the seller, the buyer will be notified of the final confirmation of the transaction.
6) removeOwnership(): This function is invoked upon the transfer of land ownership, and it eliminates the prior owner of the land associated with the specific khasra number.

5. Conclusion

The study seeks to identify and rectify the inconsistencies that exist in the conventional land registry system. The conventional register system incurs high expenses as a result of the participation of numerous intermediaries, hence significantly inflating the overall purchase costs. Furthermore, due to the reliance on a completely paper-based system, the process is time-consuming and contingent upon the presence and accessibility of lawyers, sub-registrars, and intermediaries. Due to the centralized nature of the current system, all important documents are stored in the sub-registrar's office, making them susceptible to tampering. In response to the existing issues, we have developed the concept of a land registration system that utilizes blockchain technology to ensure security. As every piece of data on the blockchain is stored in the ledger using cryptographic techniques, it enhances security and facilitates tracking. The immutability of the blockchain ensures that any attempt to modify the information will result in the disruption of subsequent nodes, thereby indicating that an alteration has been attempted. Additionally, the subsequent nodes will be determined by comparing them to the other network, given its spread nature. Smart contracts have demonstrated significant effectiveness in enhancing system transparency and reducing reliance on third-party intermediaries.

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