Rivista Italiana di Filosofia Analitica Junior Vol 14, No. 1 (2023)
ISSN: 2037-4445

Smart Land Record System Using Blockchain

Man Singh[1] , Amit Kumar Tiwari[2], Shyam Kishor Yadav[3], Anshul Yadav[4], Deepak Kumar[5]
Department of Computer Science and Engineering
United Institute of Technology, Prayagraj, India
mans77singh@gmail.com, kumartiwariamit@gmail.com, shyamkishoryadav@9682836162@gmail.com,
anyadav411998@gmail.com, rockdeepak25@gmail.com

Abstract: The existing land registry system in India is plagued by complex procedures, convoluted networks of intermediaries, and inherent difficulties in verifying ownership, resulting in multiple transactions for a single piece of land. In this pioneering study, we harness the transformative potential of blockchain technology to overcome these challenges. By leveraging a decentralized system built upon existing land record registration models, our research presents a groundbreaking proof-of-concept that has the potential to revolutionize the Indian government's land registration agency. Our comprehensive framework provides a meticulous blueprint that outlines essential elements for the successful implementation of a distributed land record registry system. Utilizing Ethereum's blockchain infrastructure, we establish an innovative system that captures the intricate process of land ownership transfers through immutable transactions. Smart contracts play a pivotal role in triggering significant events, such as granting land document access to authorized land inspectors, freezing designated land blocks for sale, and facilitating fund transfers upon rightful landowner verification. With this pioneering framework, the validation of land ownership achieves unprecedented levels of integrity, supported by immutable transactions recorded on a public ledger. This paradigm-shifting approach enhances the land registration process with remarkable efficiency, transparency, and a significant reduction in legal complexities, ushering in a new era of seamless and equitable land transactions.

Keywords: transactions, integrity, immutable, ushering

1. Introduction: The existing land registration system lacks safeguards against double selling, highlighting the need for blockchain-based land records in this project. By leveraging blockchain technology, we ensure the integrity and security of land records through their storage on a distributed ledger. Each record is encapsulated within a block, forming a tamper-resistant chain through a linked list data structure. The utilization of Distributed Ledger Technology ensures data replication across multiple nodes, making it extremely difficult for hackers to tamper with or manipulate the data [9]. Our implementation also incorporates the deployment of a smart contract interface, benefiting from the inherent trust and reliability of the blockchain's design. Both sellers and buyers have unwavering confidence in the transaction process, as any changes made by one participant are reflected across all nodes. In a public blockchain, transactions undergo scrutiny and authorization by a decentralized network of miners before being added to the blockchain. Conversely, in a permissioned blockchain, consensus is achieved through recognized validators who are stakeholders within the network. This meticulous consensus mechanism guarantees the authenticity and validity of transactions within the permissioned blockchain ecosystem [7].

A. Motivation and Contribution:

Central data storage system has limitations so that we emanated up a solution which is based on blockchain and system is able to handle the problems from which suffer centralized land record data storage system.

In this paper, our contributions to the research community are delineated as follows:

1. There are few flaws in the present land registry system. Implementing blockchain technology gives fruitful insights.
2. Blockchain is a disruptive technology which have such potential and effectiveness that we got by doing experiments [14].

3. With the help of blockchain we bring security and transparency of the very sensitive land record, data and it has alteration procedures [15].

B. Concept of Land Registry System:

In the early stages of record-keeping, ensuring reliability and trust was a challenge. Typically, village officers or patwaris acted as the sole custodians of records, using "khasra numbers" to establish ownership [17]. However, disputes and corruption emerged as inherent issues in these methods. To address these challenges, a digitization process was introduced, which successfully eliminated forgery and corruption but still relied on centralized storage. In our proposed framework, we introduce two core concepts: the land registry office and the land registry officer. The blockchain process validates transactions initiated by the officer, ensuring that any transaction or entry made in the land registry is authenticated and recorded [12].

2. Existing Land Record System Of India:

In India, land record data is currently stored on a centralized server monitored by a single individual known as the Patwari. This centralized server introduces vulnerabilities, making it a potential target for hacker attacks and susceptible to environmental factors, thereby becoming a single point of failure [21]. The Patwari's authority over the entire system raises concerns about data manipulation and falsification, further compromising the integrity and reliability of the land records [21].

The existing land record system faces several problems:

Multiple Selling: The system struggles to track cases where a single piece of land is sold to multiple buyers, making the process laborious [19].

Time Consuming: The system lacks efficiency in facilitating rapid transactions, causing delays when farmers require land documents for collateral security in banks or other purposes [13].

Government Subsidies: Farmers face difficulties in obtaining essential documents such as Rights of Records (RoR), mutation extracts, and crop certificates. These documents are crucial for accessing loans, subsidies, and governmental benefits. The reliability and integrity of data within the land records system, registration system, and interconnected departments are of paramount importance. Any unauthorized alterations or manipulations could disrupt the smooth initiation and execution of vital transactions [18].

3. Block Chain Technology

The implementation of blockchain technology, as substantiated by a reputable source [6], instills a decentralized and remarkably impregnable environment. Recognizing the inherent sensitivity of land records, it becomes incumbent upon us to establish formidable systems for land management and title cataloging. These systems must exhibit unwavering resilience against falsification endeavors, while simultaneously ensuring uninterrupted access to records and expeditious execution of critical operations.

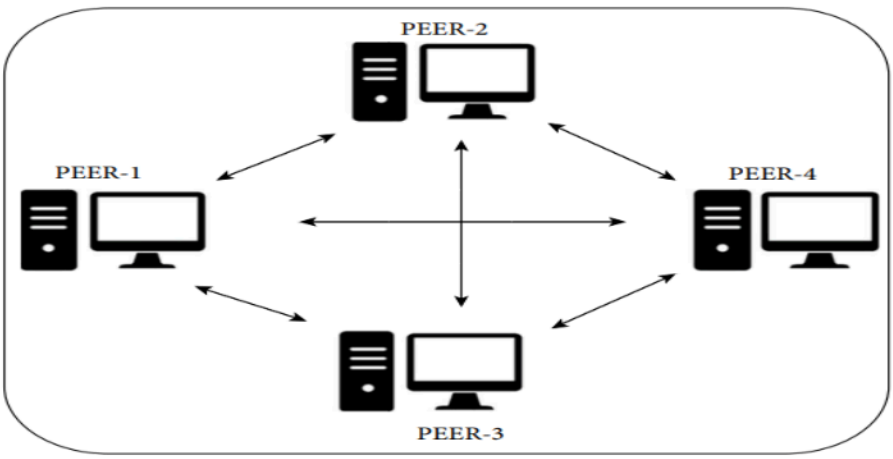

Fig. 1. Centralised Application Architecture [6]

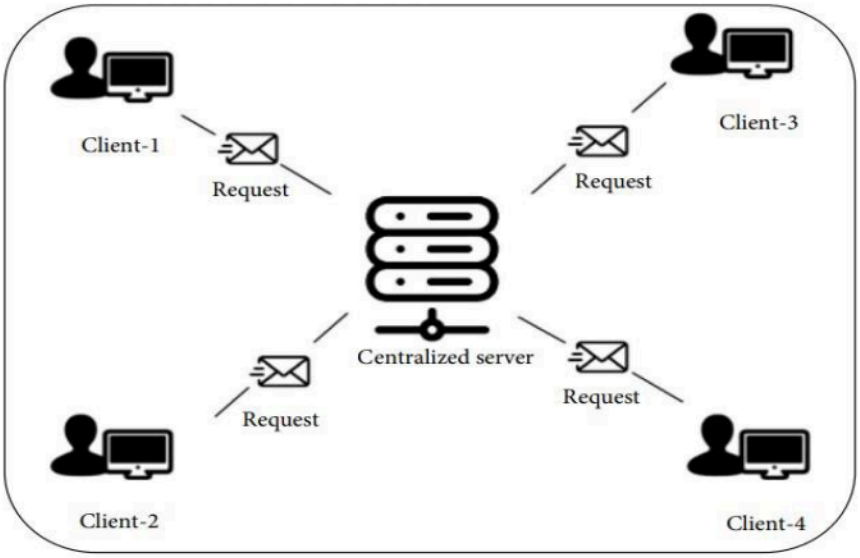

Fig. 2. Decentralised Application Architecture [6]

Blockchain, in its current iteration, transcends its rudimentary origins, undergoing a profound metamorphosis into a sophisticated framework that encompasses diverse disciplines such as mathematics, networking, cryptography, and dis- tributed consensus algorithms. This symbiotic amalgamation significantly augments the versatility of blockchain, endowing it with the capacity to cater to the intricate demands of modern applications [20], including the domains of land management and title recording systems. By harnessing the decentralized nature inherent to blockchain, stakeholders can confidently rely upon a transparent and inviolable platform that guarantees the streamlined and secure management of land records [16].

Types of Blockchain:

1. Public Blockchain (Permission less):
a. Access: No restrictions
b. Transact: Anyone can make transactions
c. View: Anyone can view
d. Type: Large, decentralized, i.e., bitcoin and Ethereum cryptocurrency platforms
2. Private Blockchain (Permissioned):
a. Access: Invitation only by the network administrator
b. Transact: Only those who have rights
c. View: Shared between trusted parties
d. Type: Middle ground platforms, accounting and record keeping procedures
3. Consortium Blockchain (Permissioned Permissionless)
a. Access: Restricted to selected consortium members
b. Transact: Selected consortium members only
c. View: Restricted to selected consortium members
d. Type: Participatory institutions immersed in the consensus and decision process [1].

Our implementation entails a consortium blockchain frame- work, imbued with an ingress gatekeeper demanding requisite permissions for network access, while fostering an intranet- work ambiance of unrestricted participation and untrammeled autonomy.

4. Proposed System:

The proposed system utilizes blockchain technology to establish a decentralized application (dapp) with a transaction flow diagram. The following steps outline the process:

1. All landowners are required to register on the blockchain network.

2. The addition of new landowners is solely performed by the Super Admin, a government body.
3. During the initial registration, the details of new landowners are cross-referenced with the government database, forming the genesis data for the project.
4. Subsequently, these verified details are stored on Pinata IPFS, a distributed web3 media management platform.
5. The IPFS database serves as a means to verify details whenever necessary and will be utilized by other government departments to prevent duplicate subsidies [3].

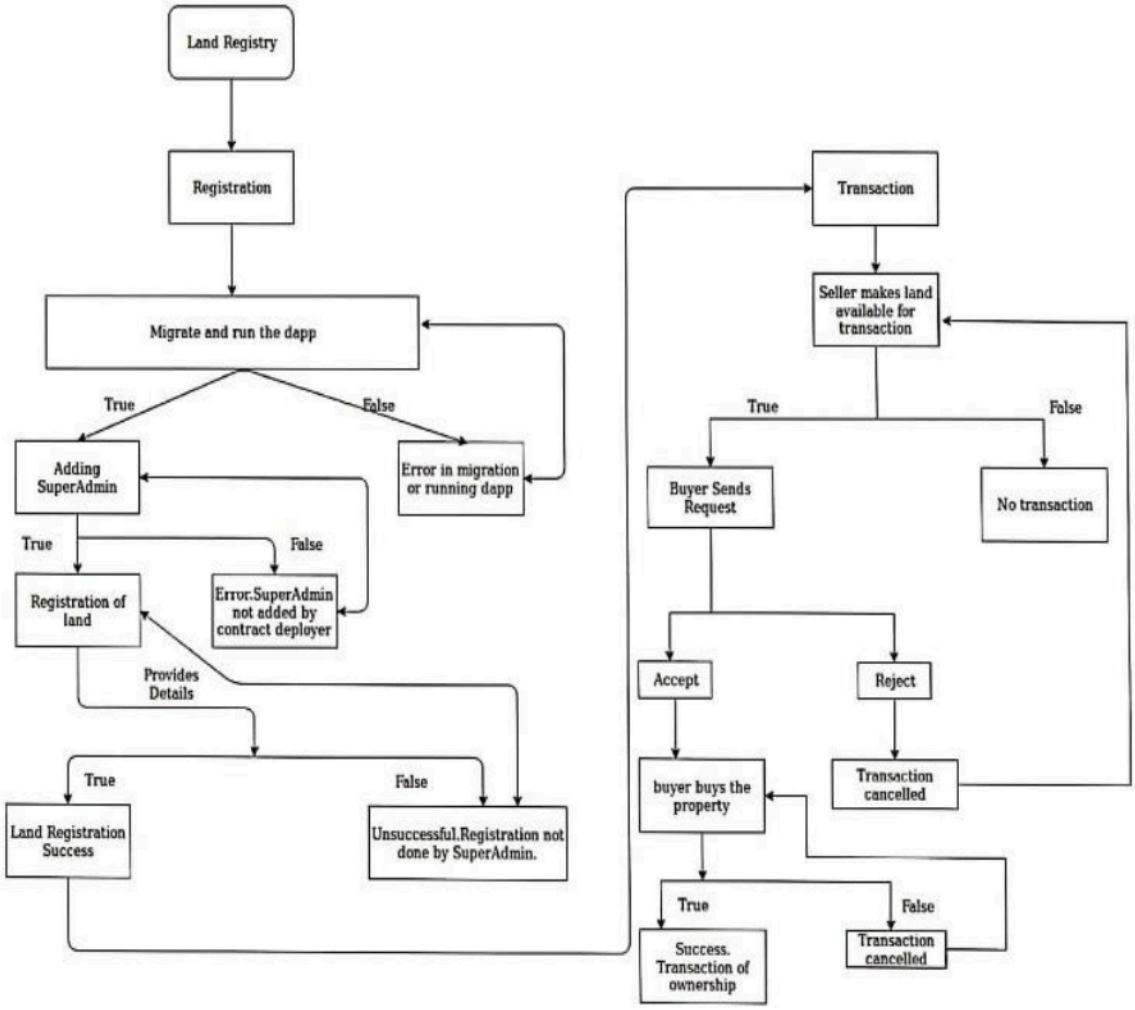

Fig. 3. Transaction flow Diagram

Implemented Functions:

1. addSuperAdmin(): This function is used to add addSuperAdmin in our network. Only the person who deployed it can call this function. For every particular village a Super Admin is assigned.
2. Registration(): Owner's Ethereum address, State, District, Village, Market value of land along with survey number and property ID is given as input to this function at the time of registration. These details can be only added by Admin which is assigned by Super Admin.
3. landInfoOwner(): This function shows the information of how much landowner owns. When we give survey number, State, District and village it will give all the land associated with that particular owner.
4. landInfoUser(): landInfoUser() function shows the in- formation about any user which the survey number belongs to.
5. requestToLandOwner(): This function is used to send the request to landowner using property ID that I want to buy this land. The address of the requester is automatically sent to landowner.

6. viewRequest(): When any buyer wants to buy land then he sends request to the seller. In the request section of seller it shows all the requests of all buyers.
7. makeAvailbale() : In this function seller makes available the land for sale and when the user search using the property ID it shows you can request to buy this land [4].
8. buyProperty() : when buyer requests to buy the land and seller approved it then transaction get happens and the title of land goes to buyer from seller.
9. removeOwnership() : When seller accept the request of buyer then removeOwnership() function is called and the property of seller go to buyer [22].

5. Conclusion:

The incorporation of carefully designed functionalities such as landInfoUser(), makeAvailable(), and requestToLandOwner() provides a strong defense against the harmful practice of double selling in land transactions. By utilizing the reliable Pinata IPFS, an exceptional distributed storage system, the preservation of crucial documents is ensured. The acquisition of the private key significantly reduces the likelihood of tampering. As a result, financial institutions can trust the integrity of these documents, enabling smooth loan disbursement to deserving farmers. Additionally, governmental bodies benefit from the utility of these secure documents, facilitating swift and accurate allocation of subsidies to rightful recipients.

References:

[1] Paul, P., Aithal, P. S., Saavedra, R., & Ghosh, S. (2021). Blockchain Technology and its Types—A Short Review. *International Journal of Applied Science and Engineering (IJASE)*, *9*(2), 189-200.Raj, P., Saini, K., & Surianarayanan, C. (Eds.). (2020). *Blockchain technology and applications*. CRC Press.

[2] Vayadande, K., Shaikh, R., Rothe, S., Patil, S., Baware, T., & Naik, S. (2022). Blockchain-Based Land Record System. In *ITM Web of Conferences* (Vol. 50). EDP Sciences.

[3] Khan, Rizwan Ansari, Shadab Sachdeva, Saksham Jain, Sneha. (2020). Blockchain based land registry system using Ethereum Blockchain. Xi'an Jianzhu Keji Daxue Xuebao/Journal of Xi'an University of Architecture and Technology. 12. 3640-3648

[4] Krishnapriya, S., & Sarath, G. (2020). Securing land registration using blockchain. *Procedia Computer Science*, *171*, 1708-1715.

[5] Zhao, X., Lei, Z., Zhang, G., Zhang, Y., & Xing, C. (2020). Blockchain and distributed system. In *Web Information Systems and Applications: 17th International Conference, WISA 2020, Guangzhou, China, September 23–25, 2020, Proceedings 17* (pp. 629-641). Springer International Publishing.

[6] Khalid, M. I., Iqbal, J., Alturki, A., Hussain, S., Alabrah, A., & Ullah, S. S. (2022). Blockchain-based land registration system: a conceptual framework. *Applied Bionics and Biomechanics*, *2022*.

[7] Jena, A. K., & Dash, S. P. (2021). Blockchain technology: introduction, applications, challenges. In *Blockchain Technology: Applications and Challenges* (pp. 1-11). Cham: Springer International Publishing.

[8] Priyadarshini, I. (2019). Introduction to blockchain technology. *Cyber security in parallel and distributed computing: concepts, techniques, applications and case studies*, 91-107.

[9] Masood, F., & Faridi, A. R. (2018). An overview of distributed ledger technology and its applications. *Int. J. Comput. Sci. Eng*, *6*(10), 422-427.

[10] Alsaed, Z., Khweiled, R., Hamad, M., Daraghmi, E., Cheikhrouhou, O., Alhakami, W., & Hamam, H. (2021). Role of blockchain technology in combating COVID-19 crisis. *Applied Sciences*, *11*(24), 12063.

[11] Krishnapriya, S., & Sarath, G. (2020). Securing land registration using blockchain. *Procedia Computer Science*, *171*, 1708-1715.

[12] Comincioli, L. M. (2021). The Role of Blockchain in Improving Land-users' Rights (Can blockchain solve corruption problems in land administration in developing countries?-The case of India).

[13] Thakur, V., Doja, M. N., Dwivedi, Y. K., Ahmad, T., & Khadanga, G. (2020). Land records on blockchain for implementation of land titling in India. *International Journal of Information Management*, *52*, 101940.

[14] Zhou, L., Zhang, L., Zhao, Y., Zheng, R., & Song, K. (2021). A scientometric review of blockchain research. *Information Systems and e-Business Management*, 1-31.

[15] Sedlmeir, J., Lautenschlager, J., Fridgen, G., & Urbach, N. (2022). The transparency challenge of blockchain in organizations. *Electronic Markets*, *32*(3), 1779-1794.

[16] Warnat-Herresthal, S., Schultze, H., Shastry, K. L., Manamohan, S., Mukherjee, S., Garg, V., ... & Kim-Hellmuth, S. COVID-19 Aachen Study (COVAS). *Balfanz, P*, 265-270.

[17] Sharma, R., Beg, M. K., Bhojaraja, B. E., & Pruthviraj, U. (2022). Automatizing the Khasra Maps Generation Process Using Open Source Software: QGIS and Python Coding Language. In *Sustainability Trends and Challenges in Civil Engineering: Select Proceedings of CTCS 2020* (pp. 1003-1018). Springer Singapore.

[18] Ahmad, T., & Haneef, R. (2019). Government agricultural schemes in India: a review. *Indian Farmers Digest*, *52*(11), 20-24..

[19] De, M. (2021). Land acquisition in India: a critical review.

[20] Sharma, P., Jindal, R., & Borah, M. D. (2022). A review of blockchain-based applications and challenges. *Wireless Personal Communications*, 1-43.

[21] Chugh, G. (2018). Examining E-governance: A study of land records management system in India. *Madhya Pradesh journal of social sciences*.

[22] Shuaib, M., Hassan, N. H., Usman, S., Alam, S., Bhatia, S., Mashat, A., ... & Kumar, M. (2022). Self-sovereign identity solution for blockchain-based land registry system: a comparison. *Mobile Information Systems*, *2022*, 1-17.

.