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TitleGuard: Safeguarding property rights through Blockchain

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ABSTRACT: Titleguard is a development for blockchain-based platform designed to revolutionise property rights management. By leveraging the power of distributed ledger technology, Titleguard aims to create a secure and immutable record of property ownership, transfers, and other leading obstacles. This system will eliminate the vulnerabilities of traditional property registries, providing a transparent, efficient, and fraud-resistant solution. Through smart contracts and cryptographic authentication, Titleguard ensures that property transactions are executed with precision and integrity, ultimately strengthening confidence in real estate markets.

KEYWORDS: Blockchain, Property Rights, Real Estate, Smart Contracts, Distributed Ledger Technology, Transparency, Security, Efficiency, Fraud Prevention.

I. INTRODUCTION

Property rights are fundamental to a stable and prosperous society. However, conventional property registration systems often suffer from inherent flaws, including susceptibility to fraud, lengthy bureaucratic processes, and a lack of transparency. Titleguard leverages blockchain technology to create an immutable ledger of property ownership, transfers, and other leading obstacles. By doing so, it addresses the drawbacks of existing registries, providing a robust and secure platform for managing property rights. This project seeks to redefine the way property transactions are recorded, offering a transparent and efficient solution that instills trust in the real estate market.

As blockchain technology forms the backbone of Titleguard, revolutionizing the way property rights are managed and safeguarded. At its core, a blockchain is a distributed and decentralized digital ledger that records transactions across a network of computers. Unlike traditional centralized systems, where a single authority holds control, a blockchain relies on a network of computers to validate and record transactions.

The key features of blockchain that are instrumental in Titleguard include:

Decentralization: Traditional property registries are centralized and controlled by a single entity, making them susceptible to fraud and manipulation. In contrast, Titleguard's blockchain is decentralized, meaning no single authority has complete control. Transactions are verified by a network of computers, enhancing security and transparency.

Immutability: Once a transaction is recorded on the blockchain, it becomes virtually impossible to alter or delete. This immutability ensures that property records remain accurate and tamper-proof, providing a reliable and trustworthy source of truth for ownership and transaction history.

Smart Contracts: Smart contracts are self-executing contracts with predefined rules and conditions. In Titleguard, they automate and enforce property transactions, ensuring they are carried out accurately and transparently. Smart contracts eliminate the need for intermediaries, reducing the risk of human error or fraudulent activities.

Transparency and Traceability: All transactions on the blockchain are visible to all network participants. This transparency allows property owners, buyers, and regulators to track and verify transactions, significantly reducing the likelihood of disputes or fraudulent activities.

Efficiency and Speed: Blockchain smoothens the property transfer process by automating many aspects of transactions. This leads to quicker and more efficient property transfers, reducing administrative overhead and potentially expediting real estate transaction.

II. PROBLEM STATEMENT

Property rights are a foundation of modern society, ensuring individuals and entities have legal ownership and control over land and real estate. However, existing property registration systems are often afflicted by inefficiencies, fraud, and lack of transparency. This leads to disputes, legal complications, and significant financial losses. The need for a secure, transparent, and efficient property rights management system is critical in safeguarding the interests of property owners and ensuring the integrity of the real estate market.

III. LITERATURE REVIEW

The document provides an in-depth exploration of how blockchain technology can revolutionize property registration and land administration. It sheds light on the shortcomings of current centralized systems, such as vulnerability to fraud and lack of transparency, and proposes blockchain as a decentralized solution. Blockchain's distributed ledger and smart contracts are highlighted as key components that can ensure secure and immutable records of property ownership and transactions. By leveraging cryptographic authentication, blockchain offers enhanced security and traceability, addressing major obstacles faced by traditional registries. The literature survey compares various consensus mechanisms, including proof-of-work and proof-of-stake, to determine their suitability for property transactions. It emphasizes the importance of scalability and trust in consensus algorithms to facilitate efficient and reliable transactions. Smart contracts are identified as powerful tools for automating and enforcing agreements in land administration. They streamline the registration process, reduce errors, and minimize the risk of fraud by ensuring the accuracy and integrity of data. The document also discusses real-world applications of blockchain in property registration, such as the Haryana Land Registration Information System in India, highlighting the government's efforts to digitize and improve registration processes. Moreover, it explores the potential of blockchain to address issues like incorrect data in land administration systems, double spending, and lack of coordination between stakeholders. Smart contracts are seen as a promising solution to these challenges, providing a transparent and secure framework for property transactions. Overall, the literature survey underscores the transformative potential of blockchain technology in property registration and land administration, offering transparency, efficiency, and trust in real estate markets.

V. PROPOSED METHODOLOGY

1. Designing the Block Class: - A Block class was created to represent individual blocks in the blockchain. - Attributes such as index, list of transactions, timestamp, and hash of the previous block were included. - A method was implemented to calculate the hash of the block's information.
2. Building the Blockchain Class: - A Blockchain class was developed to manage the entire blockchain. - The blockchain was initialized with a genesis block, which served as the first block in the chain. - Methods were implemented to add new blocks to the blockchain and validate its integrity.
3. Creating the TitleGuard Class: - A TitleGuard class was introduced to handle property registration information. - Upon instantiation, the blockchain was initialized, and a dictionary was set up to store property details. - Methods were included to register new properties and transfer ownership of existing properties.
4. Registering Property: - In the register-property method, the provided property information was validated. - If the information was deemed valid, it was added to the property information dictionary. - A new block containing the property information was mined to append it to the blockchain.
5. Transferring Ownership: - In the transfer-ownership method, both the property and new owner information were validated. - The property information dictionary was updated with

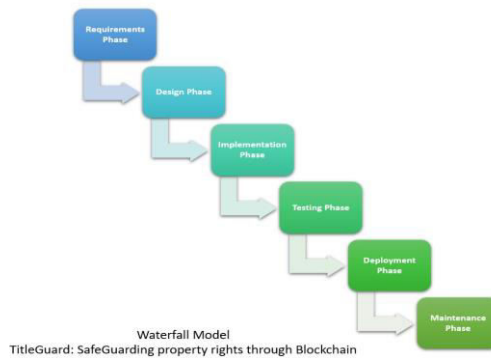


Figure 1: Waterfall Model

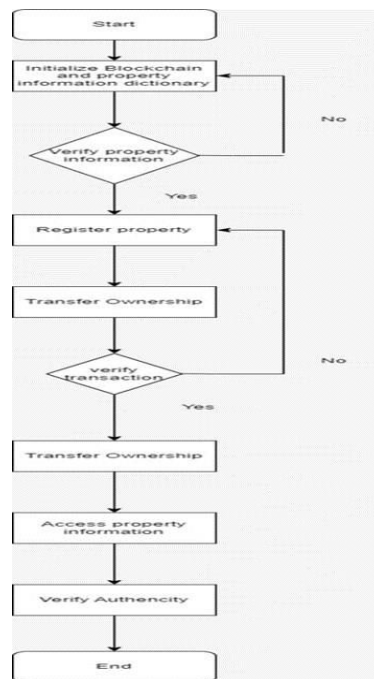


Figure 2: Flowchart

the new owner details. - A new block containing the updated property information and ownership transfer details was mined.

6. Verifying Transactions: - The verify-transaction method was implemented to ensure the validity of property transactions. - It checked if the property ID existed in the property information dictionary. - Validation of the property and new owner information was performed, returning True if both were valid, else False.

7. Accessing Property Information: - Property information was retrieved from the property information dictionary based on user queries. - The authenticity of the information was verified by cross-referencing it with the blockchain’s transaction history.

8. Additional Features: - The project was extended to accommodate various types of properties such as hotels, lands, and houses/bungalows. - The registration process was enhanced to handle specific property attributes unique to each type. - Functionality to search and filter property listings based on type, location, and other relevant criteria was implemented.

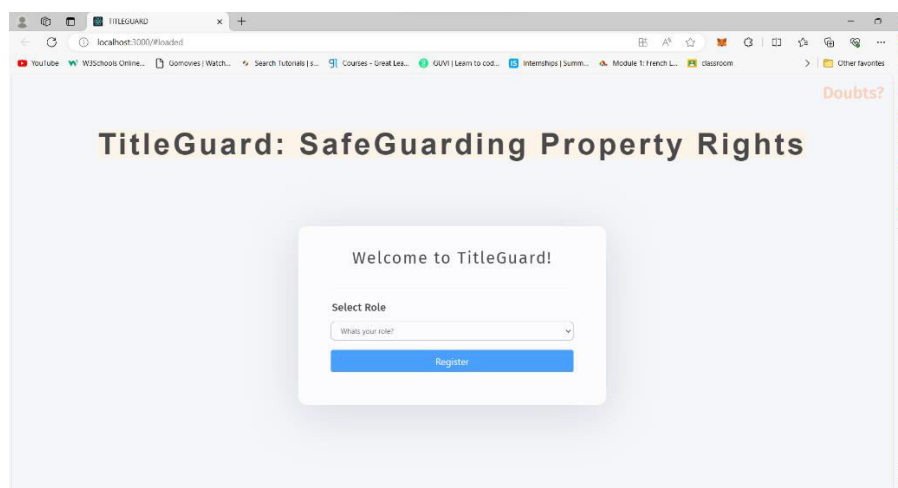
This proposed methodology ensured effective management of property registration for a diverse range of properties while maintaining data integrity and transaction security through blockchain technology under the TitleGuard framework.

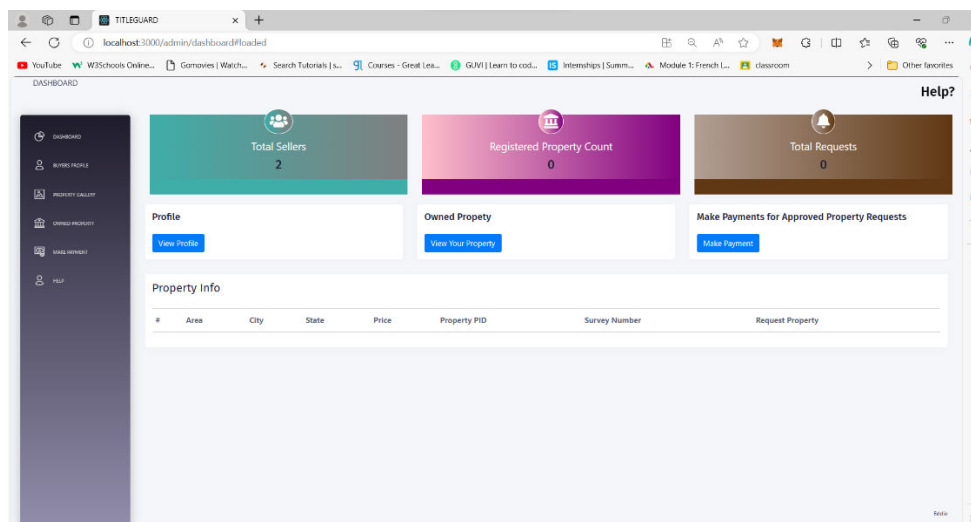
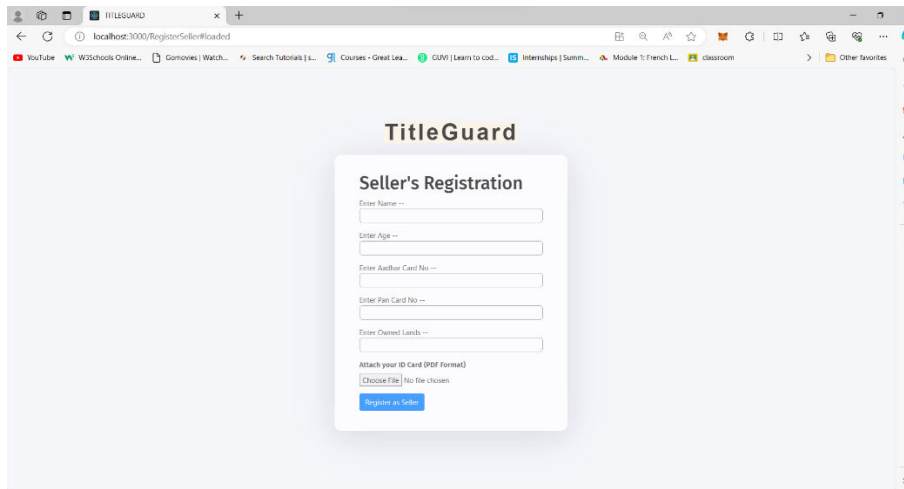
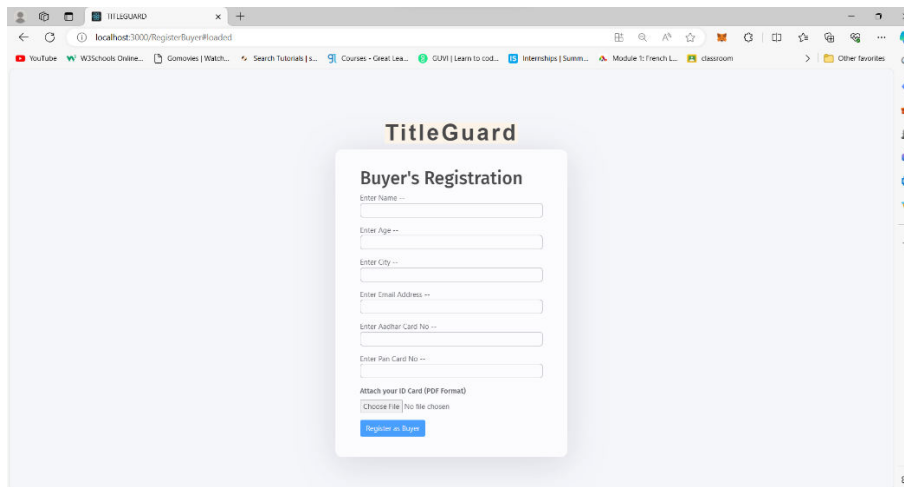
VI. SYSTEM ARCHITECTURE

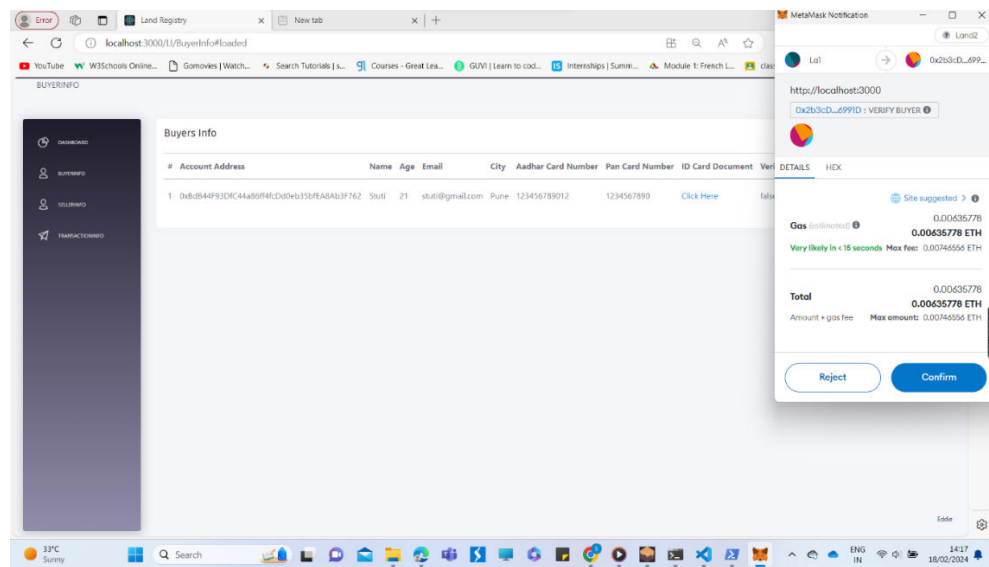
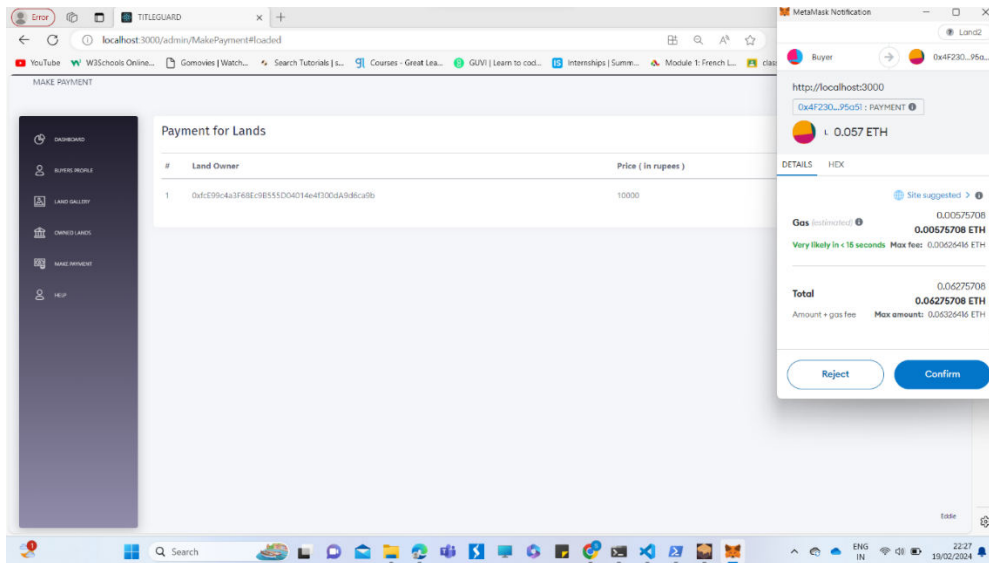
The TitleGuard system architecture revolves around three key actors in property transactions: the seller, buyer, and property inspector. Anchored by a smart contract deployed on a public blockchain, the architecture ensures transparency, security, and efficiency throughout the property registration process:

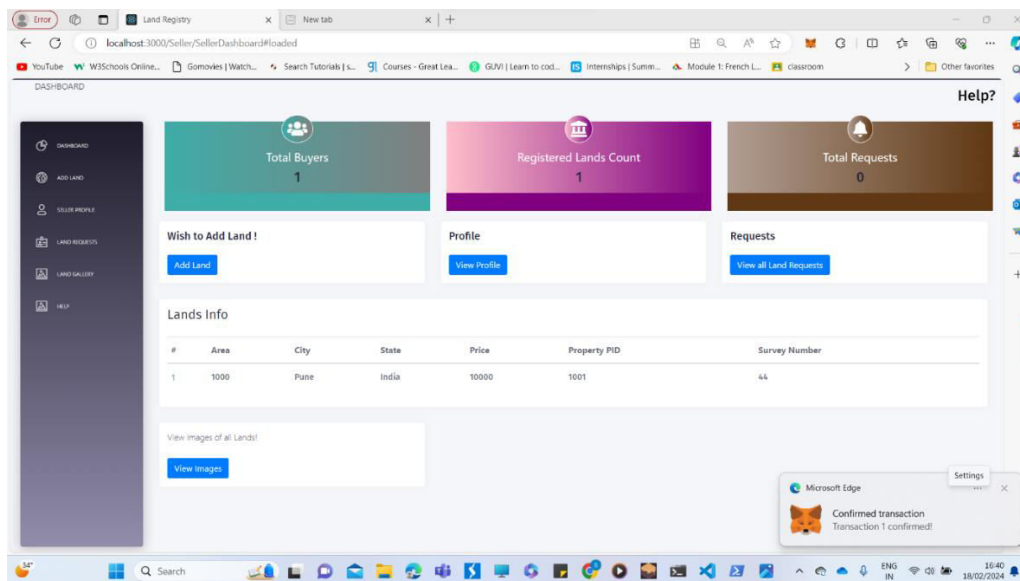
1. Seller Initiates Transaction Request: - The property transaction initiates as the seller requests registration, prompting the start of the registration process.
2. Buyer Publishes Property Details: - Using a designated Web Service, the buyer securely publishes property details, ensuring data integrity and authenticity.
3. Property Inspector Validates Details: - The property inspector, serving as an independent entity, rigorously validates the property details for accuracy and compliance.
4. Smart Contract Records Agreement: - Upon validation, the property details, along with the inspection report, are recorded in a smart contract on the public blockchain, establishing an immutable record.
5. Confirmation and Verification: - Both buyer and seller confirm the accuracy of the recorded details, ensuring consensus and transparency in the registration process.
6. Smart Contract Execution: - With consensus achieved, the smart contract executes the registration process, embedding the transaction securely into the blockchain ledger.
7. Access and Transparency: - Interested parties, including regulatory authorities and potential buyers, can access the blockchain ledger to verify property ownership and details, fostering transparency and trust in the market.
8. By integrating blockchain technology and leveraging the expertise of key stakeholders, TitleGuard establishes a robust and transparent property registration framework, facilitating seamless transactions and enhancing confidence in real estate dealings.

VII. RESULTS AND DISCUSSIONS









VIII. CONCLUSION

Titleguard represents a significant step forward in property rights management. By utilizing the potential of blockchain technology, it offers a secure, transparent, and efficient solution to the challenges faced by traditional property registries. Through the implementation of smart contracts and authentication, Titleguard ensures that property transactions are executed with precision and integrity. This project has the potential to reshape the real estate landscape, inculcating confidence in property owners and stakeholders while safeguarding the integrity of property rights. With continued development and adoption, Titleguard has the power to revolutionize the way property transactions are conducted and recorded.

REFERENCES

1. Dhruv Goragandhi, Jash Shah, Vallabhi Doshi, Archana Nanade, *The Application of Blockchain as a Distributed Ledger and smart Contract for Property Registration.*, 2021 International Conference on Disruptive Technologies for Multi-Disciplinary Research and Applications (CENTCON) DOI: 10.1109/CENTCON52345.2021.9687997
2. Amrendra Singh Yadav, Nikita Singh, Dharmender Singh Kushwaha, *A scalable trust-based consensus mechanism for secure and tamper free property transaction mechanism using DLT*, Int J Syst Assur Eng Manag (April 2022) 13(2):735–751 <https://doi.org/10.1007/s13198-021-01335-0>
3. Miroslav Stefanovic, Sonja Ristic, Darko Stefanovic, Marko Bojkicand ore Przulj, *Possible Applications of Smart Contracts in Land Administration*, 978-1-5386-7171-9/18/ ©2018 IEEE
4. Archana Sahai, Rajiv Pandey, *Smart Contract Definition for Land Registry in Blockchain*, 9th IEEE International Conference on Communication System and Network Technologies, ©2020 IEEE, DOI: 10.1109/CSNT.2020.43
5. Eduardo da Silva Oliveira, *Land Ownership and Land Use Development: The Integration of Past, Present, and Future in Spatial Planning and Land Management Policies*, Article in Landscape Journal · February 2017, DOI: 10.3368/lj.36.2.119
6. Amrendra Singh Yadav, Dharmender Singh Kushwaha *Blockchain-based digitization of land record through trust value-based consensus algorithm*, Part of Springer Nature 2021
7. Jack Laurie Tilbury, Ed de la Rey, Karl van der Schyff *Business Process*
8. *Models of Blockchain and South African Real Estate Transactions*, IEEE Explorer
9. Dr. Atefeh Mashatan, Zachary Roberts *An Enhanced Real Estate Transaction Process Based on Blockchain Technology*, Twenty-third Americas Conference on Information Systems, Boston, 2017
10. Nidhi Gupta, Manik Lal Das, Sukumar Nandi *LandLedger: Blockchainpowered Land Property Administration System*, IEEE Xplore

12. Mr. Cleverence Kombe, Dr. Majuto Manyilizu, Prof. Aloys Mvuma *Design of Land Administration and Title Registration Model Based on Blockchain Technology*, Journal of Information Engineering and Applications ISSN 2224-5782 (print) ISSN 2225-0506 (online) Vol.7, No.1, 2017
13. Desiree Daniel, Chinwe Ifejika Speranza *The Role of Blockchain in Documenting Land Users' Rights: The Canonical Case of Farmers in the Vernacular Land Market*, COMMUNITY CASE STUDY published: 12 May 2020 doi:10.3389/fbloc.2020.00019
14. Mohammad Faiz, Dr.S.K.Wagh, Renuka Shahapure, Subhojit Deb,
15. Pranesh Kamble *Land Registration System Using Blockchain*, 2023 IJCRT — Volume 11, Issue 7 July 2023 — ISSN: 2320-2882
16. Wong Phui Fung, Chia Fah Choy, Kiu Mee San, Eric C.W. Lou *Potential integration of Blockchain technology into smart sustainable city (SSC) developments: A systematic review*, Publisher: Emerald DOI: <https://doi.org/10.1108/sasbe-09-2020-0140>
17. Milon Biswas, Javed Al Faysal, Kazi Asif Ahmed *LandChain: A Blockchain Based Secured Land Registration System*, 978-1-6654-2132-
18. 4/21/31.00 ©2021 IEEE
19. Hartmut MULLER, Markus SEIFERT *Blockchain, a Feasible Technology for Land Administration?*, FIG Working Week 2019 Geospatial information for a smarter life and environmental resilience Hanoi, Vietnam, April 22–26, 2019
20. Fariha Jahan, Mayel Mostafa, Shahrin Chowdhury *SHA-256 in Parallel Blockchain Technology: Storing Land Related Documents*, International
21. Journal of Computer Applications (0975 – 8887) Volume 175 – No. 35, December 2020
22. Goran Sladi, Branko Milosavljević, Sinisa Nikolić, Dubravka Sladić, Aleksandra Radulović *A Blockchain Solution for Securing Real Property Transactions: A Case Study for Serbia*, ISPRS Int. J. Geo-Inf. 2021, 10, 35.
23. Srinath Perera, Amer A. Hijazi, Geeganage Thilini Weerasuriya, Samudaya Nanayakkara, Muhandiramge Nimashi Navodana
24. Rodrigo *Blockchain-Based Trusted Property Transactions in the Built Environment: Development of an Incubation-Ready Prototype*, Buildings 2021, 11, 560. <https://doi.org/10.3390/buildings11110560>
25. Mohammed Shuaib, Salwani Mohd Daud, Shadab Alam, Wazir Zada Khan *Blockchain-based framework for secure and reliable land registry system*, TELKOMNIKA Telecommunication, Computing, Electronics and Control Vol. 18, No. 5, October 2020, pp. 2560–2571 ISSN: 1693-6930, accredited First Grade by Kemenristekdikti, Decree No: 21/E/KPT/2018 DOI: 10.12928/TELKOMNIKA.v18i5.15787
26. Miroslav Stefanović, ore Przulj, Sonja Ristić, Darko Stefanović, Miloš
27. Vukmanović *BLOCKCHAIN AND LAND ADMINISTRATION: POSSIBLE APPLICATIONS AND LIMITATIONS*, Proceedings of the 5th International Scientific Conference on Contemporary Issues in Economics, Business and Management (EBM 2018), Faculty of Economics in Kragujevac, Republic of Serbia 09-10th November, 2018
28. FARHANA AKTER SUNNY, PETR HAJEK, MICHAL MUNK, MOHAMMAD ZOYNUL ABEDIN, MD. SHAHRIARE SATU, MD. IFTEKHARUL ALAM EFAT, MD. JAHIDUL ISLAMA *Systematic Review of Blockchain Applications*, Digital Object Identifier 10.1109/ACCESS.2022.3179690
29. Mahsa Mohaghegh, Aditya Panikkar *A Decentralised Land Sale and Ownership Tracking System using Blockchain technology*, 2020 5th International Conference on Innovative Technologies in Intelligent systems and Industrial Applications, 2020 IEEE
30. Esther Nagel, Johann Kranz *IS 'CHAINED' PROPERTY THE FUTURE? A REVIEW AND SYNTHESIS OF LITERATURE ON BLOCKCHAIN TECHNOLOGY AND PROPERTY RIGHTS*, Twenty-Ninth European Conference on Information Systems (ECIS 2021), [Marrakesh, Morocco—A Virtual AIS Conference].
32. Maurice BARBIERI, Dr. Dominik GASSEN *Blockchain – can this new technology really revolutionize the land registry system?*, Paper prepared for presentation at the “2017 WORLD BANK CONFERENCE ON LAND AND POVERTY” The World Bank - Washington DC, March 20
33. -24, 2017
34. Victoria L. Lemieux *A Typology of Blockchain Recordkeeping Solutions and Some Reflections on their Implications for the Future of Archival Preservation*, 2017 IEEE International Conference on Big Data (BIGDATA)
35. Ivana Racetin, Jelena Kilić Pamuković, Mladen Zrinjski Marina Peko *Blockchain-Based Land Management for Sustainable Development*, Sustainability 2022, 14, 10649

36. Sandeep Kumar Panda, Gouse Baig Mohammad, Sachi Nandan Mohanty, Sipra Sahoo *Smart contract-based land registry system to reduce frauds and time delay*, Security Privacy. 2021;e172. wileyonlinelibrary.com/journal/spy2
37. Balkiz Yapicioglu, Rebecca Leshinsky *Blockchain as a tool for land rights: ownership of land in Cyprus*, Journal of Property, Planning and Environmental Law © Emerald Publishing Limited 2514-9407 DOI 10.1108/JPPPEL-02-2020-0010
38. Svein Ølnes, Arild Jansen *Blockchain Technology as a Support Infrastructure in e-Government*,
39. Himani Mukne, Saish Raut, Dayanand Ambawade, Prathamesh Pai *Land Record Management using Hyperledger Fabric and IPFS*, IEEE - 45670 10th ICCCNT 2019 July 6-8, 2019, IIT - Kanpur Kanpur, India
40. Karthika Veeramani, Suresh Jaganathan *Land Registration: Use-case of eGovernance using Blockchain Technology*, KSII TRANSACTIONS ON INTERNET AND INFORMATION SYSTEMS VOL. 14, NO. 9, Sep.
41. 2020
42. Swapnil Soner, Ratnesh Litoriya, Prateek Pandey *Exploring Blockchain and Smart Contract Technology for Reliable and Secure Land Registration and Record Management*, Wireless Personal Communications (2021) 121:2495–2509
43. Miscione Gianluca, Ziolkowski Rafael, Zavolokina, Liudmila, Schwabe
44. Gerhard *Tribal Governance: The Business of Blockchain Authentication*, Zurich Open Repository and Archive, University of Zurich, 2018
45. Goran Sladi, Branko Milosavljevi, Sinisa Nikoli, Dubravka Sladi, Aleksandra Radulovi *A Blockchain Solution for Securing Real Property Transactions: A Case Study for Serbia*, ISPRS Int. J. Geo-Inf. 2021, 10, 35.
46. Raquel Benbunan-Fich, Arturo Castellanos *Digitalization of Land Records: From Paper to Blockchain*, Thirty Ninth International Conference on Information Systems, San Francisco 2018
47. Oleksii Konashevych *Constraints and benefits of the blockchain use for real estate and property rights*, Journal of Property Planning and Environmental Law · June 2020
48. Prince Donkor Ameyaw, Walter Timo de Vries *Toward Smart Land Management: Land Acquisition and the Associated Challenges in Ghana. A Look into a Blockchain Digital Land Registry for Prospects*, Land 2021, 10, 239
49. Debasish Kundu *Blockchain and Trust in a Smart City*, Environment and Urbanization Asia 10(1) 31–43, 2019 © 2019 National Institute of Urban Affairs (NIUA)
50. Rohan Bennett, Todd Miller, Mark Pickering, Al-Karim Kara *Hybrid Approaches for Smart Contracts in Land Administration: Lessons from Three Blockchain Proofs-of-Concept*, Bennett, R.; Miller, T.; Pickering, M.; Kara, A.-K. Hybrid Approaches for Smart Contracts in Land Administration: Lessons from Three Blockchain Proofs-of-Concept. Land 2021, 10, 220.
51. Muhammad Irfan Khalid, Jawaid Iqbal, Ahmad Alturki, Saddam Hussain, Amerah Alabrah, Syed Sajid Ullah *Blockchain-Based Land Registration System: A Conceptual Framework*, Hindawi Applied Bionics and Biomechanics Volume 2022, Article ID 3859629



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