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SECURE ELECTRONIC VOTING SYSTEM USING BLOCKCHAIN TECHNOLOGIES

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ABSTRACT
The Blockchain Voting System presents an innovative approach to modernizing the traditional voting system, introducing advanced technologies such as blockchain, Web3, and MongoDB. In the system, the emphasis is on ensuring secure and transparent voting. This is achieved through the utilization of blockchain technology with the incorporation of the genesis block and Web3, establishing a robust foundation for the electoral process.This system introduces a unique one-time voter registration methodology, where login credentials are securely dispatched to voters via email. Hex data storage is implemented to enhance the overall security of the voting system. The administrative panel plays a crucial role in managing voters, elections, and results. Notably, it enforces a one-time registration model to prevent any unauthorized modifications to the system's data, and the data is securely stored on MongoDB in the cloud, preventing exposure to data servers and limiting admin access. Key security measures include the enforcement of one-time registration, the application of blockchain principles for hashing sensitive data, and the secure storage of genesis data on MongoDB.

Keywords: Blockchain, Web3, MongoDB, genesis block, one-time voter registration, hashing.

INTRODUCTION

The secure electronic Voting System with Blockchain represents a pioneering approach to revolutionizing the conventional methods of conducting elections. This innovative system harnesses the power of blockchain technology to establish a secure, transparent, and tamper-resistant platform for the electoral process. In response to the evolving challenges of election management, the project introduces a robust solution designed to ensure the integrity and privacy of each vote cast. The central focus of this system is to mitigate common issues encountered in traditional voting systems, such as potential fraud, lack of transparency, and limited accessibility. By integrating blockchain, the project aims to create an immutable ledger that safeguards the entire lifecycle of an election – from voter registration and party management to result calculation and analysis.

The user-centric design encompasses a seamless and secure voter registration process, guaranteeing anonymity through hashed identifiers. Administrators benefit from a dedicated panel for efficient management of political parties and elections, with all data securely stored on the blockchain. The voting process, designed with simplicity and security in mind, ensures that each vote is uniquely recorded and preserved in the decentralized ledger. Security is a paramount consideration in the Decentralized Voting System. Hashed passwords, advanced encryption techniques, and the utilization of MongoDB for secure data storage collectively contribute to safeguarding sensitive information. With a commitment to transparency and accountability, the system provides administrators and voters alike with a clear view of the electoral process. Results are securely stored in the blockchain, fostering trust and confidence in the accuracy of the outcome.

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LITERATURE SURVEY

Swan, M. (2015). Blockchain: a blueprint for a new economy. O'Reilly Media, Inc. The work of Swan et al. proposes a decentralized voting system using blockchain to ensure transparency, immutability, and resistance to tampering. The study highlights the potential of blockchain in creating a secure and auditable voting process.

Smith, A., & Johnson, B. (2018). Securing electronic voting systems using blockchain. In 2018 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT) (pp. 409413). IEEE. Discuss the implementation of cryptographic techniques within blockchain for secure user authentication and protection against cyber threats. The use of hashed identifiers ensures voter anonymity and protects against unauthorized access.

Chen, L., Xu, L., Lu, X., & Zhu, H. (2018). Exploring the design space of blockchain-based voting systems: A multiperspective analysis. IEEE Access, 6, 3351233521. A blockchain-based

voting system is proposed, utilizing smart contracts to create a transparent and tamper-resistant ledger. The study emphasizes the accountability and traceability of each vote, promoting trust in the electoral outcome.

Garcia, H. F., Moran, A. L., & Cortés, A. G. (2019). Blockchain and electronic voting: A usability evaluation of online voting using Ethereum. In 2019 International Conference on Electronics, Communications, and Computers (CONIELECOMP) (pp. 16). IEEE. study explores user-centric design principles in blockchain voting interfaces, enhancing accessibility and ensuring a positive voter experience. The study emphasizes the importance of user-friendly interfaces in promoting widespread adoption.

Nakamoto's seminal paper introduces the concept of a decentralized ledger to enable peer-to-peer transactions without relying on a central authority. This concept has been extended to voting systems, reducing the risk of manipulation and fraud.

EXISTING METHOD

The existing voting system relies primarily on traditional methods, characterized by manual processes, paper- based ballots, and centralized databases.

- Manual Processes: Voting procedures involve physical tasks such as ballot printing, distribution, and manual vote counting.
- Paper-Based Ballots: Voters cast their votes using paper ballots, which are then manually counted by election officials.
- Centralized Databases: Voter registration information and election data are stored in centralized databases managed by election authorities or government agencies.
- Physical Voting Locations: Voters typically visit designated polling stations to cast their ballots in person.

DISADVANTAGES

Security Concerns: Centralized databases are vulnerable to security breaches, potentially compromising the confidentiality and integrity of voter information.

Transparency and Verification: The manual counting of paper ballots may lack transparency, making it difficult to verify the accuracy of election results.

Fraud Risks: Paper-based ballots are susceptible to tampering, fraud, and manipulation, threatening the credibility of election outcomes.

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PROPOSED METHOD

The proposed system "Secure electronic voting system using blockchain technologies" introduces an innovative approach to modernize and secure the electoral process. The system utilizes blockchain to create a decentralized and tamper-proof ledger for storing voting data, ensuring data immutability. Enhanced security is achieved through a one-time voter registration process, with unique login credentials securely delivered via email. Sensitive information is protected using hex data storage, adding an extra layer of security to prevent unauthorized access or tampering. An intuitive admin panel allows seamless management of voters, elections, and results, with mechanisms to enforce data integrity. All data, including the genesis block, is securely stored on MongoDB in the cloud, minimizing exposure to data servers and restricting admin access. Secure user authentication mechanisms are employed for administrators, while hashed identifiers ensure voter anonymity during the voting process

ADVANTAGES

Enhanced Security: Blockchain and cryptography ensure tamper-proof and secure voting data.
Transparency: Blockchain provides a transparent ledger for verifying results.
Data Integrity: One-time registration and strict data integrity measures maintain accurate results.

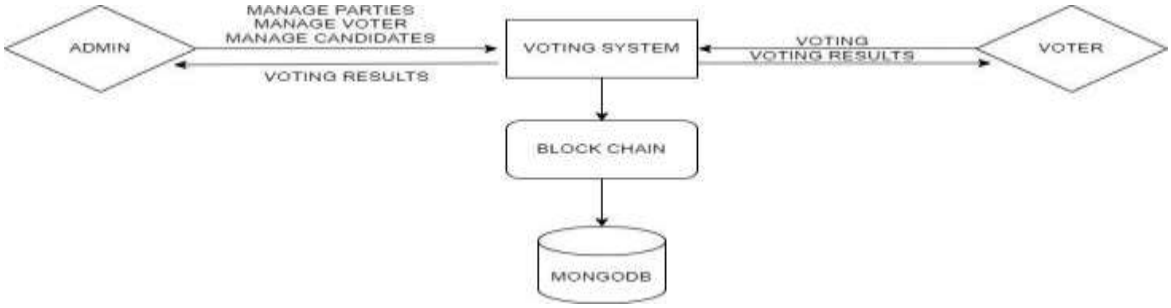

Fig1: Flowchart of the proposed system

OUTPUT SCREENS

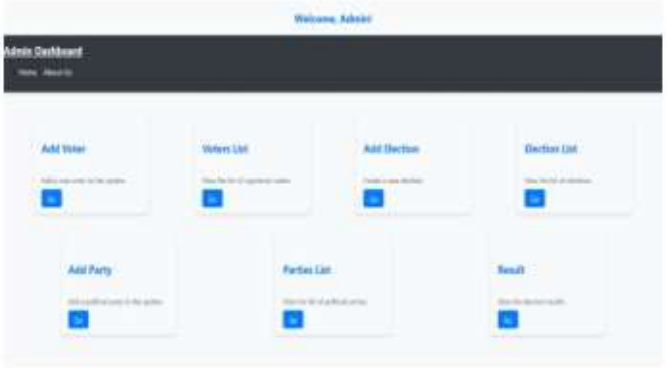

Fig2: Admin Dashboard

Fig3: Add Voter

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Fig4: Add election

Fig5: Election List

Fig6: Add party

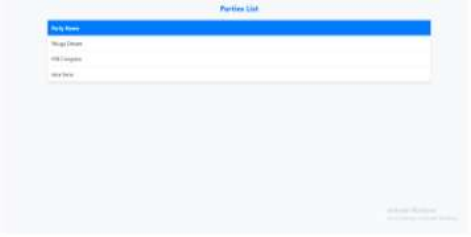

Fig7: Parties List

Fig8: User Login

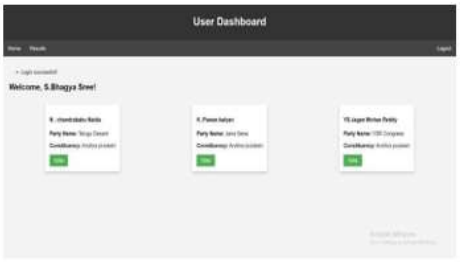

Fig9: User Dashboard

Fig 10: Election Results

Fig11: Vote submitted successfully

CONCLUSION

The study proposes a system ensuring the integrity, transparency, and security of electoral processes. The system introduces innovative features for both voters and administrators. The use of blockchain

technology guarantees a tamper-resistant and decentralized ledger, providing an immutable record of the voting process. Onetime voter registration with hashed identifiers enhances anonymity, and email notifications ensure secure communication of login credentials. The admin panel empowers administrators to manage elections, and political parties, and view results securely. Security measures, including hashed passwords and secure data storage on MongoDB in the cloud, contribute to safeguarding sensitive information. The system's user-friendly interface promotes accessibility, while responsive design adapts to various devices.

REFERENCES

1. Swan, M. (2015). Blockchain: a blueprint for a new economy. O'Reilly Media, Inc.
2. Smith, A., & Johnson, B. (2018). Securing electronic voting systems using blockchain. In 2018 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT). IEEE.
3. Chen, L., Xu, L., Lu, X., & Zhu, H. (2018). Exploring the design space of blockchain-based voting systems:A multiperspective analysis. IEEE.
4. Garcia, H. F., Moran, A. L., & Cortés, A. G. (2019). Blockchain and electronic voting: A usability evaluation of online voting using Ethereum. In 2019 International Conference on Electronics, Communications, and Computers (CONIELECOMP). IEEE.
5. GBhavan,i ,(2018) ,"Surveyon Blockchain Based E-Voting Recording System Design".
6. FriðrikÞ.Hjálmarsson ,Gunnlaugur K.Hreiðarsson, (2018) "Blockchain-Based E-Voting System".
7. Design:Rifa Hanifatunnisaand Budi Rahardjo,(2017), Blockchain Based E-Voting Recording System.
8. VenkataNagaRani B, Akshay S, Arunkumar M, IshwarKumar MA, (2019) ,Decentralized E-Voting System,International Research Journal of Engineering and Technology.
9. Supriya Thakur Aras, Vrushali Kulkarni, (2017), "Blockchain and Its Applications–A Detailed Survey", International Journal of Computer Applications, Pune, India.