IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 10, October 2024

DOI: 10.17148/IJARCCE.2024.131010

Secure Voting System Using Ethereum

Sakshi Dhekane[1], Anish Mane[2], Padmanabh Madaswar[3], Sanved Barkade[4], Shreya Yadav[5]

UG Student, PES's Modern College of Engineering, Pune, India [1,2,3,4,5]

Assistant Professor, PES's Modern College of Engineering Pune, India [5]

Abstract: Secure voting using Ethereum blockchain is a secure, transparent and tamper-proof way of conducting online voting. It is a decentralized application built on the Ethereum blockchain network, which allows participants to cast their votes and view the voting results without the need for intermediaries. In this system, votes are recorded on the blockchain, making it impossible for anyone to manipulate or alter the results. The use of smart contracts ensures that the voting process is automated, transparent, and secure. The use of the blockchain technology and the implementation of a decentralized system provide a reliable and cost-effective solution for conducting trustworthy and fair elections.

Keywords: Ethereum blockchain, online voting, decentralized application, smart contracts

I. INTRODUCTION

In every democracy, the security of an election is a matter of national security. Electronic voting machines have been viewed as flawed and Anyone with physical access to such machine can sabotage the machine, thereby affecting all votes cast on the aforementioned machine. To ensure election integrity, transparency, and verifiability, we propose a revolutionary shift from traditional paper-based electronic voting machines systems to a secure, blockchain-powered voting platform.

A Secure voting system built on the Ethereum blockchain has the potential to revolutionize the way we conduct elections. By leveraging the security, transparency, and immutability of blockchain technology, decentralized voting systems can eliminate many of the challenges and risks associated with traditional voting systems.

In a Secure voting system, each voter has a unique digital identity, and their vote is recorded on the blockchain, ensuring that the vote is tamper-proof and cannot be altered. Decentralized voting systems also eliminate the need for intermediaries, such as government agencies, to oversee the election process, making it more efficient and less susceptible to corruption or manipulation.

Furthermore, Secure voting systems can increase voter participation by allowing voters to cast their ballots from anywhere in the world, as long as they have an internet connection. This can lead to a more democratic and inclusive electoral process, with greater voter engagement and higher turnout.

Overall, a decentralized voting system using the Ethereum blockchain has the potential to bring significant benefits to the electoral process, making it more secure, transparent, and accessible to everyone. We are developing the Decentralized Voting System using Ethereum Blockchain it is a secure and transparent solution for conducting elections.

II. LITERATURE REVIEW

[1] A. Khandelwal," Blockchain Implementation on E-Voting System," IEEE, 2019. This research investigates the integration of blockchain technology into electronic voting (e-voting) systems. The study highlights key blockchain features such as immutability, security, and decentralization, which can address challenges in creating a secure and legal e-voting system. By using blockchain, issues like transparency, authenticity, and system integrity are mitigated, offering a viable solution for modernizing voting infrastructures.

[2] V. Silusaree," Blockchain Technology Application for Electronic Voting Systems," IEEE, 2021. This research focuses on the role of blockchain in remote electronic voting systems, emphasizing its potential to increase voter turnout and enhance security. By using blockchain, the system ensures vote security, prevents hacking, and maintains the integrity of the voting process, thereby increasing public confidence in e-voting systems.

[3] Z. Miao," Blockchain-Based Electronic Evidence Storage and Efficiency Optimization," IEEE, 2021. Miao proposes a model for optimizing electronic evidence storage in voting systems by integrating blockchain's Directed Acyclic Graph (DAG) and InterPlanetary File System (IPFS). This approach reduces the costs and complexity associated with traditional storage methods, providing a more efficient and transparent process for storing voting data.

[4] J. Wang," Electronic Voting Protocol Based on Ring Signature and Secure Multi-Party Computing," IEEE, 2020. This study presents a voting protocol that addresses privacy concerns through the use of ring signatures within a blockchain framework. Voters can sign their votes without revealing their identity, maintaining the integrity and

DOI: 10.17148/IJARCCE.2024.131010

immutability of voting records. This approach enhances security in the voting process but poses challenges related to computational complexity and network infrastructure.

[5] S. Singh," Designing a Blockchain-Enabled Methodology for Secure Online Voting System," IEEE, 2023. Singh's research provides a comparative analysis of various blockchain frameworks, proposing a secure online voting system that addresses limitations in existing methods. By evaluating scalability, security, and usability, the study demonstrates the potential of Distributed Ledger Technology (DLT) in ensuring a transparent and secure voting process, though scalability and energy consumption remain issues.

[6] Y. Cheng," Research on Blockchain Technology in Cryptographic Exploration," IEEE, 2020. Cheng explores the use of blockchain to enhance the security of smart factories. The study integrates Internet of Things (IoT) technology with blockchain to develop a tamper-resistant system. Though the research focuses on industrial applications, it provides valuable insights into the security features that blockchain can bring to e-voting systems.

[7] P. Rani," Deploying Electronic Voting System: Use Case on Ethereum Public Blockchain," IEEE, 2022. This study examines the deployment of an Ethereum-based blockchain for real-time e-voting systems. By leveraging Ethereum's distributed ledger, the research demonstrates how blockchain can ensure transparency and security. However, reliance on Ethereum, accessibility, and convenience issues limit the system's scalability and widespread adoption.

[8] V. Bhatnagar," Decentralizing Voting: Blockchain-Based E-Voting System Using Ethereum Smart Contracts," IEEE, 2024. Bhatnagar introduces a blockchain-based voting model designed to improve the transparency, security, and integrity of voting systems. The research evaluates various blockchain frameworks and undergoes iterative testing to refine the proposed model. Challenges regarding scalability, deployment costs, and system performance remain critical factors.

[9] A. Qumzar," E-Voting System Based on Blockchain Technology: A Survey," IEEE, 2021. Qumzar's survey assesses blockchain-based e-voting applications, exploring the potential benefits of improved security, privacy, and cost reductions. The research evaluates public, private, and hybrid blockchain systems, emphasizing the importance of decentralized ledgers in enhancing system security and maintaining voter privacy.

[10] A. Guptha," Secure Vote: AI-Powered Fingerprint Authentication for Next-Generation Online Voting," IEEE, 2023. Guptha's research proposes an AI-enabled online voting system incorporating dual-factor authentication through fingerprints and identification numbers. The system enhances voting security and reliability, though the study indicates that no single solution meets all security needs. A hybrid approach is suggested to address technical limitations and ensure adaptability.

III. SYSTEM ARCHITECTURE DIAGRAM

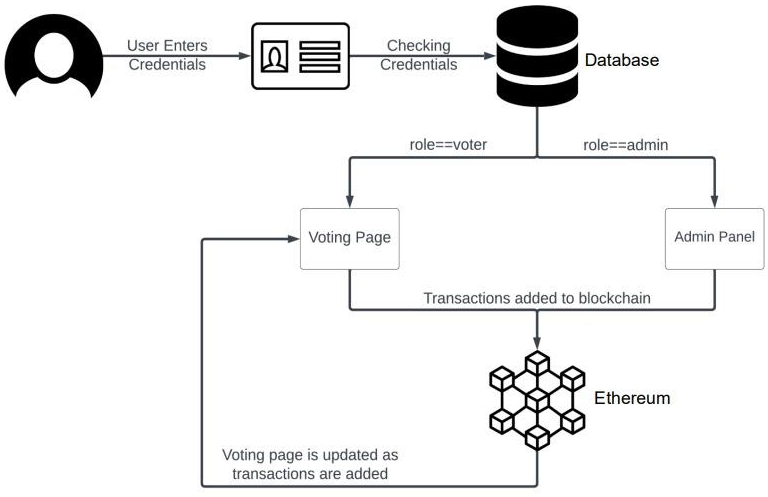

Fig. 1 Architecture Diagram

The secure voting system is built on Ethereum blockchain. The process begins when a user enters their credentials, which are then verified against the database. Based on the user's role (voter or admin), they are directed to either the voting page or the admin panel. Votes cast on the voting page are recorded as transactions and added to the Ethereum blockchain. This ensures transparency and immutability as votes cannot be altered or tampered with. As transactions are added to the blockchain, the voting page is updated to reflect the current vote count. This system leverages the security and decentralization of Ethereum to provide a fair and reliable voting process.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 10, October 2024
DOI: 10.17148/IJARCCE.2024.131010

IV. CONCLUSION

The development of a decentralized voting system using Ethereum blockchain is a promising solution to address the shortcomings of traditional voting methods. By leveraging the security, transparency, and immutability of blockchain technology, this system offers a more robust and reliable platform for conducting elections. With its potential to enhance trust, prevent fraud, and improve accessibility, decentralized voting has the power to revolutionize the democratic process and empower citizens to participate meaningfully in shaping their society. As the technology continues to evolve and mature, decentralized voting systems hold the potential to become a cornerstone of a more democratic and accountable future.

REFERENCES

[1] A. Khandelwal," Blockchain Implementation on E-Voting System," IEEE, 2019. This research investigates the integration of blockchain technology into electronic voting (e-voting) systems. The study highlights key blockchain features such as immutability, security, and decentralization, which can address challenges in creating a secure and legal e-voting system. By using blockchain, issues like transparency, authenticity, and system integrity are mitigated, offering a viable solution for modernizing voting infrastructures.
[2] V. Silusaree," Blockchain Technology Application for Electronic Voting Systems," IEEE, 2021. This research focuses on the role of blockchain in remote electronic voting systems, emphasizing its potential to increase voter turnout and enhance security. By using blockchain, the system ensures vote security, prevents hacking, and maintains the integrity of the voting process, thereby increasing public confidence in e-voting systems.
[3] Z. Miao," Blockchain-Based Electronic Evidence Storage and Efficiency Optimization," IEEE, 2021. Miao proposes a model for optimizing electronic evidence storage in voting systems by integrating blockchain's Directed Acyclic Graph (DAG) and InterPlanetary File System (IPFS). This approach reduces the costs and complexity associated with traditional storage methods, providing a more efficient and transparent process for storing voting data.
[4] J. Wang," Electronic Voting Protocol Based on Ring Signature and Secure Multi-Party Computing," IEEE, 2020. This study presents a voting protocol that addresses privacy concerns through the use of ring signatures within a blockchain framework. Voters can sign their votes without revealing their identity, maintaining the integrity and immutability of voting records. This approach enhances security in the voting process but poses challenges related to computational complexity and network infrastructure.
[5] S. Singh," Designing a Blockchain-Enabled Methodology for Secure Online Voting System," IEEE, 2023. Singh's research provides a comparative analysis of various blockchain frameworks, proposing a secure online voting system that addresses limitations in existing methods. By evaluating scalability, security, and usability, the study demonstrates the potential of Distributed Ledger Technology (DLT) in ensuring a transparent and secure voting process, though scalability and energy consumption remain issues.
[6] Y. Cheng," Research on Blockchain Technology in Cryptographic Exploration," IEEE, 2020. Cheng explores the use of blockchain to enhance the security of smart factories. The study integrates Internet of Things (IoT) technology with blockchain to develop a tamper-resistant system. Though the research focuses on industrial applications, it provides valuable insights into the security features that blockchain can bring to e-voting systems.
[7] P. Rani," Deploying Electronic Voting System: Use Case on Ethereum Public Blockchain," IEEE, 2022. This study examines the deployment of an Ethereum-based blockchain for real-time e-voting systems. By leveraging Ethereum's distributed ledger, the research demonstrates how blockchain can ensure transparency and security. However, reliance on Ethereum, accessibility, and convenience issues limit the system's scalability and widespread adoption.
[8] V. Bhatnagar," Decentralizing Voting: Blockchain-Based E-Voting System Using Ethereum Smart Contracts," IEEE, 2024. Bhatnagar introduces a blockchain-based voting model designed to improve the transparency, security, and integrity of voting systems. The research evaluates various blockchain frameworks and undergoes iterative testing to refine the proposed model. Challenges regarding scalability, deployment costs, and system performance remain critical factors.
[9] A. Qumzar," E-Voting System Based on Blockchain Technology: A Survey," IEEE, 2021. Qumzar's survey assesses blockchain-based e-voting applications, exploring the potential benefits of improved security, privacy, and cost reductions. The research evaluates public, private, and hybrid blockchain systems, emphasizing the importance of decentralized ledgers in enhancing system security and maintaining voter privacy.
[10 A. Guptha," Secure Vote: AI-Powered Fingerprint Authentication for Next-Generation Online Voting," IEEE, 2023. Guptha's research proposes an AI-enabled online voting system incorporating dual-factor authentication through fingerprints and identification numbers. The system enhances voting security and reliability, though the study indicates that no single solution meets all security needs. A hybrid approach is suggested to address technical limitations and ensure adaptability.

