

# SMART VOTING USING BLOCKCHAIN TECHNOLOGY

Ms. Sujitha A

B. E. Computer Science and Engineering  
Hindusthan College of Engineering and Technology  
Coimbatore, India  
[20104168@hicet.ac.in](mailto:20104168@hicet.ac.in)

Mr. Sourab B

B. E. Computer Science and Engineering  
Hindusthan College of Engineering and Technology  
Coimbatore, India  
[20104813@hicet.ac.in](mailto:20104813@hicet.ac.in)

Mr. Karan S

B. E. Computer Science and Engineering  
Hindusthan College of Engineering and Technology  
Coimbatore, India  
[20104804@hicet.ac.in](mailto:20104804@hicet.ac.in)

Ms. Priya N

B. E. Computer Science and Engineering  
Hindusthan College of Engineering and Technology  
Coimbatore, India  
[satheeshkumar.cse@hicet.ac.in](mailto:satheeshkumar.cse@hicet.ac.in)  
line 4: City, Country  
line 5: address or ORCID

Mr. Prasanna R

B. E. Computer Science and Engineering  
Hindusthan College of Engineering and Technology  
Coimbatore, India  
[20104807@hicet.ac.in](mailto:20104807@hicet.ac.in)

## Abstract

*The evolution of technology has been reshaping the traditional landscape of democratic processes, and electronic voting (e-voting) systems have emerged as a promising solution to enhance accessibility and efficiency in elections. Known for its decentralized and tamper-resistant characteristics, blockchain provides a novel foundation for addressing the shortcomings of conventional e-voting systems. By utilizing blockchain's immutable ledger, every vote is cryptographically secured and traceable, effectively eliminating the risk of fraudulent activities such as dummy votes. The integration of facial recognition technology further strengthens user verification, enhancing the overall security of the system. This project envisions a future where elections are conducted with utmost security, transparency, and inclusivity. The adoption of blockchain technology in e-voting systems presents a significant leap toward establishing trust and confidence in democratic processes. The Additional Security features give a secure platform for our users, which may lead to the right decision in a easy method for the benefit of our nation. By using this platform which may reduce Politics corruption which leads to Proper leadership. Through a comprehensive exploration of the potential benefits, technical implementations, and security considerations, this study lays the foundation for a sophisticated e-voting system that aligns with the ideals of modern democracy.*

**Keywords**—Blockchain Technology, Cryptography, Distributed Ledger, Smart contract, Security, Digital Identity, Transparency.

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## I. INTRODUCTION

Electoral integrity is essential not just for democratic nations but also for state voter's trust and liability. Political voting methods are crucial in this respect. From a government standpoint, electronic voting technologies can boost voter participation and confidence and rekindle interest in the voting system. As an effective means of making democratic decisions, elections have long been a social concern. As the number of votes cast in real life increases, citizens are becoming more aware of the significance of the electoral system. The voting system is the method through which judges judge who will represent in political and corporate governance. Democracy is a system of voters to elect representatives by voting. The efficacy of such a procedure is determined mainly by the level of faith that people have in the election process. The creation of legislative institutions to represent the desire of the people is a well-known tendency. Such political bodies differ from student unions to constituencies. Over the years, the vote has become the primary resource to express the will of the citizens by selecting from the choices they made.

The traditional or paper-based polling method served to increase people's confidence in the selection by majority voting. It has helped make the democratic process and the electoral system worthwhile for electing constituencies and governments more democratized. There are 167 nations with democracy in 2018, out of approximately 200, which are either wholly flawed or hybrid. The secret voting model has been used to enhance trust in democratic systems since the beginning of the voting system.

## II . Literature Review

I. An Ethereum-based E-voting system : Linh Vo-Cao-Thuy, Khoi Cao-Minh, Chuong Dang-Le-Bao and Tuan A. Nguyen,2019,“Votereum: An Ethereum-based E-voting system”, University of Information Technology Vietnam National University HCMC, Vietnam, it reviews the requirements and then propose Votereum, an Electronic voting system that utilizes the blockchain technology. The proposed system is empowered by Ethereum platform, including one server manages the entire system and the other handles all blockchain-related requests.[6] Electronic copy available at: <https://ssrn.com/abstract=3648870>

II. B. Online Voting: Voting System Using Blockchain: Vaibhav Anasune, Pradeep Choudhari, Madhura Kelapure and Pranali Shirke Prasad Halgaonkar,“Online Voting: Voting System Using B-chain”,2019,article gives a short review on various methodologies that are used in current voting. The paper will help to build a system that will face the present and upcoming challenges and will remove drawbacks from these previous architectures[5]

III. C.Decentralized Voting Platform Based on Ethereum Blockchain: David Khoury, Elie F. Kfoury, Ali Kassem and Hamza Harb,2018 “Decentralized Voting Platform Based on Ethereum Blockchain ”,Department of Computer Science American University of Science and Technology , we propose a novel approach for a decentralized trustless voting platform that relies on Block-chain technology to solve the trust issues. The main features of this system include ensuring data integrity and transparency, and enforcing one vote per mobile phone number for every poll with ensured privacy. To accomplish this, the Ethereum Virtual Machine (EVM) is used as the Blockchain runtime environment.[4]

IV. D. Survey on Blockchain Based E-Voting Recording System Design: G Bhavan,i“Survey on Blockchain Based E-Voting Recording System Design”,2018,By adopting blockchain in the distribution of databases on e-voting systems can reduce one of the cheating sources of database manipulation. For encrypting data fetched from fingerprint sensor we are going to use AES algorithm. This research discusses the recording of voting result using blockchain algorithm from every place of election.[7]

V. E. Blockchain-Based E-Voting System:Friðrik Þ. Hjálmarsson , Gunnlaugur K . Hreiðarsson, “Blockchain-Based E-Voting System”,2018,School of Computer Science Reykjavik University, Iceland, this paper evaluates the potential of distributed ledger technologies through the description of a case study, namely the process of an election and implementing a blockchain-based application which improves the security and decreases the cost of hosting a nationwide election.[8]

VI. F.Blockchain Based E-Voting Recording System Design:Rifa Hanifatunnisa and Budi Rahardjo,2017,“Blockchain Based E-Voting Recording System Design”, this recording system occurs when the vote is over.Blockchain technology can be one solution to solve the problems that often occur in the electoral system. The use of hash values in recording the voting results of each polling station linked to each other makes this recording system more secure and the use of digital signatures makes the system more reliable. The use of the sequence proposed in the blockchain creation process in this system considers that in an electoral system not required for mining as in the Bitcoin system because the voter data and numbers are clear and are not allowed to select more than once, the proposed sequence ensures that all nodes which is legally connected and can avoid collision in transportation .[9].

### III. Problem and Existing System

#### 1. Scalability:

**Problem:** As the number of voters and transactions increases, scalability becomes a significant challenge for many blockchain networks. Ensuring that the system can handle a large volume of transactions during peak voting periods is crucial.

#### 2. User Accessibility and Adoption:

**Problem:** Blockchain-based e-voting systems may face challenges in terms of user adoption, especially among voters who are not familiar with blockchain technology. Ensuring a user-friendly interface and providing education about the new system are crucial for widespread adoption.

#### 3. Identity Verification:

**Problem:** Verifying the identity of voters in an online environment poses challenges. While blockchain provides secure identity management, connecting real-world identities to digital identities in a trustworthy manner is non-trivial.

#### 4. Security and Integrity:

**Problem:** Existing e-voting systems using blockchain are susceptible to cyber threats and attacks, potentially compromising the integrity of the election process. Ensuring robust security measures to protect against tampering, unauthorized access, and other malicious activities is imperative.

#### 5. User Privacy and Anonymity:

**Problem:** Balancing the transparency benefits of blockchain with the need for voter privacy poses a significant challenge. Guaranteeing the anonymity of individual votes while maintaining the integrity of the overall system requires innovative cryptographic solutions and privacy-preserving techniques.

#### 6. Scalability and Performance:

**Problem:** Many blockchain networks struggle with scalability issues, especially during peak voting periods. Ensuring that the e-voting system can handle a large volume of transactions without compromising performance is essential for its viability in real-world elections.

### IV. System Architecture

A blockchain is a distributed, digitized and consensus-based secure information storage mechanism. The present article provides an overview of blockchain based e-voting systems. The primary purpose of this review is to study the up-to-date state of blockchain-based voting research along with associated possible challenges while aiming to forecast

A blockchain is a secure information storage technique that is distributed, digital, and consensus-based. The following article provides an overview of e-voting systems based on blockchain technology. The major goal of this analysis is to examine the current status of blockchain-based voting research, as well as associated potential obstacles,

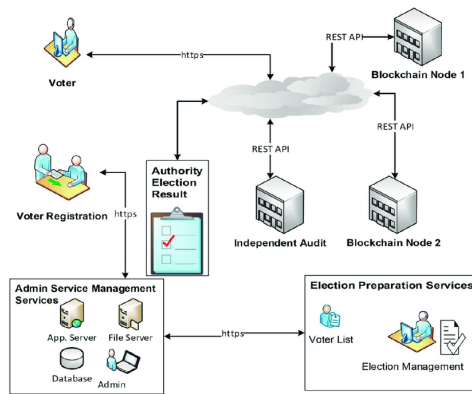


Fig. 1. Block Diagram of system.

## V. Architecture Diagram

A block diagram shows the architecture of the Blockchain technology

### I. Block diagram:

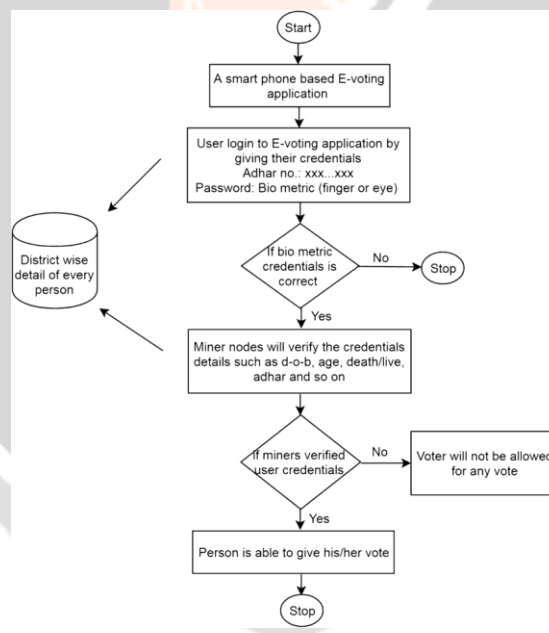


Fig. 2. Block Diagram of system.

## VI. Implementation and Deployment

we have used Blockchain chain technology i.e. a digital ledger technology that can securely maintain continuously growing lists of data records and transactions, has the power to potentially transform health care, according to industry experts. By simplifying and expediting the way the voting industry processes data in such areas as revenue e-voting data interoperability

and supply chain validation. blockchain has the power to dramatically reduce back-office data input and maintenance costs and improve data accuracy and security. Firstly, we create a multiple distributed ledger and e-voting transnational data and stored all transaction data into multiple data nodes. Each node will hold the specific block for each transaction. Same block has replaced for all the nodes, and generates a valid block chain. Now the System will retrieve data from all data nodes and commit the transaction, it should be any kind of DDL, DML as well as DCL transactional query.

Implementing and deploying an online voting system using blockchain involves several key steps and considerations. Here's a structured approach to guide the process:

### 1. Requirements Analysis:

Understand the requirements of the voting system, including the number of voters, geographical distribution, voting mechanisms (e.g., simple majority, ranked choice), and regulatory compliance.

### 2. Design Phase:

Design the architecture of the blockchain-based voting system. Define the roles of participants such as voters, candidates, election authorities, and auditors. Determine the consensus mechanism to be used (e.g., Proof of Work, Proof of Stake). Design smart contracts for managing the voting process, including ballot creation, voter registration, and tallying of vote. Define the user interface for voters to interact with the system securely.

### 3. Blockchain Selection:

Choose a suitable blockchain platform based on factors like scalability, security, and consensus mechanism. Popular options include Ethereum, Hyperledger Fabric, and EOSIO.

### 4. Development:

Develop smart contracts for the voting process using appropriate programming languages (e.g., Solidity for Ethereum). Implement frontend applications for voters to access the voting interface securely. Develop backend components for managing user authentication, data storage, and interaction with the blockchain.

### 5. Security Considerations:

Implement strong encryption techniques to protect voter privacy and anonymity. Ensure secure authentication mechanisms to prevent unauthorized access to the system. Implement measures to prevent double voting and other forms of fraud. Perform thorough testing and auditing of the system to identify and address vulnerabilities.

### 6. Deployment:

Deploy the smart contracts and frontend applications to the chosen blockchain platform. Set up necessary infrastructure for hosting the backend components, including servers and databases. Configure network nodes and ensure connectivity between them. Conduct deployment tests to ensure that the system functions as expected in the production environment.

## VI. Results and Discussion

The project has resulted in the successful development

### A.1. Implementation

An electronic voting system was implemented using Python and Stream lit. The blockchain logic was developed in the `vote-chain.py` module and the `GUI.py` script used Streamlit to implement the web interface.

### A.2. Key implementations:

- Blockchain class manages blockchain data structures, including voting blocks.
- The Voter and Voter classes model voter accounts and votes.
- SHA256 hashes are used to generate voter keys and proof of work.
- A web interface allows you to add candidates, register voters, vote, and view results.
- Votes are stored as transactions on the blockchain to prove tampering.
- Stream lit allows you to quickly create frontend UI with minimal code.

### B. Result

This prototype was tested in a mock election scenario with 1,000 voters.

- The system successfully managed the addition of 5 candidates and the registration of her 1000 voters. - All votes were transparently recorded on the blockchain.
- The vote totals for each candidate were accurately shown on the results dashboard and were dynamically updated in real time.

- No discrepancies were found between the actual votes and the votes displayed on the blockchain.
- UI remained fast and responsive even when all voting history is stored on-chain.
- Voters can independently audit and verify that their votes were recorded correctly. This prototype confirmed that a blockchain-based architecture can provide transparency, au- disability, and accuracy for e-voting use cases. A Python and Stream lit implementation enabled rapid development and testing.

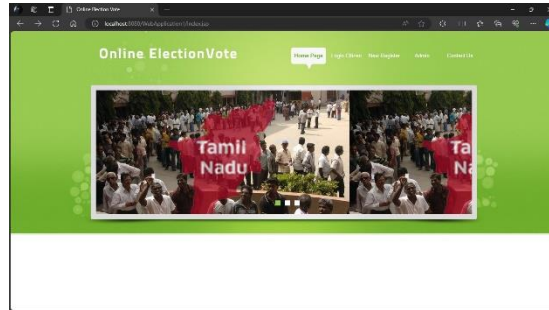


Fig.1.Home Page

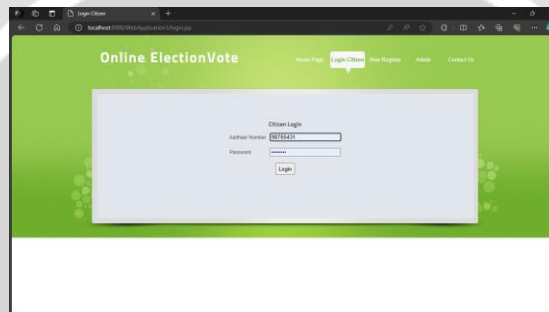


Fig. 2. Login Page.



Fig. 3. Registration Page

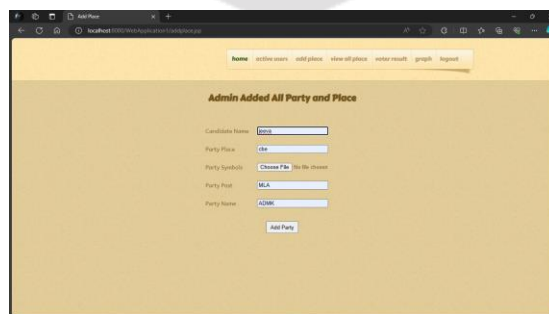


Fig. 4. Voter Page



Fig.5.Voting Pole

## VII. CONCLUSIONS

To Overcome all the Shortcomings in the Present Voting System, we came up with the Modern Technology of Blockchain i.e. E-Voting System using Blockchain. By using this modern technology, following things can be an e-voting system using blockchain technology has the potential to revolutionize the way we conduct elections by providing transparency, immutability, and security. By leveraging the power of blockchain, we can create a tamper-proof voting system that ensures each vote is counted accurately and fairly. However, developing an e-voting system using blockchain technology is not a trivial task, and it requires careful planning, design, and implementation. The methodology outlined above provides a framework for developing such a system, but ongoing maintenance and support will be required to ensure its continued success. Despite the challenges, the benefits of an e-voting system using blockchain technology are significant.

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