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Blockchain Powered Online Voting for Modern Democracy

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Abstract

The use of information technology is revolutionizing governmental services and democracy. Electronic voting, or Online voting, is a symbol of modern democracy, but it's best when compiled with existing legal and regulatory frameworks. Selecting leaders from a list is the process of voting, and in India, there are problems with improper voting during elections, untrained workers, unsafe polling places, and insufficient voting supplies. Blockchain technology provides a decentralized, unchangeable ledger for safely recording votes, offering a viable foundation to overcome these issues. In this work, we present a new online voting system that uses blockchain technology to guarantee voting process security, integrity, and transparency. To ensure accurate and anonymous voting, our system uses smart contracts for voter registration, ballot casting, and vote counting. Because they provide safe, open, and easily available voting options, online voting systems have the potential to completely transform democratic processes. Widespread acceptance has been hampered, nevertheless, by issues with security, transparency, and verifiability. Blockchain technology, which is renowned for being decentralized and unchangeable, offers a workable foundation to address these problems. An indigenous internet-based voting system aims to address these issues, but it requires citizens to be trained on how to exercise their right to vote online. The new solution has a small learning curve, but it will require citizens to be trained in how to use the system.

Keywords: Voting, Online voting, electronic voting system, Android, Blockchain

INTRODUCTION

Voters can cast ballots online from the comfort of their homes using a safe and user-friendly web-based voting system. This system is suitable for elections held in colleges and other institutions, and requires registration from Indian citizens, those over 18, and any gender. A database is maintained with all voter names and information. To vote, voters must be registered on a special site, where they can fill out a registration form. After registration, they are assigned a secret voter ID to log into the system and enjoy services such as voting. The system administration primarily registers votes for security reasons, and registration is done on a special site visited by the voter.

Due to its high level of transparency and possible uses in numerous industries, blockchain technology, which is descended from the conceptual framework of Bitcoin, has become increasingly popular. Bitcoin's distributed wallets make it possible to track the overall number of coins and the volume of transactions instantly, doing away with the need for a central authority to authorize or finish transactions. Due to its potential to completely transform several industries, this technology has become a hot topic in the software industry.

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Globally, democratic societies are fundamentally supported by the fairness and accessibility of voting processes. Though fundamental, traditional voting procedures suffer from a few issues, including difficult logistics, security flaws, and restricted accessibility for voters who live far away. Transparency, security, and efficiency in voting systems have been improved in recent years by the revolutionary approach of integrating digital technologies, especially blockchain. Compared to traditional methods, using online voting platforms built on blockchain has several advantages. Because it does away with the necessity for middlemen, there is less chance of deception and manipulation. Additionally, by allowing voters to participate safely from any location with an internet connection, it improves accessibility and raises voter engagement and turnout.

The decentralized block-based digital voting system was created to mitigate security threats related to internet platforms and electronic voting devices. It seeks to give organizations a safe and equitable election process using a closed, private Peer-to-Peer (P2P) network. Once the required security and login processes are finished, users can register to vote and cast their ballots.

The administrator oversees the maintenance of the blockchain, managing the voter list, and customizing the voting portal's GUI. The system consists of a limited number of terminals, typically 3-5, connected in a P2P network. During the voting process, users cast their votes using these terminals, and a copy of the vote blockchain is stored locally on each terminal. Administrators can add or delete voters to the voter registration list and disclose election results at the end of the voting period. The decentralized architecture of the system improves overall security by removing the possibility of a single point of failure or cyberattack. All things considered, the block-based digital voting system provides a transparent, safe, and accountable way to hold elections.

Online voting systems can be made more secure by using blockchain technology. Blockchain is very impervious to fraud and hacking because of its decentralized architecture and cryptographic procedures. Voter manipulation would necessitate manipulating the entire chain, which is computationally impractical.

Enhanced Openness and Auditability: Because blockchain data is public and unchangeable, interested parties are able to independently examine the entire voting process. This openness allays worries about fraud or vote rigging.

Convenience and Accessibility: Voters who may have trouble physically visiting polling places can find greater accessibility with online voting technologies. The ability to vote conveniently from any location with internet connection is another benefit.

Expense Effectiveness: In the long run, blockchain-based voting systems may be able to cut expenses related to conventional paper-based voting, such as printing, distribution, and human tallying.

Election results can be made more legitimate and trustworthy by utilizing the characteristics of blockchain technology in online voting systems. Increased voter participation and trust in democratic processes may result from this.

Faster Results: The digital nature of blockchain makes it possible to tabulate and report election results more quickly, cutting down on the amount of time between voting and the announcement of the result.

Difficulties and Things to Think About

Although blockchain has many benefits, there are technological, sociological, and legal issues that must be resolved before it can be used in online voting systems. These include handling identification

verification securely, protecting voter privacy, and resolving issues with accessibility and computer literacy.

RELATED WORK

Estonia is a prime example of a country utilizing technology for national elections using e-voting. The nation provides two options for voting: utilizing a mobile ID or an ID card with a PKI (digital signature).

The digital certificate on the ID card is designed to verify the cardholder's credentials. The cardholder's PIN is used to submit the certificate to the voting system, which verifies its authenticity and validity. Once validated, the user can access the online voting site to select a candidate and submit their vote. However, the Estonian e-voting system does not prevent vote selling, as anyone can use another citizen's ID card and PIN codes [1–5].

India, a large nation with 740 million eligible voters, follows precinct voting and has many polling stations. However, certain sections of the elections have faced malpractices and fraudulent voting. In the general elections of 2009, 1,368,430 EVMs were used in India, where EVMs had been utilized exclusively since 2004. Ballot printouts for paper audit trails must now be supplied with EVMs. Gujarat State, which has about 26 million eligible voters, became the first state in India to embrace and use online voting for state elections in 2011.

The UAE has implemented an advanced e-voting system for its Federal National Council (FNC) elections from 2011-2015, using biometric-based smart cards to verify voters' identity. For capacity and contingency planning, most emirates have numerous voting centers. It was anticipated that voters would cast their ballots at polling places in their represented emirate of residence.

The primary input for business processes was taken from the UAE Elections Legal Framework, which was reviewed and approved for the FNC Election.

Key success factors for E-voting and I-voting systems in these countries include the existence of a legal framework and legal validity of the use of these systems. This allows voters to check and confirm if their vote was considered in the counting of the votes.

Countries have adopted e-voting systems due to different factors. India aims to contain election fraud and reduce logistics, while Estonia focuses on providing citizen convenience and increasing voter participation. After punch card voting had problems in 2002, the USA switched to machine-based electronic voting. While Brazil utilized Direct Recording Electronic (DRE) systems, which are different from the EVMs used in India, France, Germany, and Belgium developed their own technologies and implemented online voting systems.

Self-counting online voting is a promising and widely studied method in scholarly research. It involves a self-tallying system where voters and observers can check the legitimacy of each polling form and perform calculations after gathering all the significant voting forms. This approach provides better voter security and debate freedom. Some researchers have proposed less complex plans with better effectiveness for every voter, while others have built an unknown communication channel with immaculate message mystery at the expense of expanded round uncertainty. Hao et al [6–8]. proposed a self-counting voting system based on a two-round mysterious veto convention (AVnet), which offers similar security properties but better round uncertainty. Overall, self-counting e-voting systems offer a more secure and efficient method for voting.

Khader et al [9]., Takabatake et al., McCorry et al., Shahzad B et al., Lai et al., and Wu et al. have all proposed various voting systems based on blockchain and ring mark innovation. Khader et al. argued that these systems are neither vigorous nor reasonable, and they promoted a responsibility stage and

recovery round. Takabatake et al. proposed a voting convention based on Zerocoin to improve voter protection. McCorry et al [4]. introduced Open Vote Network 8, the first decentralized self-counting online voting, a ballot convention based on Blockchain. Shahzad B et al. demonstrated a reliable online voting system that altered square makes and seals by changing the hash work in the blockchain to ensure the validity and decency of political decisions. Wu et al. proposed an online voting system based on blockchain and ring mark innovation, which resolved simplicity and security [10–13].

Wei-Jr Lai et al [14–16]. proposed a decentralized unknown voting system using Ethernet and a ring mark plan for simplicity and security. This system achieved high proficiency and speed through equal activity in the checking stage. Meanwhile, Freya Sheer Hardwick introduced a blockchain e-voting ballot convention, achieving anonymity, simplicity, and expanded modifiability through blind mark and duty innovation. Both systems have become significant advancements in e-voting ballot systems.

McCorry et al [17]. proposed a blockchain-based electronic voting system for board races, ensuring voter security without relying on any trusted power. Adiputra CK's proposal in 2018 addressed the status issue of blockchain electronic voting plans, despite not discussing the security of e-voting a ballot.

Online voting systems that include blockchain technology are a promising step toward more accessible, transparent, and safe political processes. Even with these obstacles, research and development activities are still in progress to investigate and improve these systems to satisfy the demanding specifications of contemporary election systems across the globe [18–19].

PROPOSED METHOD

The system design of the proposed system is shown in Figure 1.and the working process of each Phases are mentioned below.

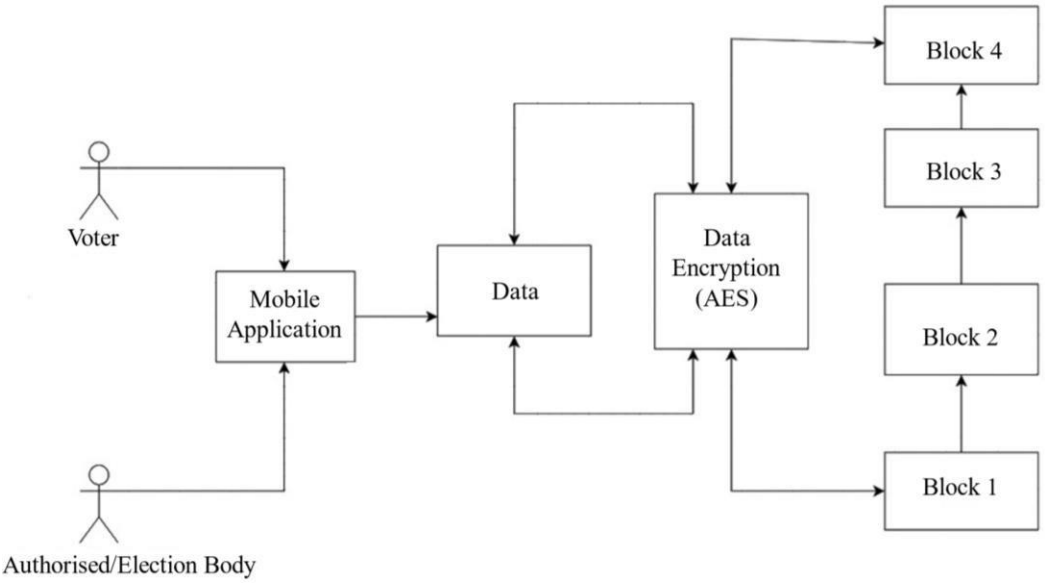

Figure 1. Proposed system design.

Implementation

Registration Phase: Voters must first register by giving a unique ID and personal data, including their name and phone number.

1. *Login:* After registering, the voter tries to log in to cast their ballot. The voter initially uses a password to log in at this phase. After logging in successfully, a voter must authenticate themselves to cast a ballot.

- *AES Encryption:* The security properties of this technology are its principal uses. It offers a setting that is safe and open. An asymmetric encryption approach is employed to secure the voter message, which is the cast vote. Blockchain offers a public key, and the host has the private key. For reasons of verification, public keys are utilized.

2. *Database*: Databases contain user databases. Information such as name, gender, and Unique Id is kept in the database. The suggested database to be used is MySQL.
3. *Result phase:* In the results phase, votes are processed and tallied. Results are produced and shown. Users can use their own public key to validate their votes. This makes the voting process transparent.

CONCLUSION

This paper introduces a blockchain-based online voting system for secure, cost-efficient elections while ensuring voter privacy. Technology offers a new way for democratic countries to transition from traditional pen-and-paper systems to more efficient, cost-effective, and time-efficient elections, while also improving security measures and enhancing transparency.

The proposed work is to remove threats during voting. Our proposed system ensures that only registered and eligible voters can give their own votes. The system security analysis shows that the system is more robust and secure against existing attacks.

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