DECENTRALISED ONLINE VOTING SYSTEM USING BLOCKCHAIN

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Abstract—**Traditional voting systems are often challenged by issues of security, transparency, and trust. This paper proposes a decentralized online voting system based on blockchain technology to ensure transparency, immutability, and tamper resistance. The system uses cryptographic mechanisms to guarantee voter anonymity while maintaining election integrity. By leveraging blockchain, the proposed solution eliminates centralized control and increases trust in the democratic process.**

Index Terms— Blockchain, decentralized voting, cryptography, online election, security.

I. INTRODUCTION

Voting is the backbone of democracy, allowing citizens to express their choice in a fair and secure manner. However, traditional voting methods, including ballot papers and centralized electronic voting systems, suffer from risks such as tampering, mismanagement, and lack of transparency. In recent years, online voting has gained popularity, but centralized systems still face challenges such as hacking and manipulation.

Blockchain technology, with its inherent features of decentralization, immutability, and transparency, provides a promising solution to these challenges. A blockchain-based voting system ensures that votes once cast cannot be altered, and results can be verified publicly without compromising voter privacy.

This project introduces a decentralized online voting system using blockchain, ensuring transparency, accuracy, and reliability.

LITERATURE SURVEY

Several blockchain-based voting systems have been proposed worldwide. Estonia, for example, has implemented electronic voting but faces skepticism about central control. Academic research shows that Ethereum smart contracts can be used to design secure election mechanisms.

Table I. Comparison of Voting Systems

Voting Method	Advantages	Limitations
Paper Ballot	Simple, tangible record	Time-consuming, prone to fraud
Centralized E-Voting	Fast, convenient	Vulnerable to hacking

Online Web Voting	Accessible remotely	Requires central authority
Blockchain Voting	Transparent, tamper-proof	Scalability, technical adoption

Existing research highlights that while blockchain offers security, issues such as scalability and voter authentication must be carefully addressed.

PROPOSED SYSTEM

The decentralized voting system is implemented using blockchain technology with smart contracts.

Key features include:

- **User Authentication:** Voters are authenticated using unique credentials (biometric or Aadhaar integration).

- **Blockchain Ledger:** Each vote is stored as a transaction on the blockchain, ensuring immutability.

- **Smart Contracts:** Manage election rules, tally votes, and enforce transparency.

- **Anonymity:** Votes are encrypted using cryptographic techniques to preserve voter privacy.

- **Distributed Access:** Election data is available across blockchain nodes to prevent central control.
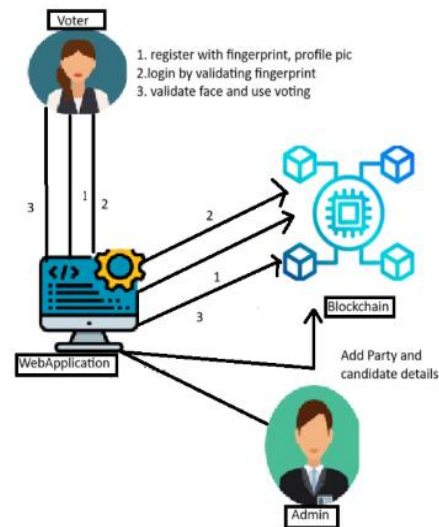

Fig. 1. Block Diagram of Decentralized Online Voting System

The system ensures that each voter can vote only once, and the smart contract automatically counts votes without external interference.

RESULTS AND DISCUSSION

A prototype was implemented using Ethereum smart contracts and tested on a private blockchain network. The results confirmed that:

- Votes were immutable and publicly verifiable.

- System prevented double voting.

- Transparency was achieved without revealing voter identity.

Performance evaluation showed that the system could handle small to medium scale elections efficiently, although scalability remains a challenge for national-level deployments.

CONCLUSION AND FUTURE SCOPE

The decentralized online voting system using blockchain ensures trust, transparency, and security in elections. By leveraging

blockchain technology, manipulation and fraud are prevented, while voter privacy is preserved.

Future Scope: Future improvements may include integrating advanced authentication methods (biometric, facial recognition), optimizing scalability using sidechains, and adopting post-quantum cryptography for stronger security. The system could also be extended to student council or corporate elections as a pilot implementation before nationwide adoption.

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