A Secure and Transparent Face-Verified Online Voting System Using Blockchain Technology

M Praveen
Dr.M.G.R. educational and research institute

***Abstract*—This paper presents a novel approach to electronic voting in India by integrating face verification and blockchain technology. Traditional and current digital voting systems face challenges related to voter fraud, lack of transparency, and vulnerability to tampering. To address these issues, we propose a secure, decentralized online voting system utilizing facial recognition for voter authentication and blockchain for immutable and transparent vote recording. The system enhances accessibility, trust, and integrity in the electoral process. We discuss the system's architecture, implementation, and security features, demonstrating its potential to reform democratic voting in India.**

***Keywords*—e-voting, blockchain, face verification, secure voting, electronic voting system, decentralization, transparency.**

I. INTRODUCTION

Voting integrity is a cornerstone of democratic societies. However, the traditional and electronic voting systems used in India face significant challenges, including voter impersonation, ballot tampering, booth capturing, and a lack of trust among the populace. With advancements in facial recognition and blockchain technologies, a new system can be developed that ensures enhanced security, transparency, and trust. This paper introduces a face-verified blockchain-based online voting system, aiming to overcome current shortcomings.

II. LITERATURE REVIEW

Prior research highlights the vulnerabilities of electronic voting systems, especially in terms of data integrity and voter privacy. Blockchain, with its decentralized and tamper-proof characteristics, has been proposed as a promising solution. Studies by Shahzad and Crowcroft (2019) and Dimitriou (2020) explore blockchain?s capability in ensuring verifiability and coercion resistance in elections. However, voter identity verification remains a challenge. Integrating facial recognition adds an additional biometric layer, increasing voter legitimacy while maintaining anonymity.

III. PROBLEM DEFINITION CHALLENGES IN EXISTING SYSTEMS

- Susceptibility to fraud and tampering.
- Limited transparency and auditability.
- Inaccessibility for remote or disabled voters.
- Manual processes that lead to delays and errors.

IV. PROPOSED SOLUTION

We propose an online voting system with the following features:

- Face Verification: Ensures only legitimate voters cast votes by verifying facial features against government databases.
- Blockchain Integration: Uses consortium blockchain to store votes, ensuring data immutability and transparency.
- Anonymity: Generates a random blockchain address per session to anonymize voters while maintaining vote verifiability.
- Smart Contracts: Prevent duplicate voting and handle vote validation and tallying.

V. SYSTEM ARCHITECTURE

Modules:

- Voter Registration: Validates and registers voters using facial recognition.
- Voting Interface: User-friendly GUI with real-time vote casting and encryption.
- Blockchain Module: Records and seals each vote as a block.

- Tally and Audit Module: Aggregates encrypted votes and publishes results transparently.

Technologies Used:

- Java, Python, PHP
- Blockchain frameworks (Ganache, Ethereum)
- Face recognition APIs
- XAMPP for backend

VI. ALGORITHMS

1. Face Verification Algorithm ? Uses AI-based image classification to validate user identity.
2. Blockchain Vote Recording Algorithm ? Encrypts and records each vote as an immutable transaction.
3. Smart Contract Execution ? Ensures one-person-one-vote, prevents duplicate entries.
4. Result Tallying? Aggregates votes without compromising anonymity using homomorphic encryption.

VII. TESTING AND EVALUATION

The system underwent multiple levels of testing:

- Unit Testing: Validated each functional module.
- Integration Testing: Ensured inter-module communication integrity.
- System Testing: Verified overall functional correctness.
- Security Testing: Simulated attack vectors such as tampering, duplicate voting, and identity spoofing.

Results showed high reliability in voter verification and integrity of vote recording. Performance remained stable under simulated load.

VIII. CONCLUSION

This paper presents a secure, scalable, and transparent electronic voting system using face verification and blockchain. By resolving key issues in existing systems?such as fraud, accessibility, and trust?this system has the potential to significantly improve electoral processes in India and similar democracies.

IX. FUTURE WORK

- Integration with national ID databases (Aadhaar, EPIC).
- Use of more advanced encryption (e.g., zk-SNARKs) for enhanced privacy.
- Performance optimization using layer-2 blockchain solutions like rollups.
- Real-world pilot implementation in municipal elections.

REFERENCES

[1] Use the same references from your report, properly formatted in IEEE or APA style