National Institute of Engineering, Mysuru

Department of Computer Science & Engineering

Minor Project Phase - 1 Report

Project Title: Decentralized Voting System using Blockchain

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Table of Contents

Introduction

Decentralized Voting System using Blockchain

Voting is the backbone of democracy, but existing electronic voting systems face challenges:

- Security vulnerabilities
- Lack of transparency
- Chances of vote manipulation

Blockchain ensures:

- **Decentralization** (no single authority can tamper results)
- **Transparency** (all transactions visible on-chain)
- **Immutability** (once recorded, votes cannot be changed)

Objective: To design a secure, transparent, and fair blockchain-based voting system.

Project Objectives and Approach

- To develop a **Decentralized Electronic Voting System** using blockchain.
- Integrate **Aadhaar-based OTP verification** for secure voter authentication.
- Use **smart contracts** to record and tally votes immutably.
- Provide **auto-generated, admin-funded wallets** to remove gas fee barriers.
- Ensure **security, transparency, privacy, and real-time result verification**.

Literature Review

Paper 1: A Review of Digital Voting Systems using Aadhaar (IJRASET, 2023)

- **Approach**: Uses Aadhaar for biometric/OTP-based voter verification.
- **Limitations**: Centralized database reliance, privacy concerns.
- **Our Improvement**: Simulate Aadhaar with OTP; store votes on decentralized blockchain.

Paper 2: Enhancing Online Voting via Blockchain (Singh et al., 2024).

- **Approach**: Ethereum smart contracts, immutable vote records.
- **Limitations**: Gas fees, lacks real-world Aadhaar/biometric use.
- **Our Improvement**: Testnet + admin auto-funding + Aadhaar OTP integration.

Paper 3: Secure E-Voting using Hyperledger (Panda & Rao, 2022)

- **Approach**: Hyperledger + cryptography for secure voting.
- **Limitations**: Complex setup
- **Our Improvement**: Lightweight Ethereum + OTP-based auth + auto wallet generation.

Literature Review

Paper 4: Verification & Maintenance of E-Voting Systems (Gibson & McGaley, 2008).

- **Approach**: Trust via independent verification agencies.
- **Limitations**: Centralized control, costly certifications.
- **Our Improvement**: Blockchain provides self-verifying, tamper-proof audit trail.

Paper 5: Blockchain-Based Voting Framework for India (IRJASET)

- **Approach**: Blockchain for storage, but EC still controls system.
- **Limitations**: Not fully decentralized, gas fees not addressed.
- **Our Improvement**: Fully decentralized, automated wallet setup + gas-free via testnet.

Paper 6: Blockchain-Based Voting on PoA Network (IEEE, 2018)

- **Approach**: Ethereum smart contracts, immutable vote records.
- **Limitations**: Gas fees, lacks real-world Aadhaar/biometric use.
- **Our Improvement**: Testnet + admin auto-funding + Aadhaar OTP integration.

Existing system & formulation of proposed system

Existing System:

- **Centralized servers** → vulnerable to hacks & manipulation.
- Some systems use **Aadhaar/biometrics** but raise privacy concerns.
- Some use **blockchain** but face issues:
  - Gas fees (public blockchains).
  - Complexity (Hyperledger).
  - Partial decentralization.
- **Gap Identified:** No system combines Aadhaar-style verification + easy blockchain voting.

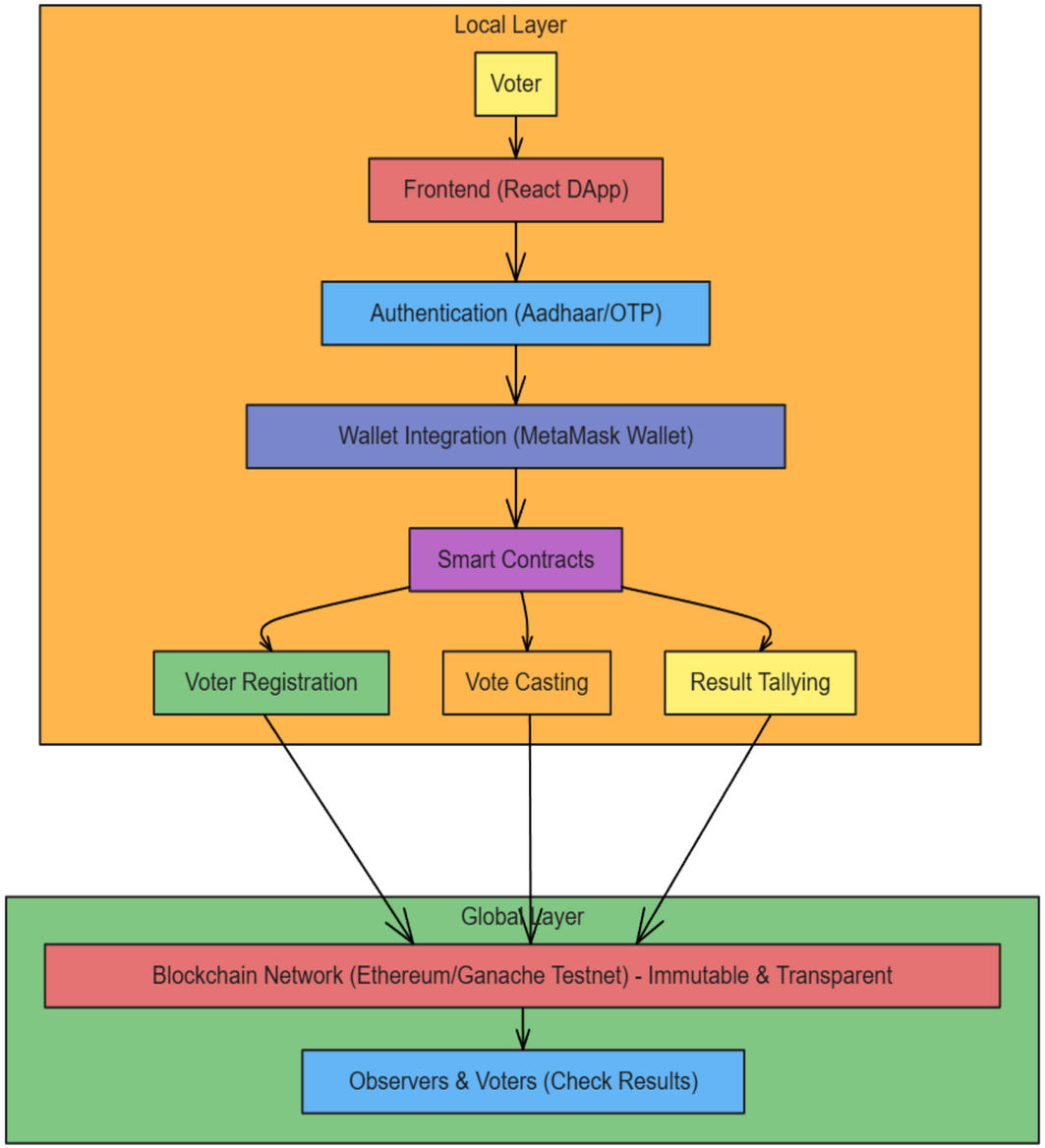
Proposed model:

Problem:
Existing e-voting systems lack transparency, are centralized, and cannot fully prevent double voting.

Proposed Solution:

- A **Blockchain-based Voting DApp**
- Uses **Ethereum smart contracts** for recording votes
- Ensures **one person, one vote** by voter registration (whitelisting addresses)
- Allows voters to **check status** (registered / voted) securely
- Provides **tamper-proof results** with full transparency

System Design



Flow:
Voter registers → OTP auth → Smart contract validates eligibility → Vote stored on blockchain → Voter checks status.

Local Layer (User Side): Voter uses React DApp → Aadhaar/OTP verification → MetaMask wallet connection.

Smart Contracts: Handle voter registration, single vote casting, and result tallying securely.

Global Layer (Blockchain): Ethereum/Ganache stores immutable votes, ensures transparency.

Observers & Voters: Can verify results and check voting status on-chain.

System Requirements

Hardware Requirements

- **Processor:** Intel i3 / Ryzen 3 or better
- **Memory:** Min 8 GB RAM
- **Devices:** Standard PC/Laptop, smartphone/browser (for UI testing)

Software Requirements

- **OS:** Windows/Linux/Mac
- **Development Tools:** Node.js, Truffle, Ganache, MetaMask
- **Languages:** Solidity, JavaScript (React)
- **Libraries:** Web3.js / Ethers.js
- **Optional:** TailwindCSS for UI styling

ethereum

Conclusion

Blockchain ensures trust, transparency, and tamper-proof voting.

Our system guarantees:

- One vote per voter
- Fair elections with no central authority

Future Scope:

- Zero-Knowledge Proofs for privacy
- Integration with Aadhaar for national-level deployment.

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