A Secure and Scalable Online Voting System: Leveraging Smart Technologies for Digital Governance and Enhanced Privacy

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Abstract:

The demand for reliable, transparent, and scalable online voting platforms have grown significantly, especially in democratic nations where traditional voting methods face logistical challenges, voter fraud, and limited accessibility. This work presents a secure online voting system built using the MERN stack (MongoDB, Express.js, ReactJS, and Node.js), designed to address these issues through an integrated role-based architecture. The platform accommodates two user roles: administrators, who manage elections, candidates, and parties, and voters, who securely log in and cast a single vote per election. To ensure end-to-end security and system integrity, the platform employs JSON Web Tokens (JWT) for authentication, bcrypt for password encryption, AES for vote data encryption, and CAPTCHA to prevent automated login attempts. With an intuitive user interface and advanced backend validations, the system enforces access control and voting limitations. This prototype demonstrates the feasibility of secure digital elections and provides a practical foundation for real-world implementation and future enhancements.

Keywords:

Online voting system, secure e-voting, MERN stack, role-based access control, JWT authentication, AES encryption, CAPTCHA verification, bcrypt hashing, digital elections, voting platform security.