Online Voting System Using Blockchain: A Comprehensive Approach

Abstract:

The Blockchain-Based Online Voting System aims to revolutionize traditional voting processes by integrating blockchain technology with a user-friendly mobile application. This system provides a secure, transparent, and efficient voting platform, enabling citizens to cast their votes remotely or at authorized voting centers. By leveraging the decentralized and immutable nature of blockchain, the platform ensures vote integrity, real-time result processing, and voter anonymity. Designed for scalability, it supports large-scale elections while reducing costs and enhancing trust in the democratic process.

Existing systems such as Ethereum-based decentralized platforms and smartphone-enabled voting applications demonstrate the promise of blockchain for secure and transparent elections. However, these systems often face challenges such as limited scalability, high energy consumption, and usability barriers. Moreover, the traditional voting process relies heavily on physical systems, such as ballot boxes, polling booths, paper-based records, and the manpower needed for organizing, monitoring, and counting votes. These resources not only incur significant costs but also introduce inefficiencies and delays in result computation. Blockchain technology offers the opportunity to minimize these dependencies by digitalizing the entire voting process, enabling automation in areas such as vote counting, result generation, and data validation. This results in a faster, more reliable, and cost-effective election process that reduces the logistical burden while maintaining robust security.

Our system overcomes these limitations by integrating blockchain to ensure tamper-proof vote storage and leveraging multi-factor authentication (MFA) to verify voter identities securely Furthermore, we employ a secondary database to securely store comprehensive end-to-end election data, including metadata, results, and detailed records (excluding sensitive voter identities during the voting process). This database organizes information about elections, parties, candidates, and voters, ensuring seamless management and accessibility. Additionally, we prioritize presenting detailed results, reports, and insights in a user-friendly and visually engaging manner by leveraging diagrammatic representations. These visual tools enhance transparency, making complex data easy to interpret for stakeholders. By integrating these features, our approach not only addresses the limitations of existing systems but also ensures a secure, transparent, and user-centric voting experience, paving the way for the widespread adoption of blockchain in electoral processes.