Online Voting System using Blocks

1 Prof. Nilesh Kamble, 2 Suraj Jha , 3 Rajesh Ghorpade, 4 Tejas Jagadale

1,2,3,4 Sinhgad Institute of Technology and Science Narhe, Pune

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Abstract-- This paper presents the development and implementation of an Online Voting System, designed to enhance the security, accessibility, and efficiency of electoral processes. The system leverages web technologies to provide a secure, user-friendly platform for electronic voting, addressing key challenges such as voter authentication, data integrity, and result accuracy. The methodology includes database-driven user verification, encryption mechanisms for data security, and a tamper-proof audit trail. The proposed system aims to eliminate traditional paper-based voting inefficiencies, reduce manual errors, and provide real-time vote counting. The results indicate that the system significantly improves voter participation and ensures a transparent and fraud-resistant electoral process. The study highlights the importance of digital solutions in modernizing democratic participation and suggests future enhancements for scalability and integration with biometric authentication.

Key Words: Online Voting, Electronic Elections, Cybersecurity, Digital Democracy, Authentication, Secure Voting.

I. INTRODUCTION

The online voting system aims to simplify and secure the voting process, allowing voters to cast their ballots digitally from a computer, laptop, or smartphone. The system provides separate logins for administrators and voters, with the administrator login managed by the election commission. Voters register using a unique voter identification number and set up a password, while also submitting a face ID using their device's webcam or front camera during registration. For added security, when a voter logs in to cast a vote, they must verify their face ID. If the face matches the one provided at registration, the voter is prompted to complete two-factor authentication. In this process, a one-time password (OTP) is sent to the voter's registered mobile number, and upon successful verification, another OTP is sent to their registered email. Once both verifications are successful, the vote is securely submitted. Each voter can cast their vote only once per election, ensuring the integrity of the voting process.

II. Literature Survey

[1] Biometric Authentication Approaches in Online Voting:

Researchers have explored integrating biometric authentication with blockchain to enhance security and transparency in online voting. M. Abinaya and P. Kaviya Priya proposed a system using biometrics, though challenges such as high costs and equipment requirements were noted. Another study by Anjana Suresh applied AI to biometric authentication, improving fraud detection and preventing impersonation.

[2] Blockchain Integration and Data Integrity:

Aju Chhabria and Ashish Bablani examined blockchain's role in ensuring transparency and data accuracy in voting. Blockchain secures votes on a public ledger, making alterations nearly impossible. While scalable for large elections, accessibility and technical complexities, such as Zero-Knowledge Proofs, remain challenges.

[3]Hybrid Online and Offline Voting Interfaces:

Neelam Keerthi and Annam Raghuram developed a hybrid system combining online and offline voting for greater accessibility. While this approach can increase voter turnout, challenges include public education and digital literacy barriers that could hinder adoption.

[4] Blockchain-Based Voting Management Systems:

Eva Chovancová and Martin Chovanec proposed a blockchain-based voting management system to reduce human errors and enhance automation. While it improves security and transparency, issues such as limited infrastructure and lack of blockchain awareness pose implementation challenges.

[5] Enhancing Security with Defined Biometrics:
Devanshi Malik, Kritika Tripathi, and Jyotsna explored biometric security enhancements in online voting using fingerprints and facial recognition. While improving accuracy and voter authentication, implementation is limited by the need for biometric hardware, which may not be accessible in all areas.

[6] End-to-End Verifiable Voting Systems:
Mohammed Alsadi, Matthew Casey, and Constantin Catalin Dragan designed an end-to-end verifiable voting system, allowing voters to confirm their votes without compromising privacy. While offering transparency, cost savings, and increased participation, potential issues include privacy risks, digital access limitations, and regulatory challenges.

III. Objective

The objective of this project is to develop a secure, transparent, and efficient online voting system by integrating blockchain technology. This system aims to enhance election integrity by preventing tampering, unauthorized access, and fraudulent activities. By leveraging blockchain, the system ensures that each vote is securely recorded and verifiable, reducing the risk of manipulation.

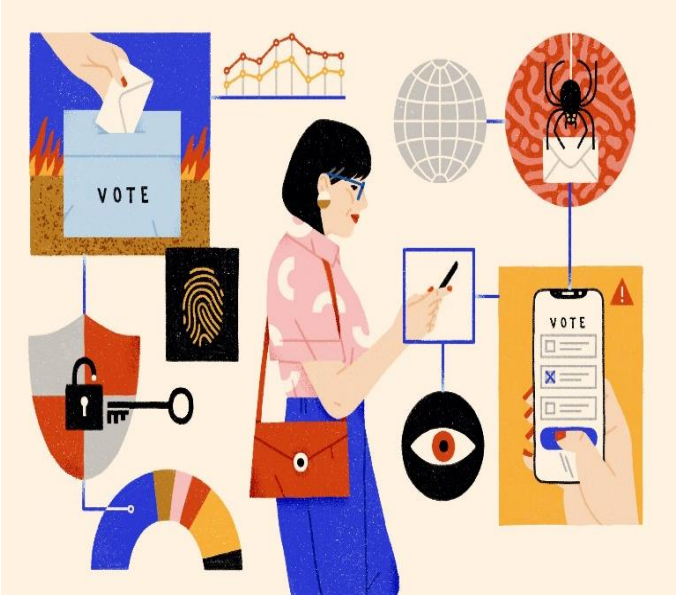
Additionally, the project focuses on improving voter accessibility and convenience, allowing individuals to cast their votes remotely without compromising security. The system aims to streamline the voting process, reduce the reliance on physical polling stations, and minimize administrative costs associated with traditional voting methods.

Another key objective is to build public trust in digital voting by providing a verifiable and immutable record of all votes, ensuring transparency in the electoral process. While blockchain improves security, the system is designed to be user-friendly, ensuring that voters can participate without requiring technical expertise.

IV. Problem Statement

Existing voting systems face security risks, fraud, and inefficiencies. While blockchain offers transparency and security, fully implementing it can be complex. This project integrates blockchain selectively to enhance vote integrity and data security while maintaining accessibility and efficiency in the online voting process.

System Architecture:



V. CONCLUSIONS

The use of blockchain technology in an online voting system significantly enhances security, transparency, and trust in the electoral process. By ensuring that each vote is securely recorded and cannot be altered, blockchain reduces the risks of fraud, tampering, and unauthorized access. This improves the overall reliability of digital voting and strengthens voter confidence. Additionally, blockchain allows for real-time verification, reducing the chances of errors and disputes in election results.

However, challenges remain in terms of accessibility, implementation costs, and public awareness. Not all voters may be familiar with blockchain technology, and its integration requires careful planning to ensure ease of use without compromising security. Despite these challenges, selective adoption of blockchain helps strike a balance between security and usability, making online voting a more viable option.

With continuous advancements in technology and better awareness among voters, blockchain-based voting systems have the potential to revolutionize elections. They can offer a secure, efficient, and tamper-proof alternative to traditional voting methods, ultimately promoting greater voter participation and trust in democratic processes.

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