Chapter 5

Blockchain Based Voting System Using Smart Contract

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Abstract: Voting is a cornerstone of democracy, enabling individuals to choose their leaders and influence decisions shaping their communities and future. Traditional voting systems, however, face numerous challenges, such as long queues, paper-based inefficiencies, and security vulnerabilities. To address these issues, blockchain technology has emerged as a transformative solution, leveraging its decentralized and secure infrastructure. This paper presents a blockchain-based e-voting system aimed at enhancing accessibility, security, and efficiency. By utilizing the Ethereum blockchain and smart contracts, the system ensures transparency, immutability, and tamper-proof vote recording. Furthermore, the integration of AI-powered facial recognition technology reinforces identity verification, guaranteeing that only authorized voters participate. Comprehensive testing, including simulations and stress analyses, confirms that the proposed model enhances the voting process by offering a secure, user-friendly, and reliable digital platform. This research highlights the potential of combining blockchain and AI to modernize voting systems, fostering trust and inclusivity in democratic processes. This paper introduces a blockchain-based e-voting system that simplifies the voting process while ensuring maximum security and trust. By using the Ethereum blockchain and smart contracts, votes are recorded and verified securely, leaving no room for manipulation. To make the system even more robust, AI-powered facial recognition is integrated to confirm voter identity, ensuring only eligible individuals can participate. The system has been tested extensively to ensure it's not only secure but also easy to use, providing a seamless experience for voters. This combination of blockchain and AI has the potential to revolutionize voting, making it fairer, more inclusive, and efficient for everyone.

Keywords: E-voting; Blockchain; Ethereum; Smart Contracts; Digital Platform; Facial recognition;

1. Introduction

Elections are the cornerstone of democracy, yet many people have lost faith in the process, which poses a serious threat to the integrity of a nation. Even in major democracies like India, the electoral system faces significant issues. Problems such as vote tampering, manipulation of election outcomes, and even violent incidents at polling stations undermine the trust in these critical processes. In recent years, Blockchain technology is revolutionizing industries like banking and healthcare, offering unprecedented security and trust. One of its most exciting applications is transforming how we vote, making elections more secure, transparent, and accessible for everyone.

At its heart, blockchain is like a digital notebook shared across a network of computers. It securely records and stores data so that everyone in the network has the same up-to-date version. Unlike traditional systems that rely on a single authority to manage data, blockchain