Report On

Voting System in Blockchain

Submitted in partial fulfillment of the requirements of the Course project in Semester VII of fourth year Computer Science Engineering (Data Science)

by

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CERTIFICATE

This is to certify that the project entitled "**Voting System in Blockchain**" is a bonafide work of "**Dikshant Buwa (Roll No. 04)**, **Mayank Jadhav (Roll No. 20), Yash Sankhe (Roll no. 53)**" submitted to the University of Mumbai in partial fulfillment of the requirement for the Course project in Semester VII of fourth year Computer Science Engineering (Data Science).

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Chapter 1
Introduction

1.1 Introduction

Elections are a formal process where a population selects someone for public office. It has been the primary method for modern representative democracies since the 17th century, used in various government branches and even in private organizations. However, in places with weak rule of law, interference from those in power can undermine the fairness of elections. Dictators use their authority to manipulate the process, while legislative factions may pass laws to protect their interests. Non-governmental entities can also disrupt elections through force, intimidation, or fraud. To address these challenges, we are working on a project that uses blockchain technology to create an electronic voting system, ensuring voter anonymity, confidentiality, and verification.

1.2 Problem Statement

In modern democracies, traditional ballot voting systems face numerous challenges, such as fraud, counting errors, limited accessibility, low voter turnout, environmental concerns, high costs, lack of transparency, security vulnerabilities, and complexity. These obstacles hinder the democratic process, necessitating the development and adoption of secure, transparent, and efficient voting systems. This has led to increased interest in electronic and blockchain-based voting technologies as potential solutions to these problems and to enhance voter participation.

1.3 Objectives

The objective of our project is to address the challenges associated with traditional voting systems, such as fraud, inaccessibility, and lack of transparency, which undermine the fairness of elections in modern democracies. To combat interference from those in power and non-governmental entities, we aim to develop an electronic voting system using Blockchain technology. This system will prioritize voter anonymity, confidentiality, and verification, ensuring the integrity of the democratic process and fostering increased voter participation.

Chapter 2
Literature Survey

2.1 Analysis of Literature

Sr. No.	Title of the Paper	Advantages	Disadvantages
1	Blockchain-Enabled E-voting	Security : BEV uses blockchain technology to generate cryptographically secure voting records.	Complexity: The complexity of blockchain technology might hinder mainstream public acceptability of BEV
2	Traditional paper ballot system	Voter Trust: Many people trust the paper-based system as it has been in use for a long time and is seen as less susceptible to manipulation compared to electronic systems.	It takes a long time as voters have to make very long queues and the voting process is slow.
3	Direct-recording electronic (DRE) voting system.	Efficiency: DRE voting machines can streamline the voting process, reducing wait times and long queues at polling places, potentially leading to increased voter participation.	The system overcomes the problem of queues however its main weakness is that it can be hacked and the results manipulated.
4	E-Voting System Based on Blockchain Technology: A Survey.	High Availability: many nodes totally distributed and storing the whole database.	The smart contract lacks a formal verification or analysis of its security and correctness.
5	Decentralized Online Voting System using Blockchain	Easy to define one common starting point, where to store the data, always attached it to the last block in the longest chain.	The proposed system's performance and cost are not compared with other existing voting systems or platforms.

2.2 Research Gap

The research gap that emerges from the discussion of traditional paper ballot systems and Direct-Recording Electronic (DRE) voting systems centers on the critical need to strike a balance between the efficiency and accessibility advantages offered by electronic voting while addressing vulnerabilities related to security and potential manipulation. To bridge this gap, research should focus on developing advanced security measures, transparent auditing and verification processes, user-friendly design, regulatory frameworks, and voter education strategies to ensure the integrity of electronic voting systems, maintain public trust, and enhance the democratic process in a technologically evolving electoral landscape.

Chapter 3

Proposed System

3.1. Introduction

The proposed system for election management aims to streamline the process, enhance security, and ensure transparency through the use of Ganache and MetaMask. The system follows a sequence of actions:

1. Admin Operations
2. Voter Participation
3. Vote Tally and Results
4. Security and Transparency

The proposed system combines the strengths of Ganache and MetaMask to provide a secure, transparent, and user-friendly platform for election management. It empowers administrators to efficiently set up elections, candidates to participate with confidence, and the public to verify election results, all while maintaining the integrity of the democratic process.

3.2. Algorithm and Process Design

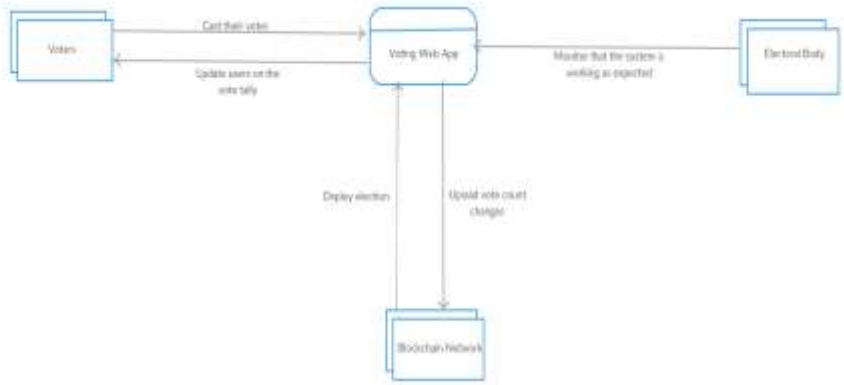

Fig 3.1 Voting Process

3.3. Details of Hardware & Software

Hardware details:

- Processor: Intel(R) Core(TM) i5-10300H CPU @ 2.50GHz 2.50 GHz
- Memory (RAM): 8.00 GB DDR4
- Storage: 512 GB SSD

Software details:

- Remix Ethereum IDE: For initial contract development and testing.

- VS-Code.
- MetaMask

Programming Languages:

- Solidity programming language: For writing the smart contract.
- Front-end technologies (HTML, CSS, JavaScript, and frameworks) for the user interface.
- Truffle: For advanced development, testing, and deployment.
- Ganache for private block chain experiment.

3.4. Experiment and Results

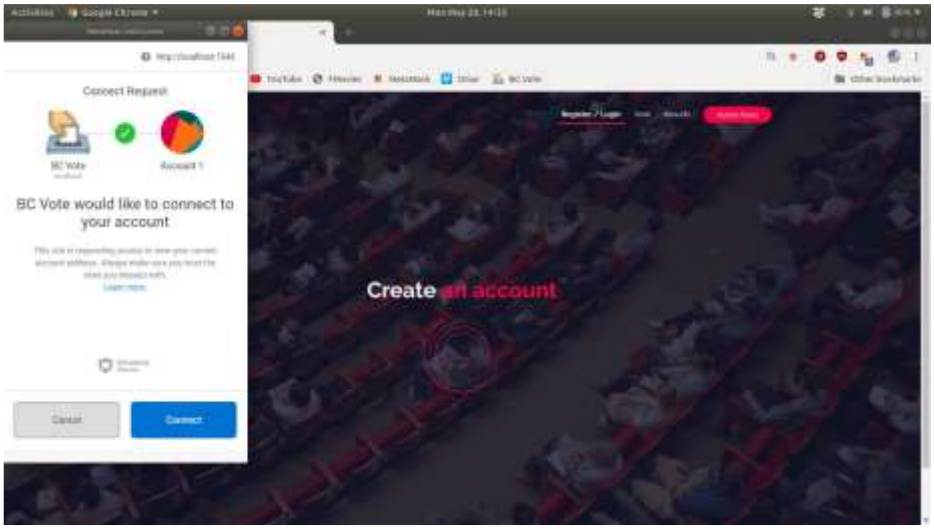

Fig 3.2. Connection project to blockchain

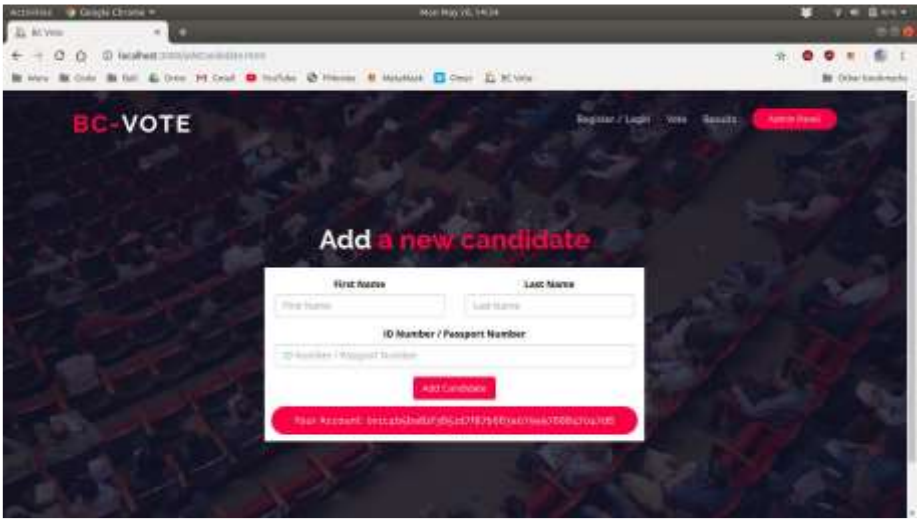

Fig 3.3. Add candidates and start and end the election.

Fig 3.4. Admins can also view the election details.

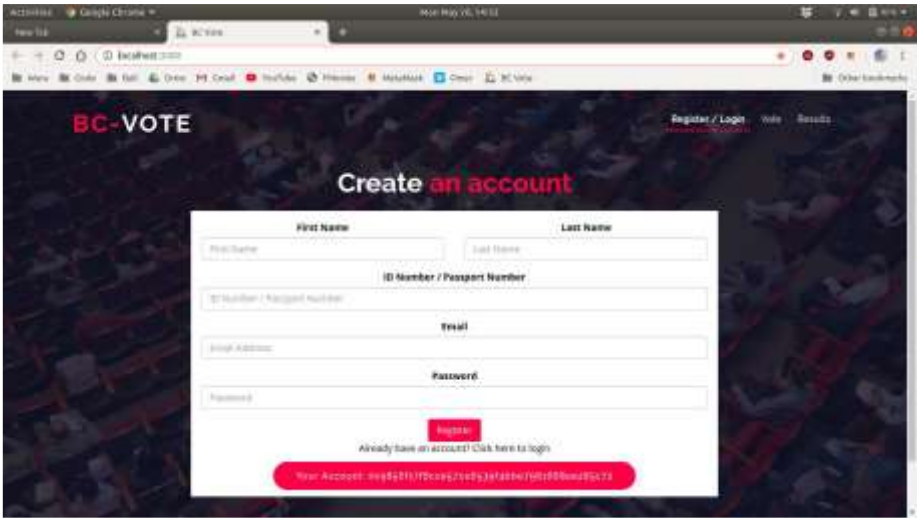

Fig 3.5. Voters can register for the voting process.

3.5 Result Analysis

- Testing Approach: The testing approach included Module Testing, Integration Testing, and System Testing, which allowed for a comprehensive evaluation of the software system.
- Integration and System Testing: These phases involved the integration of individually tested modules, and the entire system was tested to identify and correct errors and bugs. This process ensures that the system functions as a whole and meets the specified requirements.
- Software Testing Matrix: The software testing matrix includes several test cases with expected results, actual results, and pass/fail assessments, which serve as a structured method to evaluate the system's functionality.

- Login Functionality: Positive Match: The login functionality successfully identifies users, redirects them to a dashboard with specific rights, and appends relevant user information. This test case passed. Negative Match: The system correctly declines login requests and provides reasons for the denial. This test case also passed, indicating effective error handling.
- Adding Candidates: The system effectively allows candidates to be added to the voting process, with candidate details displayed on the voting page for voter selection. This test case passed, indicating proper candidate management.
- Voting Process: The system allows users to cast their votes for their preferred candidates, and the candidates' vote counts increase as expected. This test case passed, demonstrating successful vote counting functionality.
- Results Display: The system accurately displays the tally of all cast votes in real-time on the results page, ensuring transparency and accountability in the election process. This test case passed.
- Preventing Duplicate Votes: The system effectively prevents users from casting multiple votes, as the select candidate option and vote button disappear after a user has voted. This test case passed, indicating successful implementation of security measures.

3.6. Conclusion

In conclusion, the comprehensive testing approach, encompassing Module Testing, Integration Testing, and System Testing, confirmed the effectiveness of the software system designed for election management. The software successfully addressed the challenges outlined in the introduction and problem statement, such as the need for error identification and the assurance that the system complies with specified requirements. The detailed Software Testing Matrix, which included test cases related to login functionality, candidate management, vote casting, results display, and preventing duplicate votes, demonstrated the system's robustness and reliability. The software not only provides a seamless and secure voting experience but also enhances transparency in the electoral process, ensuring that it meets the requirements and operates without errors. This project stands as a promising solution for modernizing and improving the electoral systems to foster fair, efficient, and error-free elections in the digital-age

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