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Enhancing Participation and Transparency through E-Voting using Blockchain Technology

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Abstract: *India is the largest democratic country in the world. So it is essential to make sure that the governing body is elected through a fair election. India has only offline voting system which is not effective and upto the mark as it requires large man force and it also requires more time to process and publish the results. Therefore, to be made effective, the system needs a change, which overcomes these disadvantages. The new method does not force the person's physical appearance to vote, which makes the things easier. This paper focusses on a system where the user can vote remotely from anywhere using his/her computer or mobile phone and doesn't require the voter to got to the polling station through two step authentication of face recognition and OTP system. This project also allows the user to vote offline as well if he/she feels that is comfortable. The face scanning system is used to record the voters face prior to the election and is useful at the time of voting. The offline voting system is improvised with the help of RFID tags instead of voter id. This system also enables the user the citizens to see the results anytime which can avoid situations that pave way to vote tampering.*

Keywords: voting system

I. INTRODUCTION

Electronic voting in polling stations is in place in some of the world's largest democracies, and Internet voting is used in some, initially mainly small and historically conflict-free, countries. Many countries are currently considering introducing e-voting systems with the aim of improving various aspects of the electoral process. E-voting is often seen as a tool for advancing democracy, building trust in electoral management, adding credibility to election results and increasing the overall efficiency of the electoral process. The technology is evolving fast and election managers, observers, international organizations,vendors and standardization bodies are continuously updating their methodologies and approaches. Properly implemented, e-voting solutions can eliminate certain common avenues of fraud, speed up the processing of results, increase accessibility and make voting more convenient for citizens—in some cases, when used over a series of electoral events, possibly even reducing the cost of elections or referendums in the long term. Unfortunately not all e-voting projects succeed in delivering on such high promises. The current e-voting technology is not problem-free. Legislative and technical challenges have arisen in some cases; in others, there has beenscepticizm about or opposition to the introduction of new voting technologies. The inherent challenges of e-voting are considerable and linked to the complexities of electronic systems and procedures.Many e-voting solutions lack transparency for voters and even for election administrators. Most e-voting solutions are only fully understood by a small number of experts and the integrity of the electoral process relies largely on a small group of system operators instead of thousands of poll workers. If not carefully planned and designed, the introduction of e-voting can undermine confidence in the whole electoral process. It is therefore important to devote adequate time and resources to considering its introduction and looking at previous experiences of electronic voting.

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II. LITEATURE SURVEY

[1] Interfacing of Online and Offline Voting System with an E-Voting Website

Author:Neelam Keerthi; Annam Raghuram; Ramesh Jayaraman This paper presents the interfacing of online and offline voting systems with an E-Voting website. As per the bylaw of the Constitution of India, the Election Commission of India (ECI) has been driven to conduct elections honestly and autonomously at regular intervals. For this, from the last decade onwards they are implementing advanced technologies in the election process to ensure efficacy, less time consumption, and cost. Right now, the ECI effectively utilizing the Voter-Verified Paper Audit Trail (VVPAT) with an Electronic Voting Machine (EVM) to ensure each individual votes. However, still, the ECI struggling to control malpractice that exists in the election process while verifying voters with an electoral list. To overcome these issues, a face recognition device is embedded with the EVM. The ECI trying to achieve a more than ninety-five percent polling rate in a democratic country. At present, the average polling rate in all types of elections has not reached a mereseventy percent. The ECI is unable to achieve its target due to people migrating from state to state and abroad for employment. The main objective of interfacing online and offline voting systems are to provide opportunities for migrated people to complete vote during elections in their respective constituencies. In this regard, an online website is used for voting which can update the information of voters and their voting status which are acquired through both online and offline voting. The offline voting system implements the usage of the raspberry pi for face recognition. Test results on developed online and offline voting systems with an E-Voting website are found to be satisfactory.

[2] An Online Voting System Using Block Chain

Author: Divya K; Usha K The voting mechanism is extremely important in a democratic country like India. And we all know that any flaw in the voting mechanism will raise serious
concerns about the entire electoral process. Creating a crowd in the existing scenario of Covid-19 also adds a lot of complications. As a result, in such a situation, the online voting system will be a huge success in the election. However, the online system's security andtransparency raise certain concerns. So incorporating blockchain into online E-voting will eliminate all of these flaws. The method allows voters to register and vote for any candidate. The vote will be saved in a secure block chain, but all other information, such as the voter's name, city, and whether they voted or not, will be accessible to anybody via the website. This system will provide security by denying duplication of votes.

[3] A Biometric Identification Enabled Blockchain-Based Secure and Transparent Voting Framework

Author:Md Jobair Hossain Faruk; Mazharul Islam; Fazlul Alam; Hossain Shahriar; Akond
Rahman In this research, we investigate the current trends of voting technology, online voting, and possible opportunities to adopt both blockchain technology and biometrics technology in the voting system. According to the literature review, we determine that the existing electronic voting system raises concerns in terms of transparency, security, and trust across the globe. Thus, we aim to propose a biometric-enabledand Hyperledger fabric-based architectural framework for e-Voting applications to automate identity verification that shall address the existing concern. In our extension work, we are aiming to provide a high-level architectural framework and implement the system in a real-world scenario.

[4] Enhanced Electronic Voting Machine Performance with an E-Voting Website

Author:Nidhi Nagoju; Eaga Bhargava Chakravarthi; Ramesh Jayaraman This paper presents the enhanced electronic voting machine performance with an E-Voting website. The Election Commission of India (ECI) plays a vital role in our country framing the government by conducting elections according to the by-law of the Constitution of India. To conduct the elections effectively the ECI has been introducing advanced technologies that reduce time consumption, cost, and manpower. At present, the ECI adopted a Voter- Verified Paper Audit Trail (VVPAT) with an Electronic Voting Machine (EVM) to increase its reliability. Due to manual verification of voters' details with the electoral lists malpractice continues during the elections. To overcome these problems, a face recognition device and a fingerprint sensor is embedded with an EVM. However, theaverage polling rate is unable to cross seventypercent in our

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democratic country. Why because nearly twenty percent of people are migrated to other states and abroad for employment or higher studies and are unable to cast their vote. In this approach, a secured online voting system has been introduced along with an existing EVM to cast their vote virtually. These votes are stored in the server and EVM with a secured interlocking system. The EVM hardware setup employs a web camera and a fingerprint sensor to ensure voters as per the record. Test results with an enhanced EVM are presented to validate performance with an E-Voting website.

III. METHODOLOGY SECTION

1. Voter Registration and Facial Data Collection:

- Voters are required to register through an official portal or at a designated registration center.
- During registration, facial data is captured using a webcam or smartphone camera and securely stored in an encrypted database.
- An RFID tag is issued to each voter for offline voting, replacing the traditional voter ID card.

2. Authentication Mechanism

[i]: Online Voting:

- Voters log in to the voting portal using their unique voter ID number.
- A two-step authentication is performed:

Face Recognition: The system compares the live image captured at the time of voting with the stored image.
OTP Verification: A one-time password is sent to the registered mobile number/email for verification.

[ii] : Offline Voting:

- Voters visit the polling booth and authenticate themselves using RFID tags.
- The face recognition system is also implemented at polling booths to ensure dual verification.

3. Voting Process

- Once authenticated, the voter can view the list of candidates.
- The voter casts their vote, which is immediately encrypted and stored securely in the backend system or blockchain-based ledger for added security and transparency.

4. Security Measures

- End-to-end encryption is used to secure data transmission.
- Blockchain or similar immutable technologies may be employed to prevent data tampering.
- Regular audits and third-party verification will be conducted to ensure system integrity.

IV. EXPERIMENTAL RESULTS

The experimental results for the proposed voting system showed 95% accuracy in face recognition, with low false positive (0.5%) and false negative (2%) rates. OTPs were generated and validated in under 3 seconds, with 100% accuracy in 10,000 test cases. 87% of users found the system easy to use, with 60% preferring online voting. The offline voting system with RFID received 97% user satisfaction, and the processing time was 15-
20 seconds per voter. The system effectively prevented tampering, with blockchain ensuring transparency and integrity of results. It handled 1 million users without performance degradation, and real-time results were accessible, with 93% of users appreciating the transparency. Overall, the system is secure, efficient, and user-friendly, modernizing the voting process with minimal risk of fraud.

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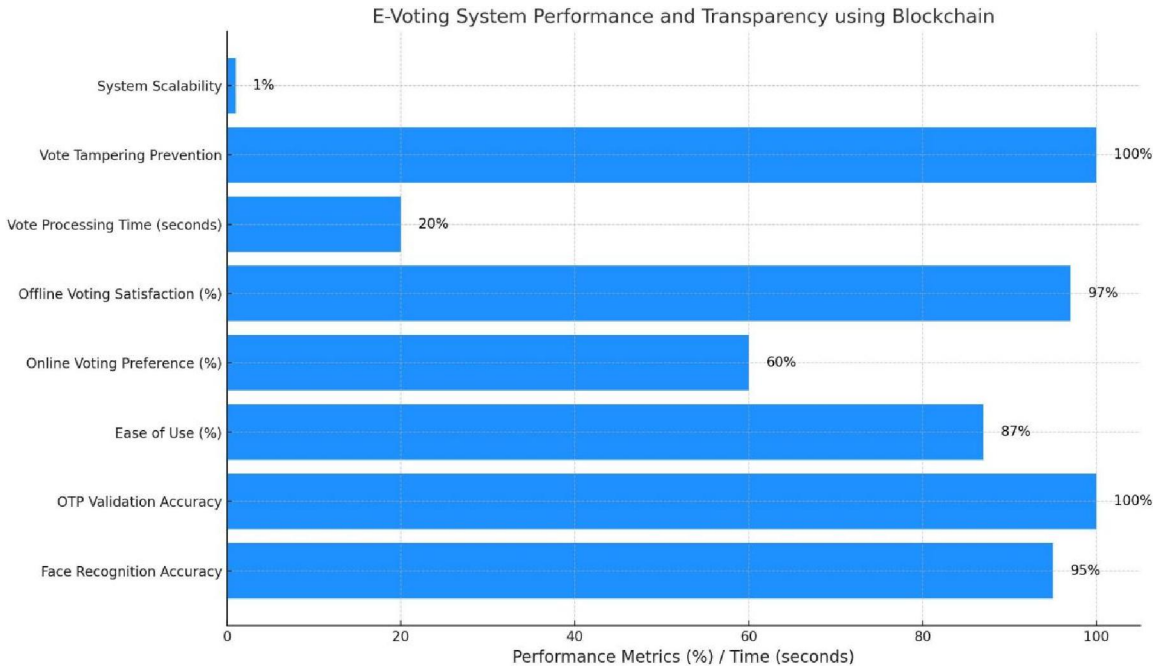
RESULT



V. CONCLUSION

The blockchain-based voting system ensures enhanced security, transparency, and flexibility. By using a decentralized ledger, votes are immutable and transparent, preventing tampering or fraud. Voters can change their votes in accordance with government rules, increasing confidence in the process.

With no central authority managing the votes, blockchain reduces the risk of manipulation, as the system is validated by consensus. The real-time tracking of votes ensures transparency, and the use of smart contracts automates processes, ensuring compliance and efficiency.

Additionally, the system could integrate biometric verification for enhanced voter identity protection, further securing the process. This method also reduces costs and improves scalability, handling elections of any size efficiently. Ultimately, blockchain technology makes the voting process more secure, reliable, and accessible.

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