Blockchain-Based E-voting System

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Abstract: It has always been difficult to devise a secure electronic voting system that delivers the transparency and flexibility offered by electronic systems while preserving the integrity and transparency of existing voting systems. In this research paper, we assess a blockchain application for implementing distributed electronic voting systems. The paper proposes a novel electronic voting system based on blockchain that addresses some of the limitations in existing systems and evaluates some of the popular blockchain frameworks to construct a blockchain-based e-voting system. Through the explanation of a literature review, namely the election process and the deployment of a blockchain-based application, which increases security and lowers the cost of hosting a national election, we specifically assess the potential of distributed ledger technology.

Keywords: Blockchain, Electronic Voting System, and E-voting.

INTRODUCTION

In the present era, technology usage is crucial for aiding in satisfying human requirements. Due to the increasing use of technology, new challenges are brought in the process of democracy as most people today don't trust their governments, making elections very important in a modern democracy. Elections play an important role in deciding who will lead a country or organization, or we might say that they are the event that dictates the fate of any nation. Elections are crucial in a contemporary democracy, but a significant concern for democracy is that majority of the people around the world do not trust their electoral system. Even the major democracies in the globe, like India and the United States, nevertheless have a flawed electoral process. The key concerns with the existing voting system involve vote rigging, EVM hacking, election manipulation, and polling booth capturing.

Blockchain is a novel, decentralized, and distributed technology that has the potential to improve multiple aspects of numerous industries. The challenges to the existing e-voting system could be resolved by expanding e-voting using blockchain technology. Without a doubt, the dynamic blockchain technology that serves as the foundation for the well-known cryptocurrency Bitcoin has sparked the dawn of a new age for the Internet and online services. While most people focus only on bitcoin and other cryptocurrencies, there are many operations, both administrative and fintech that can only be done online/offline and can now safely be migrated to the Internet as online services due to blockchain's absoluteness. What makes blockchain a powerful tool is its smart contracts and many features which overcome traditional systems.Smart contracts are meaningful chunks of code that are incorporated into the blockchain and carried out in accordance with a plan at each stage of updating the blockchain. Another crucial yet trendy topic concerning online services is e-voting. Smart contracts on blockchain make it a formidable contender to be employed in the development of more cost-effective, secure, transparent, and user-friendly e-voting systems.

PURPOSE

Elections are a fundamental pillar of a democratic system enabling the general public to express their views in the form of a vote. Due to their significance to our society, the election process should be transparent and reliable to ensure participants of its credibility. Concerning this, the voting methodology has been a dynamic field. One of the cutting-edge technologies- blockchain has solid cryptographic foundations that enable apps to take advantage of these features to provide robust security solutions.

EXISTING SYSTEM

1. Electronic voting has been an area of research focus for many years by using computing machines and equipment for casting votes and producing high-quality and precise results following the sentiments of the participating voters.
2. Initially, a computer counting system allowed the voter to cast vote on paper.
3. If the voting system is well understood by the voters, the system's usability can be increased remarkably.

OBJECTIVE OF SYSTEM

1. Secure E-Voting System
2. To make such a system which will be easy to use and more user friendly for our customer.
3. Centralized management system
4. Building an online system would enable voters to cast their votes on chosen candidates.
5. Study and implement a security method to be used to ensure that votes being cast in the system will not be compromised and any outside attack.

LITERATURE SURVEY

"A Visionary Approach to Smart Voting System" states that with the emergence of COVID-19 as a global pandemic, the need for an online voting system is becoming appallingly evident in India. In the current predicament, India unfortunately still uses a flawed election system. Ballot rigging, hacking of the EVM (Electronic voting machine), election manipulation, and polling booth capturing are significant issues in this voting system. Many nations are presently testing blockchain-based voting methods to prevent such an exorbitant scenario in the future. This approach does come with some substantial disadvantages, though. As a result, we propose a radical online voting system based on hash graph technology in our paper. Numerous blockchain flaws are addressed using the hash graph encryption technique, which is an improved version of blockchain encryption. This system preserves participants' anonymity while still being open to public inspection. Voter ID, the Aadhaar card number, and facial recognition are

used to verify voters. JWT Authentication is also used to strengthen the login portal's security. Additionally, the voters can also assure their cast a vote using the highly encrypted unique ID generated by our system. In addition to that, a highly secure database is used to preserve the voter's data. Additionally, homomorphic encryption is utilized to securely store the votes and facilitate the vote count. Lastly, it features a Chabot that assists the voter. The scheme is carefully assessed in this paper, which effectively establishes its efficacy in producing an end-to-end verifiable online voting system. [1]

"Aadhaar Based Electronic Voting System and Providing Authentication on Internet of Things" is a paper by Dr. V. Latha, presenting that Flawless voting is ensured by the Electronic voting machine. People should believe that their vote is secured and there is no malpractice involved whatsoever. The main aim of this project is to develop a secure Electronic voting machine using the Fingerprint identification method, for fingerprint accessing we use the AADHAAR card database. When voting in elections, the e-voting process authentication can be done using finger vein sensing, which allows the electronic ballot reset for voters to cast their votes. Also, the voting data and voter details can be sent to the nearby Database Administration unit by using the Wi-Fi system. Fingerprint scanning is used to ensure security to avoid fake, repeated voting, etc. Additionally, it improves the system's efficiency and accuracy. The purpose of such a system is to ensure that voting rights are accessed only by a legitimate user and no one else. During elections, a voter's thumb impression is entered into the system as input. This data is then compared with the available records in the database. Voting privileges are made available if the specific pattern matches anyone in the database. However, if the pattern does not match the database records, or if the pattern is repeated, voting access is denied or the vote is rejected. [2]

"Finger Print Based Smart Voting System" is a paper by Ms. Mary Varsha Peter. It states that the main objective of this project is to enable a safe and secure voting system and to avoid misconceptions that take place during the election period. The voting system allows people to choose their government and political representatives. It also ensures that to avoid fake and repeated votes during the election. In this project, the fingerprint is given as input. All the database of the voter including their fingerprint, photo, mobile number, etc. has been stored in MATLAB. If the fingerprint enrolled by the voter should be matched with the database, it enables the voter to enroll his/her vote. If the fingerprint doesn't match the system will lock the process. The important is that the voter can enroll their vote at their desired location. And also the number of votes enrolled should be updated in the database administration unit every time after voting is done. The automated voting method will improve the speed and accuracy of the system. Through this voting system, the disadvantages which are in the electronic voting system should be eliminated. [3]

Increasingly digital technology in the present helped many people's lives. Unlike the electoral system, there are many conventional uses of paper in its implementation. The aspect of security and transparency is a threat from the still widespread election with the conventional system (offline). General elections still use a centralized system, there is one organization that manages it. Some of the problems that can occur in traditional electoral systems are with an organization that has full control over the database and system, it is possible to tamper with the database of considerable opportunities. Blockchain technology is one of the solutions because it embraces a decentralized system and the entire database is owned by many users. Blockchain itself has been used in the Bitcoin system known as the decentralized Bank system. Adopting blockchain in the distribution of databases on e-voting systems can reduce one of the cheating sources of database manipulation. This research discusses the recording of voting results using blockchain algorithms from every place of election. Unlike Bitcoin with its Proof of Work, this thesis proposed a method based on a predetermined turn on the system for each node in the built blockchain. [4]

Using electronic voting systems is divisive as some countries used such systems and others did not. Electronic voting (e-voting) is relatively a new concept based on its application that aims at reducing errors and improving the convenience and integrity of the election process. This paper tried to explore the factors that influence the adoption of such systems in a university environment. The study utilized a sample of 302 bachelor's degree students in a public Jordanian university and in relation to the student council election process. Results indicated that students were keen on the concepts of trust and use the fullness of e-voting when adopting such systems. The study supported the findings of TAM in the area of technology acceptance. [5]

This paper [6] proposed a reliable and cost-effective secure electronic voting system that can be used in many developing countries like Egypt. The important obstacle in any e-voting system across the world is the security issue. Election results may be modified when delivered to the Higher Elections Committee, unauthorized voters may vote instead of the eligible voter, and a vote may not be calculated; also the voter has to ensure that nobody has the possibility to know his ballot data. The proposed Voting Model System overcomes these obstacles. Security evaluation experiments are performed successfully on the proposed system proving that it satisfies privacy, accuracy, reusability, eligibility, and integrity.

Democracy in any country must have a transparent voting system that meets the people's needs to give power to the right person. Furthermore, the existing traditional voting systems suffer from major drawbacks and missing lack of security and transparency. This survey paper discusses the possible opportunity for applying BC technology in e-voting systems to improve the process of voting by tackling the issues of trustless, privacy, and security. This paper aims to evaluate different applications of blockchain as a service to implement distributed electronic voting systems. Some of them have been only draft papers; others are implemented in the real world. A blockchain-based e-voting application improves security, and privacy, and decreases the cost, even more, which can be achieved. [7]

[8] proposed a system where users as individuals would interact with the system. All user interaction is performed remotely through the user's web browser. Users are provided with an online registration form before voting user should fill online form and submit details these details are compared with details in the database and if they match then the user is provided with a username and password using this information user can login and vote. If conditions are not a correct entry will be canceled. It contains two level of user's administrator level and the voter level where each level has different functionality

"RFID Based Smart Electronic Voting System for Reducing Electoral Frauds Using Arduino", is paper of Ms. A. Achammal. This paper describes the design and operation of a Smart Electronic Voting Machine using Arduino UNO, RFID, to improve the election process by avoiding electoral fraud and to ensure safety, security, reliability, and smooth conduct of elections in the country. This paper talks about an innovative approach for the voting process where the device communicates with the RFID tag, which is

embedded in the voter ID card. When the voter scans his card, the controller checks the ID, and if it matches, the LCD displays the result. [9]

"Advanced voting machine using face recognition", is a paper by A Samundeeswari. This paper states that the project is an advanced voting machine using face recognition that will provide a better, safe, and secure voting system. During the voting session, the person and his database image matching are verified. Based on the image recognition results, the person is allowed or prohibited from voting. With this systematic verification, fake voters could be prevented. In case of fake attempts, the original voter will also be alerted via GSM message. [10]

The privacy and security flaws in the e-voting systems in particular leads to a huge problem where intruders may perform a number of frauds for rigging the polls. Thus, the potential challenge is to distinguish legitimate IoT devices from malicious ones by computing their trust values through social optimizer in order to establish a legitimate communication environment. Further, in order to prevent future modifications of data captured by smart devices, a Blockchain is maintained where blocks of all legitimate IoT devices are recorded. [11] introduced a secure and transparent e-voting mechanism through IoT devices using Blockchain technology with the aim of detecting and resolving the various threats caused by an intruder at various levels. Further, in order to validate the proposed mechanism, it is analyzed against various security parameters such as message alteration, Denial of Service (DoS) and Distributed Denial of Service (DDoS) attack and authentication delay.

[12] describes the mechanisms for using ring signatures to ensure anonymity in a decentralized e-voting system. Unlike standard signature algorithms that allow you to uniquely authenticate the authorship of the signature, a ring signature allows you to hide the true public key for verification among the public keys of other participants in the system. At the same time, the use of blockchain technology allows you to verify the integrity of the users votes, as well as verify their authenticity (binding with valid public keys) and to ensure transparency in the calculation of votes and verification of the correctness of the accounting of its votes by an individual user.

PROPOSED SYSTEM

Our Indian government gave us the right to elect their desired leader. For controlling and conducting this election process, the government formed a separate commission named the Election Commission of India. This commission should not support and be favorable to any of the political leaders or the party and also it works as per the rules given in law. The election commission makes use of the Electronic Voting Machine method, which requires voters to provide election ID cards that have been issued by the commission and it is validated against the official database. The voter can only cast their ballot following this procedure. This will not lead to time consumption and less manpower. But in our project, it has less manual power and time consumption. It is also safer than the prior voting procedure. The disadvantages of EVM is that the counting of vote and result display takes several days and the candidate should enroll their vote at their allocated location only. This leads to low accuracy of voting. But our project enables the candidate can enroll their vote at their desired location or at from working place. So this leads to 100% accuracy in voting.
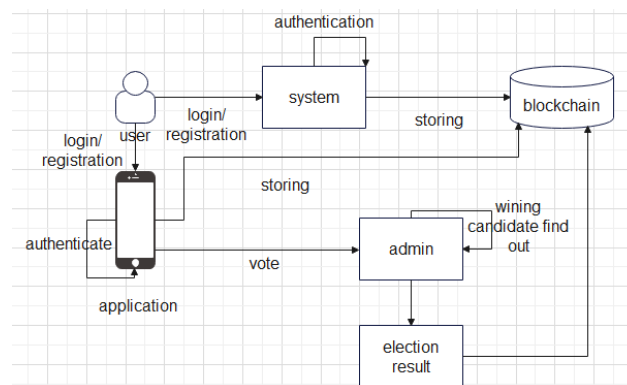
SYSTEM ARCHITECTURE

Fig -1: System Architecture Diagram

IMPLEMENTATION DETAILS

Elections are one of the most important things which bind our nation together to elect our leader till the next election. In the existing method, up until the close button is pressed, the polling officer is in charge of overseeing the election process. Hence this process consumes more manpower for each region and it is not secure. Only the voting machine should detect the discrepancy when the votes are being counted. The problem associated with this electronic voting machine is that during election time the candidate should go to their allocated location to enroll their vote. Due to this, numerous people don't like to vote. This increases the chances of resorting to various malpractices during the election period.

Our proposed system will consist of a central Administrator that will overlook the election process and will be responsible for starting/stopping the election process and viewing the election result. The admin however, will not be able to make any changes to the voting result count. The voters can rest assured that the votes are in safe hands. The votes will be counted in the form of blockchain transactions, so there will be negligible chances for anyone to manipulate the votes. The voter/user will log in through the mobile application and will cast his vote in the form of blockchain transactions. This vote will be immutable and final. The Admin, however, will log in through the web portal using his credentials and will be able to see the results of voting after the process ends.

ADVANTAGES OF THE PROPOSED SYSTEM

• Providing the preventive measures system for voting.
• It eliminates the possibility of invalid votes.

- Its use results in the reduction of polling time.
- Results in fewer issues with election planning and expenditures on law and order candidates.
- It has the potential to save money on printing supplies and the transportation of massive amounts of election materials.

OBJECTIVES

To develop a secured electronic voting system using fingerprint biometric techniques that would tackle all the drawbacks presented in this project and satisfy e-voting functional and security requirements towards achieving credible elections at all levels.

APPLICATIONS

The system can be implemented wherever there is a need for voting.

MATHEMATICAL MODEL

System Description:

$S = (I, O, F)$ is the **System**

Where,

$I = \{UI, AD, FS\}$ are set of Inputs

      UI: User Id Login

      AD: Aadhaar Data

      FS: Fingerprint Scan

$F = \{A, P\}$ are set of Function

      A: Authentication

      P: processing

$O = \{N, U\}$ are set of Output

      N: Notification

      V: Vote

Success Conditions:

      Proper database, Scanning

Failure Conditions:

No database, internet connection

CONCLUSION

In the proposed framework, we have formulated the idea of building a secure voting system that is free from unauthorized access and the voters can rest assured that their votes aren't being tampered with. The server aspects of the proposed system will have such a distribution of authority that the server does not enable the manipulation of the votes. It is expected that the proposed voting system will increase the transparency and reliability of the existing electoral system

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