MyVote - Blockchain Based Online Voting System

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Abstract - **The application of blockchain technology has drawn a lot of interest as a potential solution for secure and open online voting systems. In order to guarantee the validity and reliability of the voting process, this research paper focuses on analyzing the design and implementation of an online voting system built on blockchain technology. The architecture of the system is covered in the paper, including how smart contracts are used to control the voting process and how a face detection system and cryptographic techniques are integrated to guarantee the confidentiality and privacy of voter data. Furthermore, the contribution evaluates the usability and perceived security of the system through the presentation of the results of a user study. The findings suggest that a blockchain-based online voting system is a promising approach to enable secure and transparent voting. In addition, the study provides insight into the challenges and opportunities associated with using blockchain technology for online voting systems.**

Keywords: Blockchain, Ethereum, SHA-256, Face-API, Firebase, Ganache, Metamask.

I. INTRODUCTION

The earliest form of voting was using paper ballots. India eventually developed an electronic voting machine (EVM)-based voting system. India, which has the biggest democracy in the world, needs a voting system that its people can trust. In view of recent claims against the current system, including identity theft, false votes, and corruption, India urgently needs a voting system that everyone trusts. The amount of time spent travelling to the polling places, infrastructural costs, and security expenses must also be decreased.

We intend to build a blockchain-based electronic voting system to overcome the difficulties mentioned above. Blockchain is an unchangeable ledger that offers dependability and transparency. Cryptographic security also guarantees the security of every voter's ballot.

A decentralized system called blockchain employs nodes to store information about each transaction. A Blockchain is the safest sort of database. Under the proposed system, every voter can cast a ballot with confidence that their votes won't be tampered with or wasted. Even in the event of an attempt of

tampering, it would take a very long time to weaken the cryptographic security, making it almost hard to destabilize the system. Because the hash of data is stored in every node and each node also stores the hash value of its previous node. So, as the data changes the hash value also be changed and thus if anyone wants to tamper with data he have to change the data of every node.

As the results are updated in real-time, the vote count will be transparent and any third party has almost no chance to alter even a minor Blockchain node with this approach. As a result, voter authentication, vote security, vote transparency, protection from false or duplicate ballots, and intrusion will be the system's major features. And by fusing all of these parts together, a distributed system is produced. Each operation in a blockchain can only be carried out once, preventing repetition. Voting electronically ensures that there are no opportunities for tampered ballots.

1.1 What is Blockchain?

Blockchain is a data storage technology that makes it difficult or impossible to change, hack, or otherwise control the system. A distributed ledger known as a blockchain replicates and distributes events throughout a network of computers.

Blockchain technology enables the transparent maintenance of transactional information across numerous databases by using peer-to-peer servers, which are frequently referred to as "blocks" or "chains." The term "digital ledger" is frequently used to describe this type of storing.
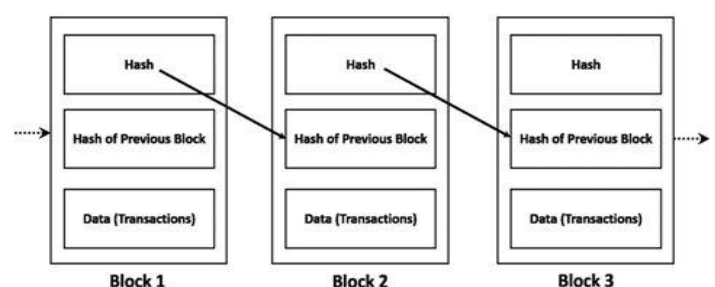

Figure 1: Blockchain Architecture

As shown in the Fig.1 Blockchain holds data in the form of blocks that are cryptographically linked together. Each

block in the blockchain is uniquely identified by a different cryptographic hash, which is also used to identify the block that came before it.

With each block, a new transaction is logged, saved, and added to the database. All transactions are recorded in a new block, which is added to the one before it. Data on a blockchain cannot be changed or removed since doing so would need changes to every block after it.

1.2 What is Smart Contract?

A piece of software known as a "smart contract" enables the direct and automatic transfer of digital assets between parties under specific circumstances. In addition to automatically enforcing it, a smart contract functions similarly to a normal contract. Computer programs known as "smart contracts" execute the precise tasks for which they were designed or intended. Similar to how traditional contracts are enforced by code, so are smart contracts.

Smart contracts will be extremely important in our proposed system since we will use them to record the transactions that will be used as votes.

II. LITERATURE REVIEW

So many researchers have studied about blockchain technology, as well as how it will help in elections and make online elections secured and how it can be implemented. Followings are the some literature reviews.

[1] Aadhaar Base Voting System Using Blockchain Technology - Ms. Sayali B. Khatal, Ms. Vaishnavi R. Musmade, "International Journal of Scientific Development and Research (IJSDR)", Jan 2022.

This study assesses the viability of using blockchain technology to create an electronic voting system. A blockchain-based voting system that employs "permissioned blockchain" to support liquid democracy is suggested after researching existing blockchain frameworks suitable for building such systems. Users' registration and authentication, poll setup, polling, tabulation, result publishing, auditing, and validation are just a few of the many components that go into an internet-based survey. Because the Internet-based surveys operate in three distinct environments, a security breach on any component of the system could produce erroneous results. To produce fair, secure, accurate, and unbiased polling results, the administration or authority administering the poll must take precautions to protect these three distinct environments and the information exchanged between them from various attacks. Internet-based voting systems are subject to the same security threats as computerized voting systems.

[2] A Two-Phase Authentication Mechanism for E-voting in India - Dr. Maya Rathore, "International Journal of Research in Engineering and Science (IJRES)", April 2022.

In this paper, a two-phase authentication method based on the registered mobile number for e-voting and the Aadhar number is suggested. With the help of this paper, a voter will be able to cast their ballot online from anywhere in India without using a surrogate or casting a second ballot. The suggested mechanism eliminates every flaw in the current voting process, including rigging, fraudulent votes, and errors in voter identification. Every person's Aadhar number is distinct, so the suggested mechanism completely lowers the likelihood of an invalid vote. This method is also friendlier to use for those who are illiterate. By requiring a unique identification number and registered mobile number, this system offers extra security by allowing voters to cast their ballots only once. The suggested mechanism can prevent double voting or cross voting by the same voter by utilizing the concept of flag variables.

[3] Blockchain Based E-Voting System - Mr. Shreeyash Pednekar, Mr. Bhushan Halasagi, "International Journal of Creative Research Thought", May 2022.

Due to the transparency of the blockchain, votes can be more thoroughly audited. Some of the prerequisites for a legal system are represented by these traits. These characteristics, which appear in redistributed networks, have the ability to make elections especially direct election systems more democratic. Using blockchain technology would be a practical way to improve the openness, transparency, and audit ability of electronic polling. In the context of electronic voting, this endeavor illustrates the value and promise of the blockchain technology. The blockchain cannot be tampered with since it is distributed and publicly verifiable. Modern society may find it desirable to change digital election methods to make the public voting process less expensive, quicker, and simpler. This kind of computerized voting system ensures the same thing while also providing extra advantages like an instant electoral count, open-source, transparent voting platforms, and the freedom for users to cast their ballots whenever they want.

[4] Blockchain Based E-Voting System for India Using UIDAI's Aadhaar - Ms. Spurthi Anjan, Mr. Johnson P Sequeira, "Journal of Computer Science Engineering and Software Testing".

It is essential to replace traditional methods of administration with advanced alternatives in order to keep up with current development. We must prioritize user flexibility, security, and transparency when doing so. An electronic voting system model provides these benefits and more, such as instant electoral count, transparent and open source voting

platforms, and the ability for users to vote remotely from home.

[5] Blockchain Based Tamper Proof E-Voting Application - Rahul R, Shabarish D Rao, Shakti KV, "International Research Journal of Modernization in Engineering Technology and Science", July 2022.

A Blockchain-based digital e-voting system that employs a decentralized architecture to make the electoral process more transparent and secure by preserving voters' election integrity. The only prerequisite for using this proposed application system is an Internet connection. The proposed system also aims to increase voter participation in the election by ensuring that any person in any part of the world can vote with a single click. We could eliminate the need for a third party and eliminate the possibility of double voting by designing this proposed model. Thus, when compared to the traditional voting system, the proposed model is more reliable and robust, while also maintaining election integrity. This proposed system can be improved further by incorporating a report generation system that generates a report on the election process's end results. By integrating our system with Aadhar Card API and fingerprint biometric verification, we can implement strong authentication principles.

III. METHODOLOGY

In order to cast the votes, make the vote count transparent, and show the vote total in real time, MyVote will leverage blockchain technology. We can work with blockchain technology by using Solidity to build smart contracts and tools like Ganache, Metamask, and Truffle for testing purpose.
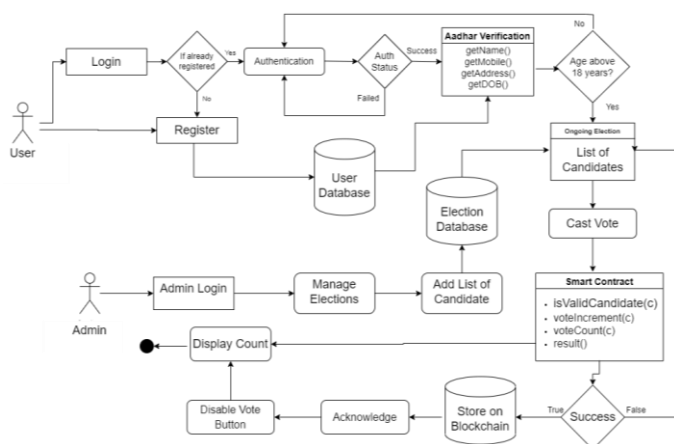

Figure 2: Blockchain Architecture

The voter must first register on the MyVote voting system. After successfully registering, the user can login by just inputting their Aadhar number and then OTP will be sent

to the registered mobile number. After successful verification of OTP, the user's information will be instantly retrieved.

The voting information will be kept on the blockchain and the user will receive an acknowledgment for successfully voting if the voter is eligible to vote. The system will display the candidates list and can only vote for one candidate.

3.1 Modules

Register – The voter must first register on the MyVote site using the user's basic information, including name, address, phone number, date of birth, and Aadhar number. The system will notify the user that the aadhar number is already registered if it has already been registered in the database. Additionally, the portal will notify the user if the user's age as of the date of birth is less than 18 years old. If all went well, the system would enable successful registration and would also encrypt the Aadhar number using SHA-256 encryption for security reasons.

Face-Capture – After Entering all the basic details for registration the user will be redirected to the face capture page where the user's face will be captured and then the captured image will be converted in base64 string and stored in the database along with the user's basic information. The face is captured for avoiding the risk of fake voters.

Login – Voting requires logging in, thus users must do so in order to cast a ballot. The user's Aadhar number is required for the login process, and the system will then encrypt the aadhar number using SHA-256 Encryption and determine whether or not the user is already registered by doing a check. The OTP will be delivered to the user's registered mobile number if they are already registered. Likewise upon a successful verification. A redirect will take the user to the voting page.

Vote Casting –Following a successful login, the user will be taken to the voting page, where they can select a candidate from a dropdown box that lists all the candidates. From where the users can select the candidate whom they wants to vote and click the Vote button to cast their vote. After successfully casting the vote, the vote button will be disabled, making it difficult for the user to vote again.

Face Proctoring – The system will be able to detect faces by using the camera on the user's device. We are utilizing the Face-API library to detect faces. If the camera detects more than one face, the system will display an alert to the user and also sent the user back to the home page and stop their voting process.

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Display Result – A real-time update of the vote total will be shown. Thus the transparency will be maintained and user can also verify their vote is getting counted.

3.2 Tools & Technologies

Solidity - Blockchain networks employ the object-oriented programming language Solidity to build and develop smart contracts. It is used to develop smart contracts, which are used to implement voting processes within the blockchain system and produce a number of transaction records.

Ganache - Using Ganache, a private Ethereum blockchain ecosystem, you can create a copy of the Ethereum blockchain and use smart contracts on your own private blockchain. Additionally, it provides a small number of fictitious Ethereum accounts, each of which includes 100 fictitious ethers, solely for testing purposes.

Metamask - For a connection to the Ethereum network, use the software wallet Meta Mask. It makes it simpler for consumers to interact with decentralized apps by giving them access to their Ethereum wallet through a mobile application or browser extension. It will be utilized with Ethereum transactions that the blockchain will store as votes.

Firebase – Google Firebase is a platform that is used to create iOS, Android, and web applications. For monitoring statistics, reporting and fixing app issues, and creating marketing and product trials, Firebase provides resources. We store user information in Firebase's Fire store database and enable OTP login using its Authentication feature.

Face-API – The Face-API is a library used for face detection, face authentication, face recognition, etc. We used this library in our project to detect faces in the real time and get the count of the faces in real time. If the multiple faces are detected in the webcam then the system will show an alert to the user.
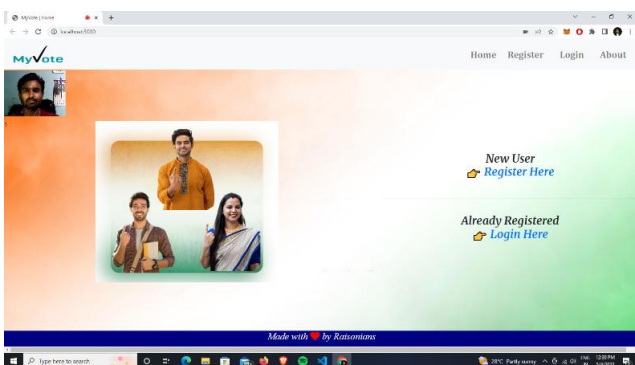
IV. RESULT

Figure 3: Home Page

Whenever the user opens the MyVote portal the Home Page of MyVote will be displayed as shown in fig. 4.
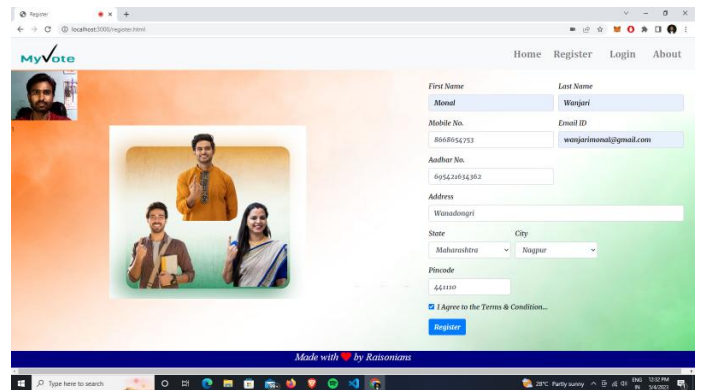

Figure 4: Register Page

Prior to using the MyVote Portal, the user must register first on the portal. After successfully entering all the basic details and clicking on the Register button user will be redirected to the Face Capture page.
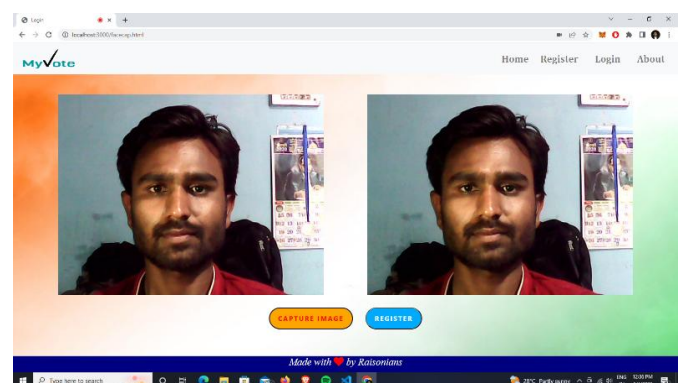

Figure 5: Face-Capture Page

On the face capture page the users face will be captured and the image will be converted in base64 string and all the basic information entered by the user in register page along with the captured image stored in the firebase fire store database.
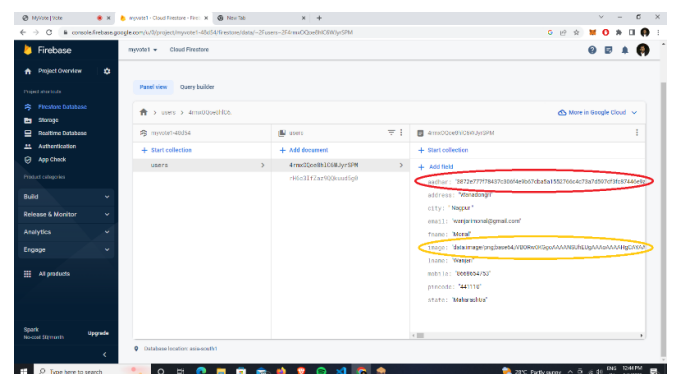

Figure 6: Stored Data in Firebase Fire store Database

After Successful Registration Process all the data gets stored in the firebase fire store database. The aadhar number is encrypted with the SHA-256 Encryption technique before getting stored in the database as shown in fig 5 with red circle. Similarly the captured image also converted in base64 string before getting stored in the database as shown in fig. 5 with yellow circle.
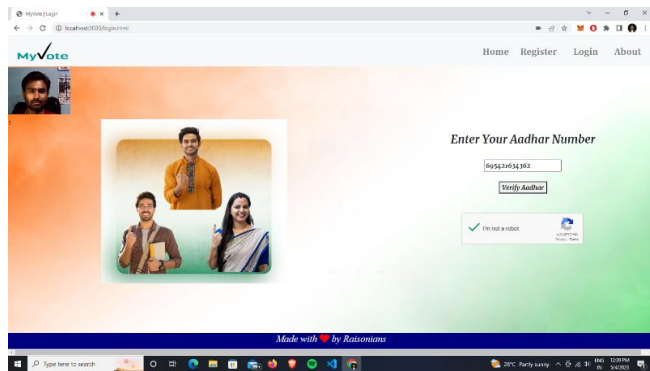

Figure 7: Login Page

Login is required in order to access the voting page. To verify Aadhar, the user must first log in with their Aadhar number.
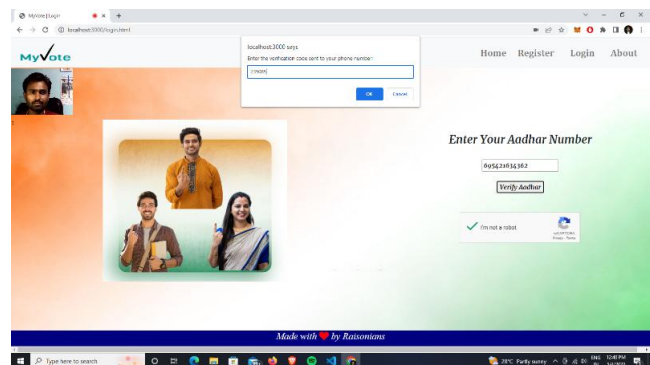

Figure 8: OTP Verification Alert box

The OTP will be sent to the user when they click the Verify Aadhar button. And then as shown in fig. 8, an alert box will display asking the user to enter the OTP.
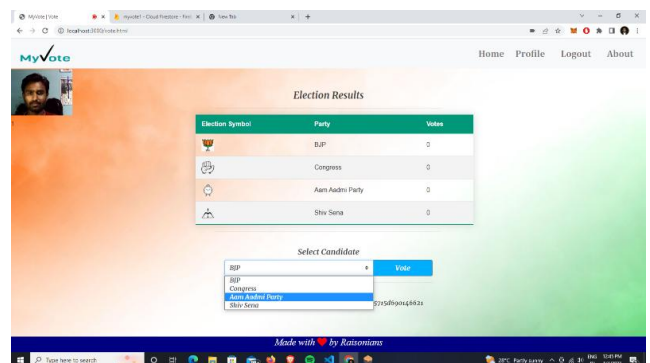

Figure 9: Voting Page

Once the OTP has been successfully verified, the user is sent to the voting page, where they can choose a candidate whom they want to vote from a dropdown box as shown in fig. 9.
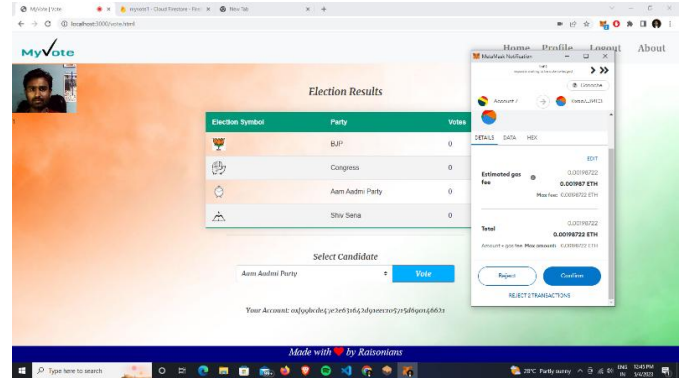

Figure 10: Ethereum Transaction Confirmation (Metamask)

Once the user selects the candidate they want to vote for and clicks the "Vote" button then, the Metamask will display a dialogue box for them to confirm the transaction.
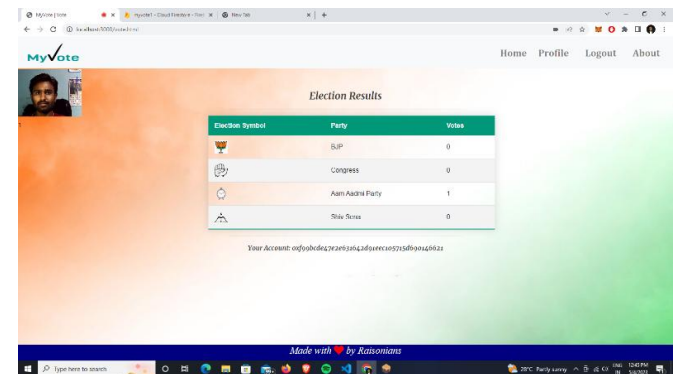

Figure 11: Display Voting Result

The user can view the live vote count for all the candidates on portal as shown in fig. 11. This feature is implemented to maintain the transparency such that the user can also confirm that their vote is counted.

V. CONCLUSION

There will be very less chance that votes will be tampered with or altered because they will be stored on a blockchain. The vote data will be stored on a distributed server. As a result, no single authority will have any authority. Cheating might become less likely as a result. It won't be necessary to have a voter ID card to cast a ballot.

The technology uses a user's Aadhaar Card number to rapidly verify them, and it also uses their age to decide whether they are old enough to vote. This voting mechanism will be far more effective and secure than the ones now in use.

The cost of the administration's election organization will be lower.

The votes are saved on the blockchain; therefore there is very minimal chance of a hack or vote tampering. On a distributed server, voting information will be stored. No single authority will therefore be able to exercise any type of control. As a result, cheating will be less likely. A phone verification is used to help with login. Voting transactions are made using Ethereum.

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Citation of this Article:

Dr. Sonali Ridhorkar, Monal Wanjari, Shamsul Ansari, Pankaj Sonwane, "MyVote - Blockchain Based Online Voting System" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 4, pp 268-274, April 2023. Article DOI https://doi.org/10.47001/IRJIET/2023.704041

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