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Decentralised Voting System Using Blockchain

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Abstract: *Voting is a fundamental right in any democracy granting citizens the power to choose future leaders. It allows individuals to express their opinions and make their voices heard in their community. This empowers the people to have a say in decisions that impact their lives and the future of their country. Without the right to vote, citizens would have no control over who represents them or what policies are implemented. Thus, voting is an essential aspect of democracy, providing citizens with a vital tool to impact the future of their country and shape their society. Online voting systems provide a tool to raise awareness about the importance of citizenship. These software platforms offer a secure way to conduct voting and elections, making the process more accessible and convenient. This can encourage more people to participate in the democratic process, which is essential for a functioning society. By using online voting systems, citizens can realize the power they have to affect change and make a difference in their communities. Overall, online voting systems have the potential to strengthen democracy by promoting civic engagement and increasing participation. Digital platforms provide a convenient and secure way to cast your vote without using paper or gathering in person. These platforms ensure the integrity of your vote by preventing voters from casting multiple ballots. This technology simplifies voting processes, eliminates the need for in-person voting and is an effective way to democratise voting. Through digital platforms, people can exercise their right to vote conveniently, and from anywhere, while contributing to a more efficient and secure electoral process. Electronic voting, or e-voting, offers advantages over traditional paper-based systems. E-voting is efficient, reduces errors, and increases voter participation by enabling voting from anywhere with an internet connection. Blockchain is an advanced and decentralised technology with robust cryptographic foundations that has the potential to enhance several industries. Its distributed nature addresses issues related to data security and privacy, making it a reliable solution for secure and transparent transactions. With its capability of creating tamper-proof and immutable records, blockchain can be instrumental in improving several fields such as supply chain management, healthcare, banking and finance, and more. The technology is still in its nascent stage but holds great promise for creating a trust-less and decentralised ecosystem. Blockchain technology could provide a secure and efficient solution for e-voting. Our proposed system would prevent fraud and simplify the voting process through the use of lockchain.*

Keywords: e-Voting, Block chain, Decentralised, Authentication, Security

I. INTRODUCTION

India, a democratic country, has embraced the digital revolution with the introduction of the Aadhaar card for all its citizens. With the evolution of voting schemes from manual hand counting to electronic voting machines, India is steadily moving towards digitally enabled elections. As a result, the election process in India has become more efficient, transparent and accessible, ensuring that every citizen has an equal opportunity to participate in the democracy. The digital infrastructure implemented in the country has opened up several avenues for growth and development, making it a key player in the global digital landscape.

1.1 Existing System

The current election system is operated manually, requiring voters to physically attend booths to cast their vote. This method results in a waste of time, causing many people to abstain from voting. This trend is concerning as exercising the right to vote is pivotal. Online voting can be a secure and efficient alternative to the traditional voting system. It

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can prevent voting fraud and improve transparency in the process. As every vote is crucial in a democracy, an online voting system can ensure that each voice is heard and counted accurately. With advanced technology, online voting can also make the process faster, more convenient, and accessible to a wider population. Overall, a new online system would strengthen the democratic process and provide a more accurate representation of the people's choices.

1.2 Proposed system

The current voting system has issues that require improvement. One solution is to replace it with a new system that can limit fraud and increase efficiency in the process of voting and counting. This improvement can benefit voters and ensure a fair election.

Following are the main features of our project :

- Online Election System would have user registration, user login and admin login
- This system allows voters to easily access and exercise their voting rights by providing a secure login to manage their information.
- During voter registration, individuals will be required to provide their full name, age, Aadhaar card number, mobile number, and email address. Once these details have been submitted, the information will be verified to ensure accuracy. Upon successful verification, voters will be granted access to participate in elections. It is important to note that the verification process is crucial to maintaining the integrity of the election process, and to prevent fraudulent activities such as duplicate or fake voter registrations.
- To ensure a secure voting process, voters will be required to enter their Aadhaar ID when requesting to vote. Once authenticated, they will be able to select a candidate from the list and submit their vote. Each voter is only allowed to vote for a candidate once per election, ensuring fairness and preventing any fraudulent activity. This system helps to maintain the integrity of the voting process and ensures that every vote is counted accurately.
- The software system enables users to log in and upload their information, including previous milestones. The admin has the ability to review each candidate's information.
- The software system enables voters to access a list of candidates in their locality. The admin has complete control over the system and has the authority to manage and remove any information that does not conform to the election regulations.

II. BLOCKCHAIN

Blockchain technology is an ideal candidate for implementing a secure and tamper-proof voting system due to its immutable and transparent nature. The distributed ledger system ensures that information cannot be altered or deleted, providing a high level of security and trust in the voting process. A blockchain-based voting system can also enable greater efficiency and accessibility, allowing for secure remote voting and reducing the need for physical polling stations. As blockchain technology continues to evolve, it has the potential to transform the way we think about democratic processes and improve the integrity of electoral systems worldwide.The distributed ledger system involves each node having its own copy of all transaction data, eliminating the need for a central control system. If the majority of the nodes within the network agree on a transaction, it is accepted. This decentralisation allows for greater security and transparency within the system.

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Blockchain technology can revolutionise e-voting by making it cheaper, easier, and more secure to implement. This new paradigm helps to create decentralised systems that ensure the integrity, availability, and fault tolerance of data.

Blockchain technology is designed to transform existing systems by creating decentralised networks of computers that validate and record online transactions. These networks also include ledgers that link digital data together into blocks, forming what is known as blockchain. By transforming traditional systems into this decentralised model, blockchain technology has the potential to revolutionise industries ranging from finance to healthcare and beyond.

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Benefits of blockchain system over traditional systems

a. Increasing the level of participation :

The Internet voting system enables maximum user participation by providing the flexibility of voting from anywhere with an internet connection, using any device. This convenience allows voters to cast their ballots at their own convenience, which can lead to higher voter turnout rates. The accessibility of the Internet voting system can also benefit individuals who have mobility issues or live in remote areas, ensuring their democratic rights are fulfilled. Overall, the Internet voting system increases the accessibility and convenience of the voting process, promoting a democratic society.

b. Security :

Implementing e-voting systems using blockchain is crucial because it can provide a secure, transparent, and immutable platform for voting that cannot be tampered with or manipulated. Blockchain's decentralisation and consensus mechanisms ensure that every vote is accurately recorded and distributed across the network, making it virtually impossible for malicious actors to interfere. Furthermore, blockchain-based e-voting systems can eliminate the need for intermediaries like election officials or third-party software providers, thereby streamlining the voting process and reducing costs. In summary, lever aging blockchain for e-voting can help ensure fair and democratic elections.

c. Efficiency :

Electronic voting significantly improves the efficiency of election management due to the reduction in organisational and implementation costs, in comparison to traditional paper voting methods. This leads to significant savings in time and resources, enabling election officials to focus on issues relating to voter education, outreach, and security. Overall, the use of electronic voting systems can help to streamline the election process while ensuring greater accessibility, transparency, and accuracy.

d. Precision :

The electronic voting system solves the problem of errors in manual counting of votes, resulting in an accurate and prompt release of election results. Moreover, each vote cast has a receipt, adding to the transparency and credibility of the electoral process. This automated process saves time and simplifies the counting process while providing reliable results. Seeking to eradicate errors and ensure anonymity, the electronic voting system serves as an agile and modern way to conduct fair and valid elections.

III. LITERATURE SURVEY

1.Blockchain technology based e-voting system.

Prof. Anita A. Lahane, Junaid Patel, Talif Pathan and Prathmesh Potdar.

Juhu Versova Link Rd, behind HDFC Bank, Gharkul Society, Bharat Nagar, Versova, Andheri West, Mumbai, Maharashtra 400053

This paper presents a security model and criteria for evaluating comprehensibility and applies it to a web voting system called Pretty Graspable Democracy. The authors demonstrate that this system meets the security requirements and is more user-friendly than the current system, Pretty Smart Democracy.

2 Blockchain Based E-Voting System

Prof. Mrunal Pathak, Amol Suradkar, Ajinkya Kadam, Akansha Ghodeswar, Prashant Parde

Assistant Professor at Information Technology Department, AISSMS Institute of Information technology, Pune, Maharashtra, India

B.E. Scholar, Information Technology Department, AISSMS Institute of Information technology, Pune,Maharashtra, India

This paper proposes how there is a future scope for the development of blockchain-based applications that can streamline business processes, increase transparency and security, and reduce costs. These applications include supply chain management, identity verification, smart contracts, and decentralised finance. As the technology continues to evolve and more use cases are discovered, the future of blockchain looks promising for businesses and consumers alike.

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3. A Framework to Make Voting System
Transparent Using Blockchain Technology
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A system has been proposed that eliminates the need for operating entities, but it lacks the ability to ensure a voter's identity. Additionally, the system requires intricate computing processes.

IV. METHODOLOGY & PROPOSED WORK

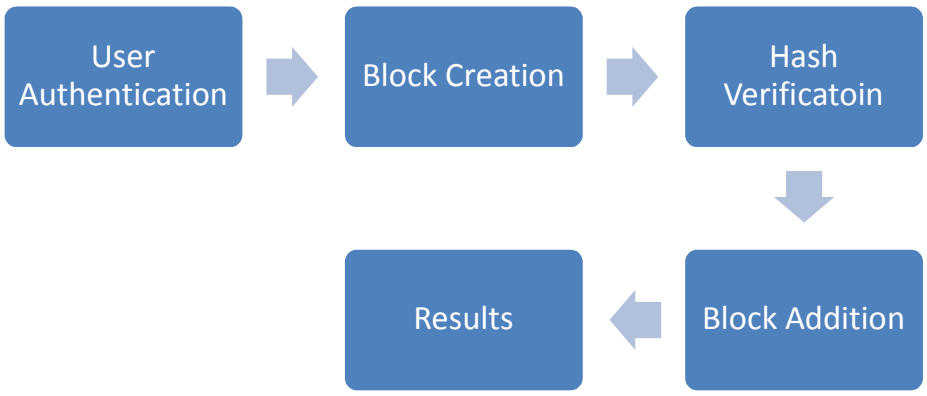

Fig. . Block diagram of proposed system flow

Step 1 : User Authentication : Proposed system allows users to create their own accounts and submit personal information for verification by the admin. Upon successful information verification, the admin will mark the user as verified, allowing them to access the full range of features available in the project. This authentication process ensures the security of user data and enhances the overall user experience within the project.
Step 2 : Block Creation :Transactions in Ethereum are shared with the network and consolidated into a transaction pool. These transactions can encompass sending ether or performing smart contracts.
Step 3 Hash Verification :Miners play a crucial role in the blockchain network by validating and adding new blocks. They select transactions from the pool and create a new block by gathering required data including previous block's hash and a timestamp. This process ensures the accuracy and security of the blockchain. As a reward for their efforts, miners receive crypto-currency or transaction fees. Overall, miners form the backbone of the blockchain network and enable the decentralised and transparent nature of the technology.
For encryption we use SHA-256 algorithm SHA-256 (Secure Hash Algorithm 256-bit) is a cryptographic hash function that operates on input data and produces a fixed-size output of 256 bits. Here's a simplified explanation of how SHA-256 works:

- Input Preparation: The input data, which can be any length, is processed in blocks of fixed size. Padding is applied to ensure the last block is complete.
- Initialisation: SHA-256 starts with an initial set of constants, called the initial hash values. These values are predetermined and unique to the algorithm.

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- Message Schedule: Each input block goes through a message schedule calculation. The message schedule expands the block into an array of 64 words.
- Compression Function: The compression function performs a series of operations, involving logical functions, bitwise operations, and modular addition. It takes the current hash value and the expanded message block as inputs and produces a new hash value.
- Iteration: The compression function is iterated 64 times for each block, using different constants and words from the message schedule in each iteration.
- Finalisation: Once all the blocks have been processed, the resulting hash values from each compression function iteration are combined to form the final hash value. The final hash is a 256-bit output representing a unique digest of the input data.

SHA-256 is designed to be a one-way function, meaning it is computationally infeasible to reverse-engineer the original input from the hash value. It is widely used in various applications, including blockchain technology, digital signatures, password storage, and data integrity verification.

Step 4 : Block addition:After validation, the new block is added to the blockchain, becoming the latest block in the chain. All nodes update their local copies of the blockchain to incorporate the new block.

Step 5 : Results :Hence new blocks are added into blockchain.

V. EXPERIMENTAL RESULTS

Our team has designed an intuitive and user-friendly interface for our decentralised voting application. Our goal is to simplify the voting process and make it more accessible to everyone. With our interface, users can easily navigate through the various options and cast their votes with just a few clicks. We believe that by making the process more convenient, we can encourage more people to participate in democratic decision-making.

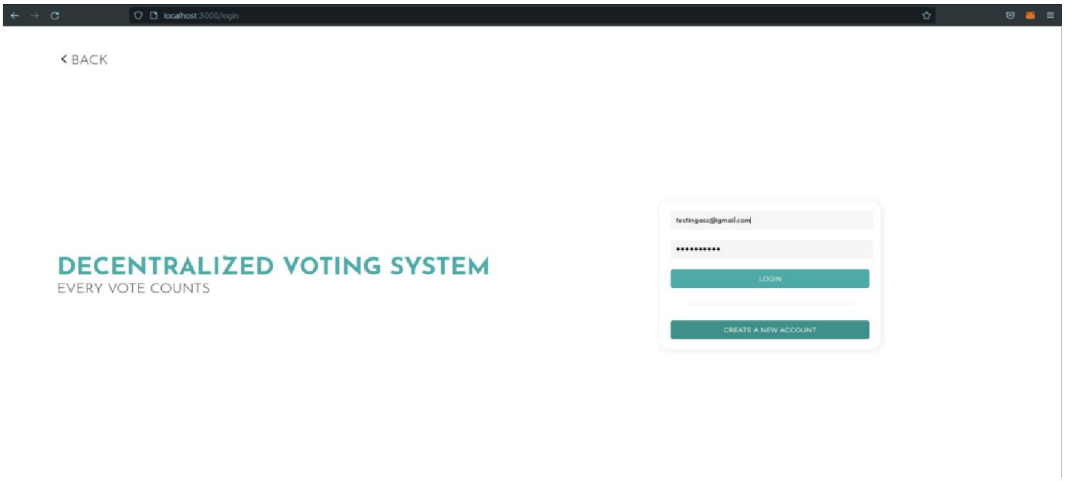

Fig. . Login Page

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Fig. . Results Page

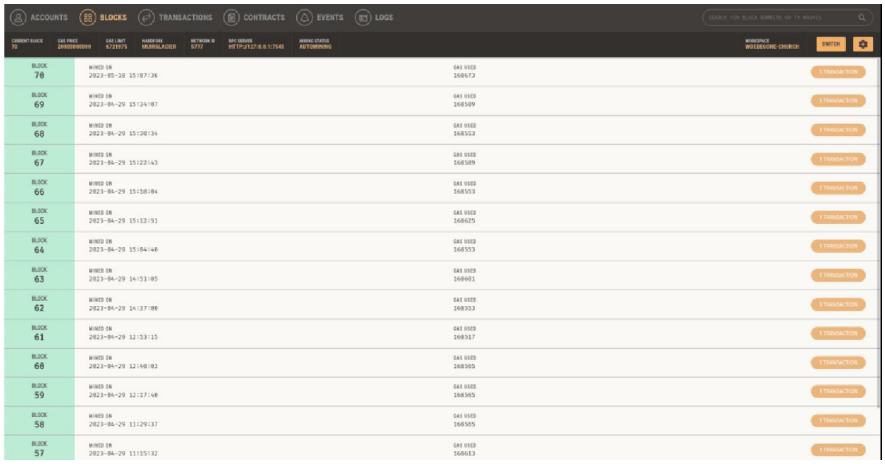

Fig. . Blocks visualisation in Ganache

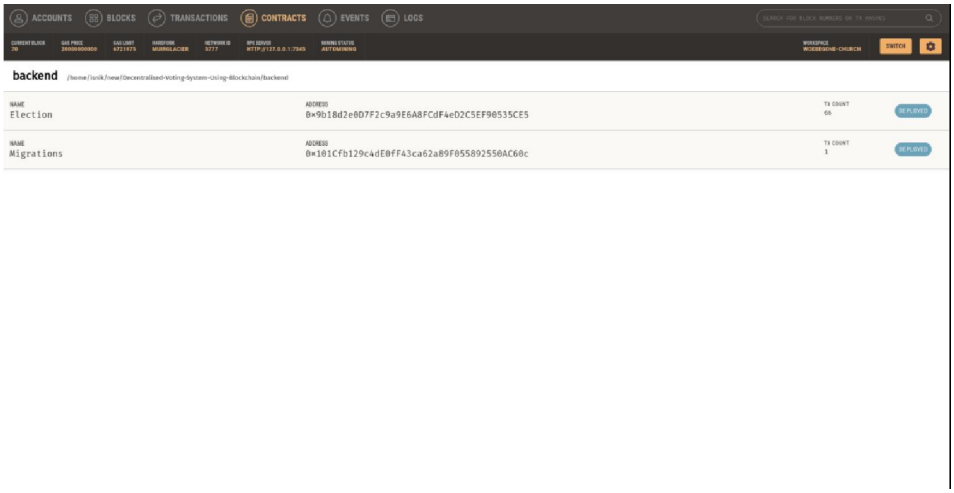

Fig. .Smart contract deployment in Ganache

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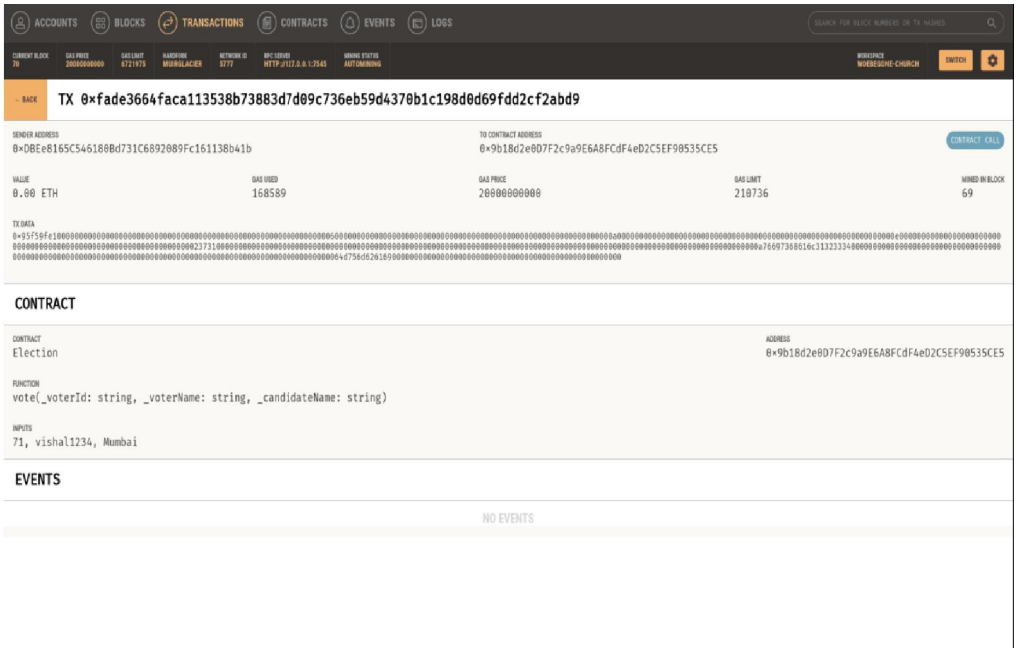

Fig. . Information about mined block in Ganache

VI. CONCLUSION

Our project developed a secure and cost-efficient electronic voting system utilising blockchain technology and smart contracts. This ensured privacy for voters and minimised the risk of fraudulent activities.

Blockchain technology provides a solution to the challenges faced by electronic voting systems, allowing for secure and transparent elections. It eliminates the need for intermediaries, ensuring the integrity and confidentiality of the voting process. With the ability to create immutable records and track results in real-time, blockchain technology offers unparalleled transparency. It provides a potential solution to the obstacles faced by electronic voting systems, removing concerns over security and promoting voter participation.

Through an Ethereum private blockchain, sending numerous transactions per second can be done efficiently by utilising all features of the smart contract. This helps reduce the burden on the blockchain and improve transaction processing rates.

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