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# Smart and Secured Online Voting System Using Blockchain Technology

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**ABSTRACT:** Nowadays, Blockchain technology plays a major role in human life in helping to meet the needs of humans. Due to the increase in the usage of technology, new challenges are brought into society as most people today don't trust their governments. Elections have a great importance in determining who will rule a nation or an organisation or it can be said as it is an event that decides the fate of any nation. In modern days, elections are very important but the problem is large sections of society around the world do not trust the election system which is a major concern for democracy. Even the world's largest democracies like India, and the USA, nevertheless suffer from an incorrect electoral machine. Vote rigging, hacking of EVM (Electoral vote casting gadget), election manipulation, and polling sales space capturing are the main problems in the present-day balloting gadget.

**KEYWORDS:** Blockchain, Governments, Elections, democracy, flawed electoral system, vote rigging, EVM, election manipulation, polling booth capturing.

## I. INTRODUCTION

In recent years, technological advancements have significantly transformed various aspects of our daily lives, including the way we conduct elections. Traditional paper-based voting systems are often plagued by issues such as fraud, tampering, and logistical challenges. In response to these shortcomings, electronic voting (e-voting) systems have emerged as a promising alternative. Among the various technological innovations being explored to enhance e-voting security and transparency, Blockchain technology has been a significant attention. The ways of paper voting and E-voting maintain one common thing, which is voters need to travel to the designated polling station to cast their vote. The counting process of paper voting which completed manually or by machine (physical counting) after the voting process. In contrast, E-voting is synchronously counting when each vote is cast. The last process will be the same for both results by integrating all counts of each candidate from the polling stations. Considering that in 1999, India was one of the countries that used EVMs for the election. EVMs in India are cost-effective compared to the other E-voting. Blockchain generation was first conceptualized because the underlying.

Framework for cryptocurrencies like Bitcoin has evolved into a versatile tool with applications across various industries at its center, a Blockchain is a decentralized, allotted ledger that record transactions in a comfortable, transparent, and immutable way. This technology holds immense potential to address some of the key challenges associated with traditional e-voting systems, including trust, transparency, and security. One of the primary advantages of integrating Blockchain technology into e-voting systems is its ability to ensure the integrity of the voting process.

## II. RELATED WORKS

This paper presents in this area different arrangements that endeavor to incorporate E-casting a ballot and Blockchain to empower the decentralization of casting a ballot administration. The vastest of them are going to be mentioned right here. Maintaining the Integrity of the Specifications. All of the noteworthy statistics like outcomes and votes stored on a Blockchain. There has been no authority access to the information or the information to exchange it from any node or ledger.

[1]. In the year 2021, the authors Ganesh Prabhu.S, Prabu.S, R.R.Thirrunavukkarasu, Nizarahammed. A, Raghul.S and P. Jayarajan proposed methodologies called the "Face Recognition Method" and "OTP-based system". In this project, Arduino, LCD, and Push buttons were used. The proposed machine has many robust functions like correctness, verifiability, convenience, and so on. For this system no requirement for an election officer, paper ballot, or any electronic voting machine only an internet connection. [2] In the year 2020, the authors K. Lakshmi Sai Priya, Ch.

Rupa proposed a “Block Chain Technology Electoral Franchise” using Blockchain Technology. The System is implemented on a ganache and solidity platform by considering Eth cryptocurrency. By using Blockchain, a robust and secure system for electronic voting can be devised. ID theft or vote tampering is not possible in this BCT voting.

[3]. In the year 2019, the authors BASIT SHAHZAD, JON CROWCROFT proposed “Trustworthy Electronic Voting Using Adjusted Blockchain Technology”. In this system, we consider Pakistan as a case study. Before casting the vote, the voter has to be authenticated by the biometric system. The record of the voter is checked with the help of NADRA’s (National Database and Registration Authority). [4]. In the year, the authors Gökhan DalkÖlÖç, Umut Can Çabuk, Emre Yavuz, Ali Kaan Koç, proposed “Towards Secure E-Voting Using Ethereum Blockchain”. In this study, Ethereum environment is preferred as the development platform and the blockchain network. Transparency, authentication and provability in the voting platform can be provided by using BlockChain Technology.

[5]. In the year 2019, the authors Sahil Gupta, Sai Krishna Kothuri, Sahil Kr. Aggarwal, Sachin Bisht, Pavi Saraswat, Kanika Garg, proposed "A Comparative Analysis on E-Voting System Using Blockchain". In this paper they were studied on e-voting in thematic basis like e-voting with iot and fingerprint, e-voting with blockchain and Aadhar verification. The main advantages are Low Cost, Speed, Scalable, Ease-of-Use, Fraud-Resistance.

[6]. In the year 2020, the authors Emmanouil Vasilomanolakis, Johannes Mols, proposed "ethVote : Towards secure voting with distribute ledgers". They proposed ethVote - an Internet Voting system that is based on Ethereum smart contracts. Future work includes the addition of the zero-knowledge proof implementation to the PoC. [7]. In the year 2019, the authors Arpan Sarkar, Aritra Paul, Sanchay Mishra, "Block Chain Based Cloud Computing Model on EVM Transactions for Secure Voting". Our proposed system involved storing the ballot information as a block for each and every voter and transfer the hash over internet to cloud based storages, which when tallied with the EVM can discretely identify the manipulated votes. Implementing cloud-based solutions as well as blockchain for security will improvise on the transparency for the critics and also improve the security on the ballot information that is collected.

[8] In the year 2019, the authors George Asante, Samuel Agbesi, proposed “Electronic Voting Recording System Based on Blockchain Technology Distributed Ledger Technology (DLT)”. By using a P2P network which allows copies of the blockchain database to be shared among all the participant on the blockchain. The main advantages are trust and transparency.

[9]. In the year 2020, the authors Ch.sai pratap varma, D.sumanth rahul Jithina Jose, B Keerthi Samhitha Suja Cherukullapurath Mana proposed “Aadhar Card Verification Base Online Polling”. In the proposed system, Aadhar Database is used as the backbone of our project to verify and test voting qualifications. This determines by its special finger impression on the actual voter whether or not he/she is a significant voter. [10]. In the year 2020, the authors Riswanto, Pandu Bintang Pratama , Dana Indra Sensuse, ”Conceptual Model of E-Voting in Indonesia”. Electronic voting refers to any system where a voter casts his or her ballot using an electronic system, rather than a paper ballot (or a mechanical machine to punch a paper ballot).

[11]. In the year 2020, the authors Zeyad A.T. Ahmed, Vivek Mahale, d Dr.Ashok T. Gaikwad, Ali Mansour Al- madani proposed “Decentralized E-voting system based on Smart Contract by using Blockchain Technology”. The application based on Ethereum Blockchain technology as a network and a decentralized database all in one for storing voter’s accounts, votes, and candidates’ details. Blockchain provides a decentralized model that makes the network reliable, safe, flexible and able to support real-time services. [12]. In the year 2019, the authors Vijayalakshmi V, Vimal S, proposed “A Novel P2P based System with Blockchain for Secured Voting Scheme”. In our study, we present various solutions for the process of secured voting by integrating e-voting and Blockchain technology. The requirements needed to poll a vote is an application with the internet connection in the booth and a mobile application, if the user wants to verify his/her polled vote.

### III. BLOCKCHAIN TECHNOLOGY

Blockchain ensures unmatched security in online voting by decentralizing and distributing voting data across a network. This decentralized structure safeguards against manipulation and fraud, enhancing the overall integrity the electoral process. The transparent nature of Blockchain allows all participants to independently verify the accuracy of recorded votes. Participants can scrutinize the Blockchain, contributing to increased transparency and building trust in the reliability of the online system. Blockchain's inherent features, such as resistance to tampering and immutability, contribute to the overall integrity of the electoral process.

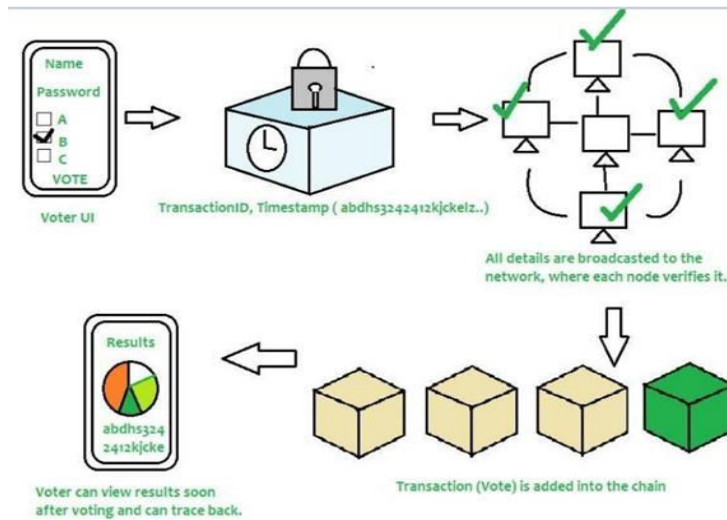


Fig. 1. Web Application Architecture

#### IV. PROCESS OF ONLINE VOTING

The first step in this approach is a detailed examination of the system's needs, which include security, openness, accessibility, and scalability. The next step is to carefully choose a Blockchain platform that works for you, like Ethereum, to take advantage of its built-in features, such as decentralization and smart contracts. The critical development stage then begins, during which time strong smart contracts are carefully written to oversee every aspect of voting, including voter registration, ballot preparation, voting, and tabulation of results. Meanwhile, frontend developers work to create a user-friendly interface that can be easily integrated with Blockchain transactions using MetaMask or other comparable tools to guarantee safe authentication and transaction processing. To find and fix vulnerabilities and guarantee adherence to legal requirements and data protection policies, thorough security audits and rigorous testing are carried out.

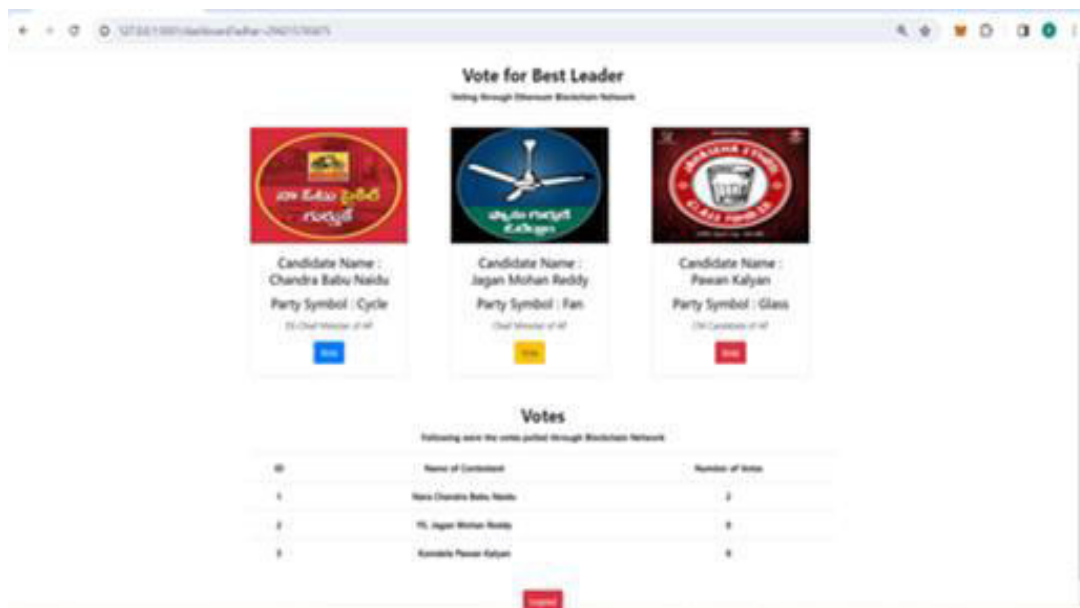
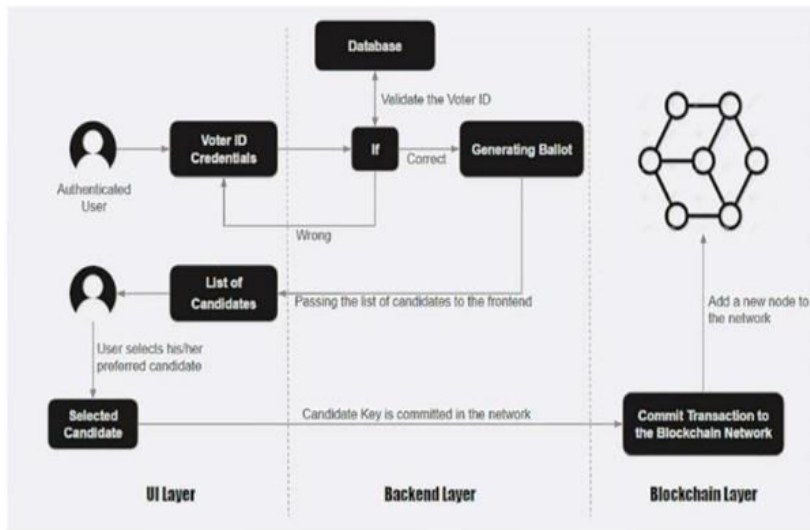


Fig. 2. Process of Online Voting



Smart contracts and the frontend application are carefully deployed as part of the deployment, which also includes proactive voter outreach and education campaigns to encourage participation and answer concerns. The electoral process is made more trustworthy and confident by the implementation of rigorous result verification procedures, responsive support, and constant monitoring to preserve the online voting system's efficacy, integrity, and openness. All of the business logic and the electronic voting program are located here. This is also where all the codes could be written. Smart contracts for the Ethereum virtual machine enable code writing and modification of both reading and writing. Smart contracts are similar to web microservices in that they transport data and carry out any business logic that the software specifies.



Fig. 3. Registration Page

There are prerequisites for developing Decentralized Applications (DAPs), including Command prompt, Truffle Framework, Ganache. The specifics of each are as follows:

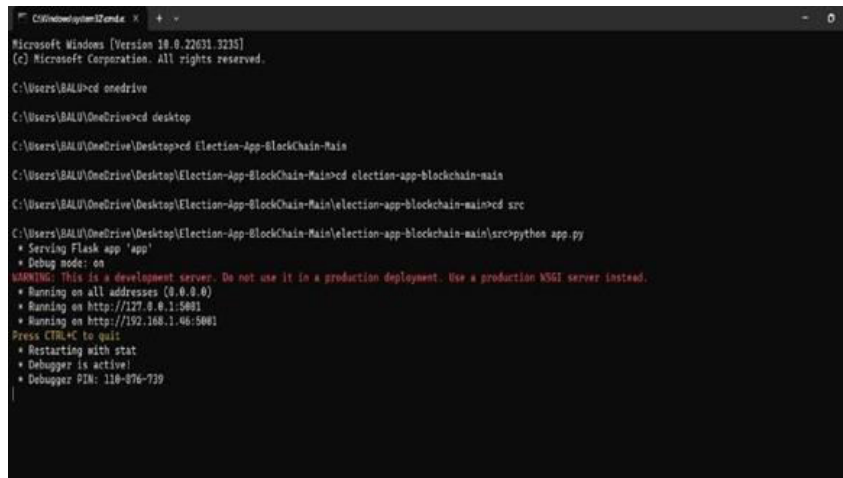


Fig. 4. Command Prompt

### A. Truffle Framework

One of the best development frameworks for Ethereum Blockchain applications is called Truffle. It offers a set of tools that make creating, testing, and implementing decentralized apps (DApps) and smart contracts easier. Developers can create automated tests, manage project dependencies, and publish contracts to several Blockchain networks with ease by using Truffle. It is a vital tool for Ethereum developers because it comes with built-in support for smart contract compilation, migration, and debugging. With Truffle's extensive feature set and user-friendly interface, developers can quickly and easily build reliable and secure Blockchain apps, which speeds up the development process and promotes innovation in the decentralized ecosystem.

### B. Ganache

A portable Blockchain emulator called Ganache is used for testing and developing Ethereum applications. As a personal Blockchain emulator for testing Ethereum-based applications (DApps), Ganache is a local Blockchain development environment designed specifically for Ethereum developers. Without the need for external connections, it allows developers to set up a local Blockchain network on their computer, mimicking the behavior of an actual Blockchain network. Pre-funded Ethereum accounts are included with Ganache, enabling developers to easily mimic transactions and account interactions. Moreover, it offers comprehensive transaction logs and an intuitive interface, enabling developers to effectively monitor and communicate with the local Blockchain network. Before releasing their Ethereum projects to a live network, developers may obtain important insights into the behavior of smart contracts and the performance of their applications in a controlled environment by using Ganache to streamline.

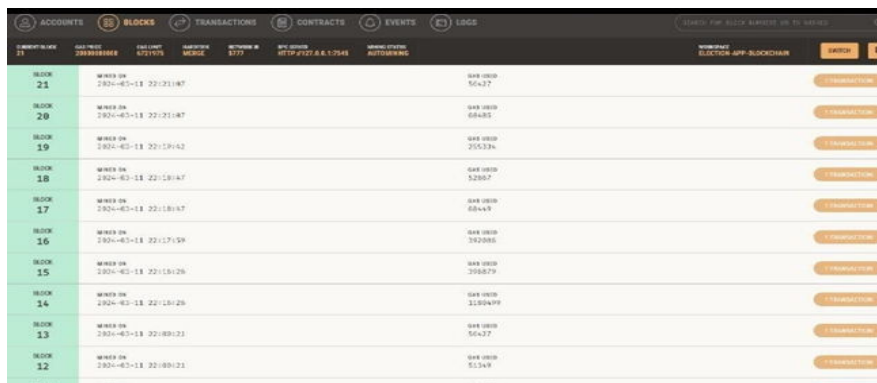


Fig. 5. Ganache



**C. MetaMask**

The well-known cryptocurrency wallet and browser add-on MetaMask enables users to communicate with Ethereum Blockchain decentralized apps or DApps. It lets users handle, move, and store Ethereum and other ERC-20 tokens safely. Additionally, MetaMask serves as a portal for users of web browsers like Chrome, Firefox, and Brave to easily access Ethereum-based DApps. MetaMask's intuitive user interface and strong security features have made it a vital tool for interacting with Blockchain-based apps and services and navigating the decentralized ecosystem.

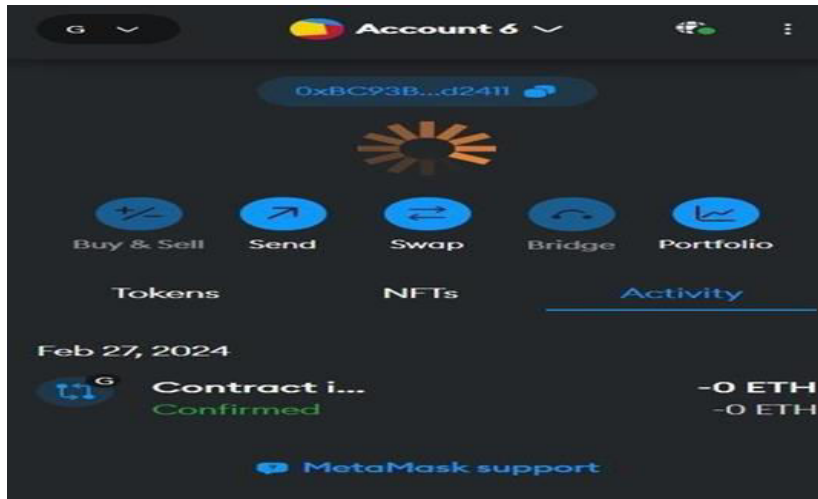


Fig. 6. Metamask

**SMART CONTRACTS IN BLOCKCHAIN**

Smart contracts are self-executing contracts with the terms of the agreement immediately written into code. They run on Blockchain networks and automatically execute and enforce the terms of the agreement when predefined conditions. Using Blockchain technology to create an intelligent and safe online voting system is a multi-step process where smart contracts are essential to maintaining the transparency and integrity of the system. The following is how smart contracts are put into practice in such a system: Analysis of Requirements: Recognize the needs and goals of the online voting system, including its scalability, security, accessibility, and transparency.

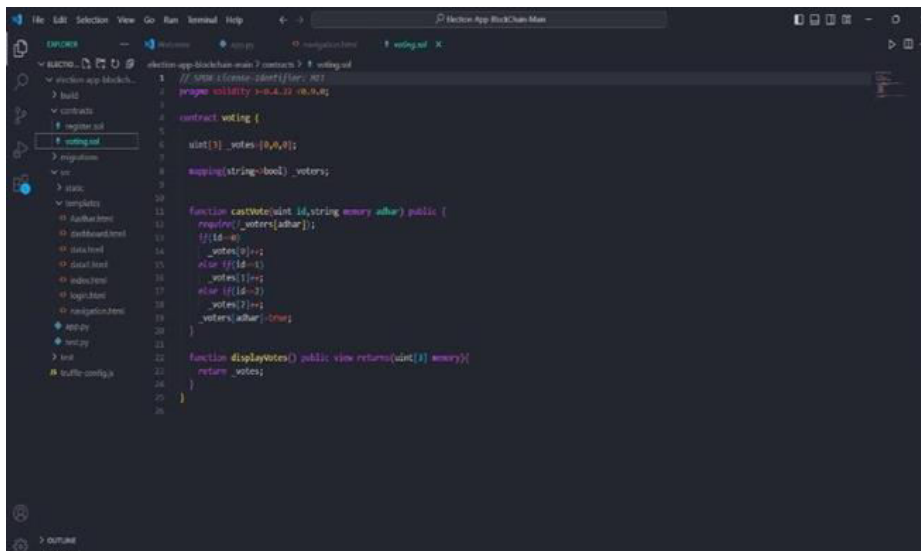
Smart Contract Architecture: Describe the architecture and reasoning of the smart contracts that control the voting procedure. Create smart contracts to handle operations like result tabulation, ballot production, voter registration, and voting. Use security elements to protect the voting process's integrity, such as encryption and access control methods.

```

1  // SPDX-License-Identifier: MIT
2  pragma solidity ^0.8.0;
3
4  contract Register {
5      string[] _names;
6      string[] _ahars;
7      string[] _mobiles;
8      string[] _dobs;
9      string[] _states;
10     string[] _districts;
11     string[] _pincodes;
12     string[] _statuses;
13     mapping(string => bool) _users;
14
15     function adduser(string memory name,string memory ahar,string memory while,string memory do,string memory state,string memory district,string
16         memory mobile) public {
17         require(!_users[name]);
18         _names.push(name);
19         _ahars.push(ahar);
20         _mobiles.push(mobile);
21         _dobs.push(do);
22         _states.push(state);
23         _districts.push(district);
24         _pincodes.push(picode);
25         _statuses.push(wh);
26         _users[name]=true;
27     }
28
29     function validateuser(string memory ahar,uint state) public {
30         uint i;
31         for(i=0;i<_ahars.length;i++){
32             if(keccak256(abi.encodePacked(ahar)) == keccak256(abi.encodePacked(_ahars[i]))){
33                 _statuses[i]=state;
34             }
35         }
36     }
37 }
    
```

Fig. 7. Register.Sol

Choosing a Blockchain Platform: Select a Blockchain platform that works well for the online voting system—such as Ethereum—that can accommodate smart contracts and provide the capabilities and scalability needed. Development of Smart Contracts: Use a programming language that is compatible with the selected Blockchain platform to create smart contracts, such as Solidity for Ethereum. Implement features in smart contracts to manage processes such as ballot creation, voter registration, and vote counting. Make sure that common security flaws like multiple voting and tampering are avoided in the design of smart contracts. Security audits and testing: Make sure smart contracts are thoroughly tested to find and fix any problems or vulnerabilities. Conduct security audits to evaluate the resilience of smart contracts and make sure they follow safe development best practices. Frontend integration: Provide a front-end interface for the online voting system that is easy to use, like a web or mobile application. Connect the blockchain's smart contracts to the front end to facilitate activities like voting and voter registration. Verification of Voters: To confirm voters' identities and stop illegal access to the voting system, put in place a secure authentication system. Make sure voter identities are authentic by using cryptographic techniques like digital signatures. Then later Voting process execution takes place along the results tabulation and transparency, now development, and maintenance come in if required.



```

1 // SPDX-License-Identifier: MIT
2 pragma solidity ^0.8.20 <0.9.0;
3
4 contract Voting {
5     uint[] _votes [0x0,0];
6     mapping(string->bool) _voters;
7
8     // state
9
10
11     function castVote(uint id,string memory addr) public {
12         require(!_voters[addr]);
13         [][18-0];
14         _votes[id]=1;
15         emit [][14-1];
16         _votes[id]=1;
17         emit [][14-2];
18         _votes[id]=1;
19         _votes[addr]=true;
20     }
21
22     // helper
23
24     function displayVotes() public view returns(uint[] memory){
25         return _votes;
26     }
27 }
    
```

Fig. 8. Voting.Sol

### V.CONCLUSION

In light of the prevalent challenges facing electoral systems globally, the integration of Blockchain technology emerges as a promising solution to restore trust and integrity in democratic processes. As society becomes increasingly reliant on technology, skepticism towards governmental institutions poses a significant barrier to effective governance. Elections, as pivotal events shaping the destiny of nations, demand utmost transparency and fairness. Issues such as vote rigging, EVM hacking, election manipulation, and polling booth capturing undermine the sanctity of the democratic process. However, the advent of Blockchain technology offers a beacon of hope for reform. With its decentralized, transparent, and tamper-resistant nature, Blockchain holds the potential to revolutionize electoral systems.

In conclusion, the project underscores the urgency of embracing innovative solutions to address the challenges confronting democratic governance. Through collaborative efforts between governments, technologists, and civil society, we can pave the way for fairer, more transparent, and resilient electoral systems. By harnessing the power of Blockchain technology, we reaffirm our commitment to upholding the principles of democracy and safeguarding the democratic process for generations to come.



## REFERENCES

- [1] Ganesh Prabhu.S, Prabu.S, R.R.Thirrunavukkarasu, Nizarahammed. A, Raghul.S, P. Jayarajan, "Smart Online Voting System",7th International Conference on Advanced Computing and Communication Systems (ICACCS), pp.632-634, 2021 IEEE.
- [2] K. Lakshmi Sai Priya, Ch. Rupa, "Block Chain Technology based Electoral Franchise", 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA) ,pp.1-5, 2020 IEEE.
- [3] BASIT SHAHZAD, JON CROWCROFT, "Trustworthy Electronic Voting Using Adjusted Blockchain Technology, IEEE Access, vol.7, pp.24477-24488, 2019 IEEE.
- [4] Gökhan Dalkılıç , Umut Can Çabuk, Emre Yavuz, Ali Kaan Koç, " Towards Secure E-Voting Using Ethereum Blockchain", 6th International Symposium on Digital Forensic and Security (ISDFS), 2019 IEEE.
- [5] Sahil Gupta, Sai Krishna Kothuri, Sahil Kr. Aggarwal, Sachin Bisht, Pavi Saraswat, Kanika Garg, "A Comparitive Analysis on E-Voting System Using Blockchain", 2019 4th International Conference on Internet of Things Smart Innovation and Usages (IoT-SIU), 2019 IEEE.
- [6] Emmanouil Vasilomanolakis, Johannes Mols, "ethVote: Towards secure voting with distribute ledgers", 2020 International Conference on Cyber Security and Protection of Digital Services (CyberSecurity), pp. 1-8, 2020 IEEE.
- [7] Arpan Sarkar, Aritra Paul, Sanchay Mishra, "Block Chain Based Cloud Computing Model on EVM Transactions for Secure Voting", 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC), pp.1075-1079, 2019 IEEE.
- [8] George Asante, Samuel Agbesi, "Electronic Voting Recording System Based on Blockchain Technology", "Distributed Ledger Technology (DLT)", 2019 12th CMI Conference on Cybersecurity and Privacy (CMI), 2019 IEEE.
- [9] Ch.Sai Pratap Varma D.sumanth rahul Jithina Jose B Keerthi Samhitha Suja Cherukullapurath Mana "Aadhar Card Verification Base Online Polling", Proceedings of the Fourth International Conference on Trends in Electronics and Informatics (ICOEI 2020), pp. 479-483.
- [10] Riswanto, Pandu Bintang Pratama, Dana Indra Sensuse ,” Conceptual Model of E-Voting in Indonesia”, 2020 International Conference on Information Management and Technology (ICIMTech), pp. 387-392.
- [11] Zeyad A.T.Ahmed ,Ali Mansour Al-madani, Vivek Mahale, Dr.Ashok T. Gaikwad, “Decentralized E-voting system based on Smart Contract by using Blockchain Technology”, 2020 International Conference on Smart Innovations in Design, Environment, Management, Planning and Computing (ICSIDEMPC), pp. 176-180.
- [12] Vijayalakshmi V, Vimal S, “A Novel P2P based System with Blockchain for Secured Voting Scheme”,2019 Fifth International Conference on Science Technology Engineering and Mathematics (ICONSTEM), pp. 153-156.



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