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ONLINE VOTING SYSTEM

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Abstract: The word “vote” means to choose from list, to elect or to determine. The main goal of voting (in a scenario involving the citizens of a given country) is to come up with leaders of people’s choice. In response to the inherent challenges faced by traditional voting systems, the proposed online voting system serves as a forward-looking solution, aiming to alleviate issues such as vote rigging, insecure polling stations, insufficient materials, and inexperienced personnel. Recognizing the pivotal role of elections in selecting leaders. This ensures a secure and verified voting process, mitigating concerns about tampering or unauthorized access. Moreover, the online voting platform emphasizes user empowerment and accessibility. Citizens are granted ample time during the voting period, fostering greater participation. To enhance the electorate's confidence and proficiency in the digital voting process, comprehensive training sessions are provided before the election. This proactive approach not only addresses concerns related to inadequate polling materials and inexperienced personnel but also promotes a more inclusive and informed electorate. By combining secure authentication, extended voting periods, and user education, the online voting system aspires to usher in a new era of democratic participation, transcending the limitations of traditional voting mechanisms.

“Index Terms: E-voting, Ballot, Encryption, Security, Multi-factor Authentication, Web/Mobile App, Blockchain”.

1. INTRODUCTION

Voting systems have evolved significantly from traditional hand-counting methods to advanced electronic systems. The early voting techniques involved simple hand counting, which was prone to errors, delays, and lacked transparency. Over time, paper ballots, punch cards, mechanical levers, and optical-scan machines emerged as key technological improvements in voting. Each new system introduced incremental benefits in accuracy and convenience, but also faced certain limitations such as human errors, large amounts of paperwork, and logistical challenges. Electronic voting (e-voting) systems were developed to address these issues, offering several advantages over traditional methods, such as enhanced accuracy, convenience, flexibility, privacy, verifiability, and mobility [1]. These features make electronic voting an appealing

choice for modern elections, where large-scale participation and efficient management are crucial.

Despite these improvements, electronic voting systems are not without their drawbacks. One significant issue is the time consumption involved in setting up and maintaining the systems, especially when it comes to processing large amounts of data [2]. Additionally, these systems often require significant infrastructure and have the potential for malfunctioning if not properly managed, leading to the failure of voting machines or delays in results. Furthermore, the absence of direct involvement by higher officials in the voting process can undermine the credibility and security of the system [3]. Another major disadvantage of electronic voting is that it does not allow mass updates, meaning users cannot simultaneously edit or update multiple items at once, making the system less flexible [4].

The solution to many of these problems comes in the form of Online Voting Systems. These systems allow voters to cast their votes remotely from anywhere, eliminating the need to visit polling booths and reducing the risk of violence and intimidation at voting centers. Voters can access the system securely using their personal credentials, ensuring the privacy and confidentiality of their votes [5]. The online voting system also offers the advantage of increased voter turnout by making the process more convenient and accessible to a broader population, including those with disabilities or those who live in remote areas [6]. Moreover, these systems can be designed to ensure the accuracy and integrity of votes through various cryptographic techniques and secure authentication methods [7].

In this work, electronic voting systems offer several advantages over traditional methods, they still face certain challenges. Online Voting Systems overcome many of these limitations by offering a more flexible, accessible, and secure way for citizens to exercise their voting rights.

2. LITERATURE SURVEY

The concept of electronic voting (e-voting) has gained substantial attention in recent years due to the increasing need for secure, accessible, and efficient voting systems. Several studies have explored various facets of e-voting, including its advantages, challenges, and implementation strategies, contributing to the ongoing evolution of this technology.

One of the earliest and most notable implementations of online voting systems is the i-Voting system in Estonia, introduced as part of the country's e-government initiatives. According to a report by e-Estonia [1], Estonia pioneered the development of i-Voting, where citizens can cast

their votes remotely in national elections using secure digital authentication methods. The i-Voting system has played a crucial role in increasing voter participation and reducing the risks associated with physical voting booths, such as violence and intimidation. Estonia's success has inspired other countries to explore similar e-voting solutions, showcasing the potential benefits of adopting online voting systems.

In contrast to the Estonian model, the Philippines has also made significant strides toward e-voting, particularly in relation to the grid power requirements necessary for its implementation. The National Electrification Administration (NEA) of the Philippines discussed the challenges of implementing e-voting in areas with insufficient power infrastructure, proposing solutions for integrating grid power into the e-voting system [2]. This issue highlights the technological challenges that arise in regions with limited infrastructure and the need for robust power systems to ensure the smooth operation of electronic voting machines. This study underscores the importance of preparing the local infrastructure to support such systems, especially in less developed areas.

Switzerland, known for its robust democratic processes, introduced a new legislation on internet voting, with the aim of making voting more accessible to Swiss citizens abroad. A report from electoralpractice.ch [3] outlines the Swiss approach to e-voting, focusing on the development of secure online systems that ensure voter privacy and prevent manipulation. The Swiss government's move to regulate internet voting through legislation illustrates the growing recognition of online voting as a legitimate option for modern democracies. It also emphasizes the importance of legal frameworks

in safeguarding the integrity and transparency of e-voting systems.

The international landscape of e-voting development is also explored by Buchsbaum [4], who discussed the various developments in e-voting technologies globally. His work delves into the international efforts to improve the security and accuracy of electronic voting systems, with particular attention to the lessons learned from early e-voting experiments. Buchsbaum's study highlights the importance of understanding both the technical and political dimensions of e-voting, as well as the need for continuous improvement in security measures to prevent fraud and ensure the credibility of election results.

A key concern in the deployment of electronic voting systems is security, which is thoroughly addressed by Zissis and Lekkas [5]. They propose a comprehensive architecture for securing e-voting systems through the use of open cloud computing. Their study emphasizes the importance of secure cloud infrastructure in handling sensitive voting data and ensuring that voter identities and choices remain confidential. The authors also explore the use of encryption and secure communication protocols to prevent unauthorized access and tampering with voting data. Their proposed solution not only enhances the security of e-voting systems but also provides a flexible and scalable model for implementation in various political environments.

Cook [6] provides a broad overview of the pros and cons of electronic voting systems compared to traditional paper voting. His work highlights the primary advantages of electronic voting, including increased accessibility, the potential for higher voter turnout, and the reduction of errors associated with manual counting. However, Cook also identifies

several challenges that need to be addressed, such as the risk of cyberattacks, system malfunctions, and concerns about the reliability of electronic voting machines. He stresses the need for comprehensive security measures and public trust in the system to ensure its success. Cook's analysis underscores the importance of balancing the benefits of electronic voting with the risks it entails, suggesting that both technological and social considerations must be taken into account when implementing such systems.

An extensive discussion on the pros and cons of electronic voting, particularly in the context of the Estonian experience, is provided by Anwar [8]. This study focuses on the advantages and disadvantages of e-voting as seen in the Estonian case, offering valuable insights into the strengths and weaknesses of digital voting systems. Anwar explores how Estonia has successfully integrated e-voting into its national elections, improving the overall efficiency of the voting process and fostering greater participation. However, Anwar also points out some of the challenges faced by Estonia, including technical issues, concerns about voter anonymity, and the potential for cyberattacks. The study provides a balanced view of the benefits and risks of electronic voting and serves as a useful reference for other countries considering the adoption of similar systems.

Lastly, Thompson's reflections on the trustworthiness of technology, particularly in the context of secure voting systems, are relevant when discussing e-voting. His famous 1984 paper, "Reflections on Trusting Trust" [9], explores the complexities of trusting software systems, especially those used in critical applications like voting. Thompson's work has influenced the field of cybersecurity and has been cited in discussions

about the risks of tampering and fraud in electronic voting systems. His insights are particularly valuable in the context of e-voting, where trust in the system's security and integrity is paramount.

3. METHODOLOGY

This Online Voting System will manage the Voter's information by which voter can login and use his voting rights. There is a database which is maintained by the election commission of India in which complete data of voter with complete information is stored. At the time of registration voter will be asked for this: Full name, age, voter card no, mobile no. email id, finger prints and verified the details by administrator. At the time of requesting vote, voter will be asked to enter his voter id. Then voter will be authenticated, and he can give vote from one of the candidate from the list. If voter already has voter Id then he/she don't need to register, else before voting he/she need register himself/herself in voter database.

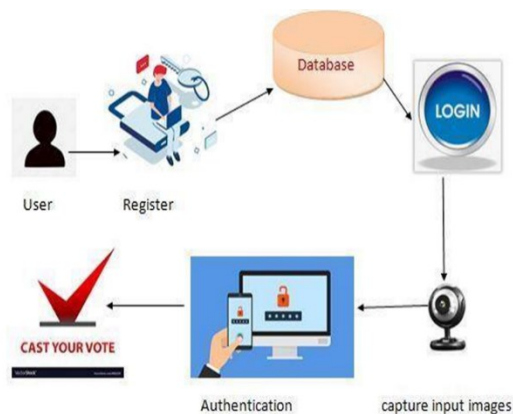


Fig.1 System Architecture

This system architecture outlines a secure online voting process. Users first register and then authenticate their identity through a multi-factor authentication process. This could involve biometric verification (e.g., fingerprint or facial recognition)

and password entry. Once authenticated, users can cast their votes securely. The system likely stores user data and voting information in a database, which is protected by robust security measures. The use of a webcam suggests that the system may capture images of the user during the authentication process for additional security.

a) Collecting Registration Details: The user fills out a registration form, providing essential details such as name, email, and contact information. These details are securely stored in our database to create a unique user profile for future interactions and authentication purposes.

b) Validate Registration Form: During new user registration, we perform a validation check to ensure that the entered details are correct and that the user hasn't previously registered. This prevents duplicate registrations and ensures that every user has a unique account in our system.

c) Collect Login Details: After successful registration, users can log in by providing their credentials, such as username and password. We validate these details by matching them against the data stored in our database to ensure the user's identity is legitimate.

d) Authenticate User: To enhance security, we use OTP (One-Time Password) authentication. The user receives an OTP via SMS or email, which they must enter to verify their identity. This ensures that the login attempt is from a legitimate and authorized user.

e) Access Services: Once authenticated, users can access various services on the platform, such as casting votes and viewing results. The platform is designed to provide seamless navigation, ensuring

users can interact with the services efficiently and securely after logging in.

f) Logout: After completing their session, users can log out at any time. The logout process terminates the user’s active session, ensuring the security of their account and preventing unauthorized access when the user is not actively engaged.

4. EXPERIMENTAL RESULTS

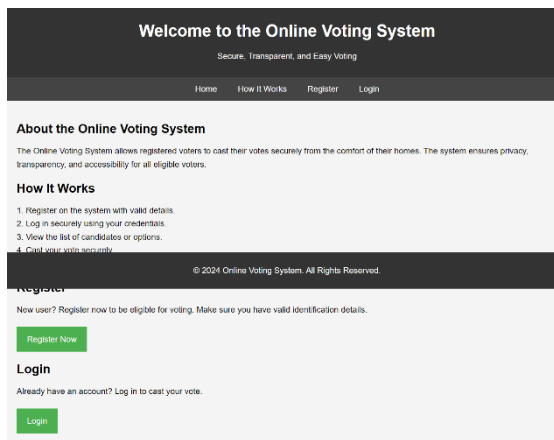


Fig.2 Home Page

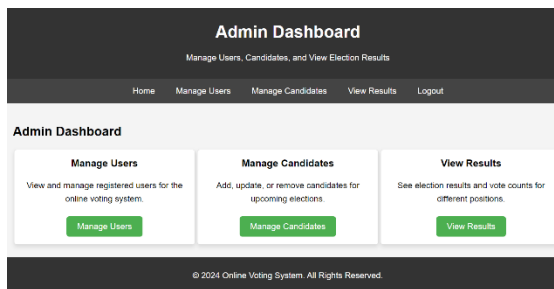


Fig.3 Admin Page

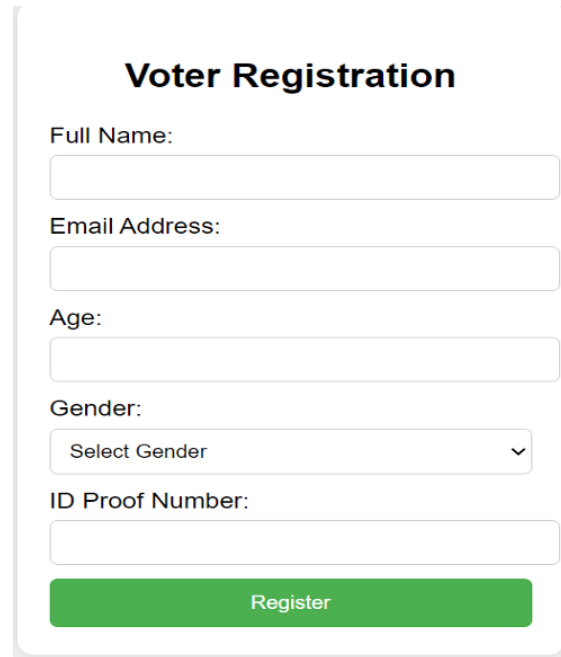


Fig.4 Voter Registration

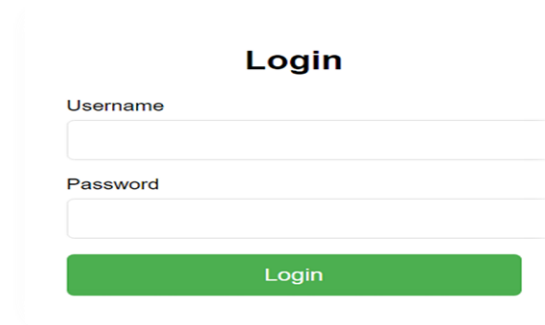


Fig.5 Voter Login

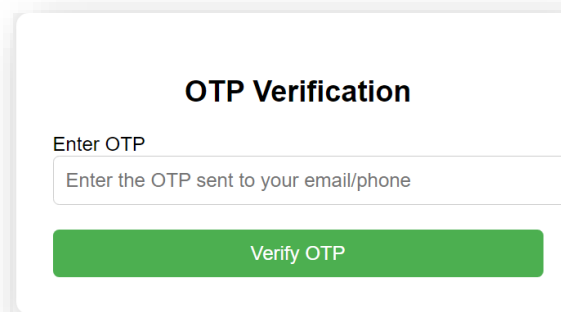


Fig.6 OTP Verification

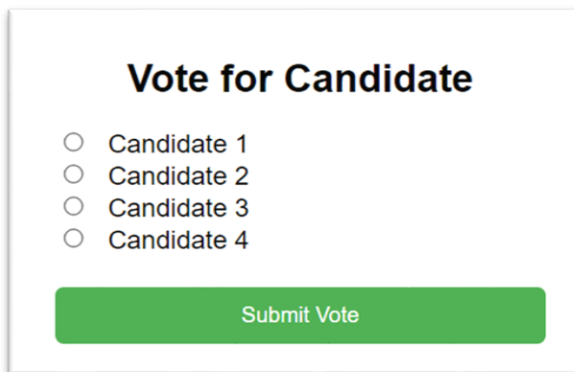


Fig.7 Vote for candidate

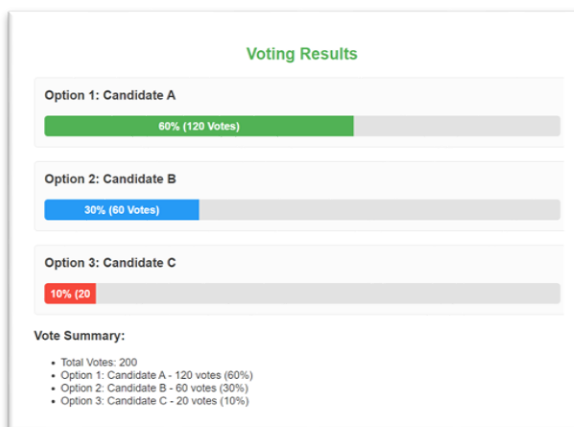


Fig.7 Voting Results

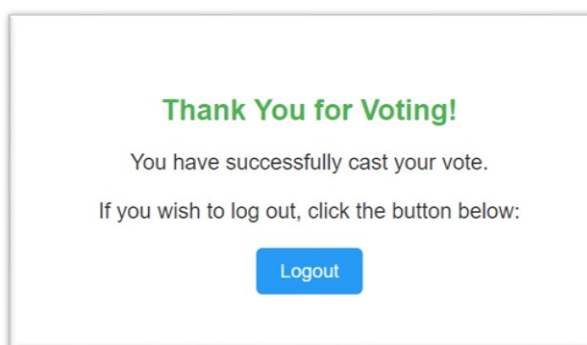


Fig.8 Final Outcome

5. CONCLUSION

The online voting system is a transformative solution that modernizes and streamlines the

electoral process for both administrators and voters. It offers comprehensive features such as secure admin and voter management, efficient election and position setup, and transparent result display. The system's user-friendly interface ensures accessibility across all devices, promoting higher voter participation and trust. By integrating robust security measures and intuitive functionalities, this platform enhances the overall efficiency, integrity, and transparency of elections. The ability to manage voters, candidates, and election results seamlessly makes it a reliable tool for contemporary voting needs. This system not only simplifies the administration of elections but also ensures that the entire process is conducted fairly and securely, fostering confidence in the electoral process and encouraging democratic participation.

Future research in online voting systems should focus on enhancing security through advanced encryption, biometric authentication, and exploring blockchain technology for a transparent and tamper-resistant environment. Improving user experience and accessibility is crucial, with studies addressing interface optimization and user-friendliness for diverse users. Additionally, digital literacy programs can bridge knowledge gaps, while continuous monitoring and evaluation frameworks ensure system effectiveness. Comparative studies of various online voting systems will offer valuable insights for further improvements and adoption in both academic and broader contexts.

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