

Online Voting System Using Aes Algorithm with OTP Validation

Vishnu Natarajan¹, Siddharth M. S^{2*}, Sajin Vaz J³, Rathi Pathi R⁴

^{1,2,3}UG, Computer Science and Engineering, National Engineering College, Thoothukudi, Tamil Nadu, India.

⁴Assistant Professor, Computer Science and Engineering, National Engineering College, Thoothukudi, Tamil Nadu, India.

Emails: 2012017@nec.edu.in¹, 2012090@nec.edu.in², 2012101@nec.edu.in³, rathipathi-cse@nec.edu.in⁴

***Corresponding Author Orcid ID:** <https://orcid.org/0009-0001-0630-5476>

Abstract

This project introduces the integrity of the electoral process and faces increasing challenges, primarily due to limited means of voter identification, which often rely solely on physical voter identification cards. As a result, vulnerability to fraudulent election practices has increased. To address these concerns, our project introduces an innovative solution that uses both Android and web applications to securely store and verify voter identities. The system incorporates a robust One-Time Password (OTP) authentication mechanism that uses the voter's unique ID for login and cross-checks with a centralized database. Admin-generated OTPs provide an additional layer of verification, thereby improving system security. This streamlined process not only speeds up voter verification but also reduces voting queue time, promising a more efficient and secure voting experience

Keywords: Online Voting System, AES Encryption, OTP Validation, Voter Registration, Electronic Voting

1. Introduction

In recent years, there has been a growing emphasis on enhancing the efficiency and security of the voting process through the use of advanced technology. One such innovation is the development of an Online Voting System, which leverages cutting-edge techniques to ensure a secure and accessible voting experience. [1] To tackle the challenge of enabling secure online voting, this system integrates the AES (Advanced Encryption Standard) algorithm, known for its robust encryption capabilities. It employs AES encryption to protect the integrity and confidentiality of each vote cast. Additionally, the [2] system incorporates OTP (One-Time Password) validation as an added layer of security, ensuring that only authorized voters can participate. Implemented as a Web-based application, the Online Voting System

offers a user-friendly interface that allows voters to Securely submit [3] their ballots. This system streamlines the voting process while maintaining the anonymity of voters and the accuracy of results. Election administrators benefit from a centralized database that efficiently manages voter registrations, candidate information, and the secure storage of encrypted votes. Real-time monitoring and reporting capabilities enhance transparency and trust in the electoral process. [4] This innovative solution goes beyond traditional voting methods, promoting the integrity of elections through structured data transformation and model-driven architecture. System Architecture Shown in Figure 1.

2. Experimental Methods or Methodology

The Online Voting System (ACMS) presented in this paper encompasses a comprehensive approach that

integrates the AES algorithm and OTP validation.

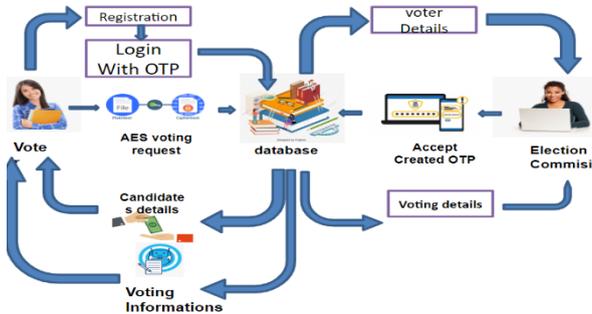


Figure 1 System Architecture

[5] The methodology can be segmented into the following key components Sign-in Page shown in Figure 2.

2.1 Voter Registration Process

The voter registration process is an important first step in ensuring the integrity of the online voting system. The process begins when voters access the app and begin registering. During this stage, voters must provide their personal information and mobile phone number. This information [6] is cross-referenced with an existing centralized database containing voter records. To verify their identity, the system generates a one-time password (OTP) and sends it to the voter's registered mobile number. This OTP acts as a unique and temporary authentication code. Home Page Admin is shown in Figure 3. The voter then enters this OTP into the application. The database will check the OTP entered by the voter against the OTP generated by the system. [7] If the OTP entered matches the OTP generated by the system, it means the voter is valid and allowed to participate in the election. This verification process is important to ensure that only qualified voters can vote. Generating OTP process is shown in Figure 4.

2.2 Database Verification and Validation

The focus of the second phase lies in the robustness of the database system. The centralized database contains a comprehensive trove of voter information, including their eligibility status and mobile phone numbers. [8] As voters attempt to register and authenticate their identities, databases play a central role in cross-referencing the data provided. Once the OTP is generated and sent to the voter, the database

verifies the OTP the voter entered. This verification process is necessary to confirm the authenticity of the voter and ensure that only authorized individuals can participate in the voting process. [9] The database's role in maintaining accurate voter records and securing the authentication process is critical to the overall integrity of the system. The candidate page is shown in Figure 5.

2.3 Select Candidates and Vote

After successfully authenticating a voter, the application provides access to the candidate list. This list is an important element of the online voting system because it allows voters to make informed decisions. The list displays the names of candidates participating in the election, [10] ensuring transparency and clarity. Poll details are shown in Figure 6. In front of each candidate's name, there is a prominently displayed "Vote" button. To vote, voters must select the candidate of their choice by pressing the "Vote" button. This step ensures that each voter's choice is recorded accurately and securely. The act of voting, as simple as pressing a button, is the essence of the democratic process in an online voting system. It [11] symbolizes the outcome of voters' decision-making process and represents their participation in the election.

2.4 Complete The Online Voting Procedure

The culmination of the online voting process, marked by the completion of voting procedures, is a critical moment to protect democratic principles and ensure the security of each voter's voice. Once voters have carefully selected their preferred candidate and confirmed their choice by pressing the "Vote" button, the system will securely store their decision. This stage was meticulously designed to be user-friendly and intuitive, prioritizing ease of use to [12] meet the needs of all voters, regardless of their level of technological familiarity. The user OTP sending process is shown in Figure 7. Once this voting process is complete, voters can rest assured that their vote has been accurately and securely recorded in the system's robust digital infrastructure. The reliability of any online voting system depends largely on this basic step. Not only must it ensure the highest security, but it must also protect the integrity of each vote. The success of

the voting procedure is a clear indicator of the effectiveness of the [13] system, emphasizing its commitment to democratic principles and the sanctity of the electoral process. A user page is shown in Figure 8.

3. Aes Hash Algorithm

The use of the AES (Advanced Encryption Standard) hashing algorithm is central to our commitment to a secure and tamper-proof online voting system. AES plays a central role in protecting the integrity of the entire voting process by converting voting requests into uniquely encrypted codes that cannot be tampered with or altered. This encoding process is twofold in importance. First, it protects the security of election data, ensuring that each voter's choices remain confidential and anonymous. Second, it ensures the transparency and security of the system, making it accessible to all eligible voters without compromising security standards. By applying the AES algorithm, we highlight [14] our commitment to ensuring the accuracy and fairness of the voting process, thereby strengthening public confidence in election results. Candidate details are shown in Figure 9. This strong encryption method not only enhances the security of our online voting system but also demonstrates our commitment to democratic ideals and election transparency.

4. Implementation

The implementation of our Online Voting System involves configuring the software components and deploying the software applications [15-17] steps in the implementation process are as follows: The final Election Results are shown in Figure 10.

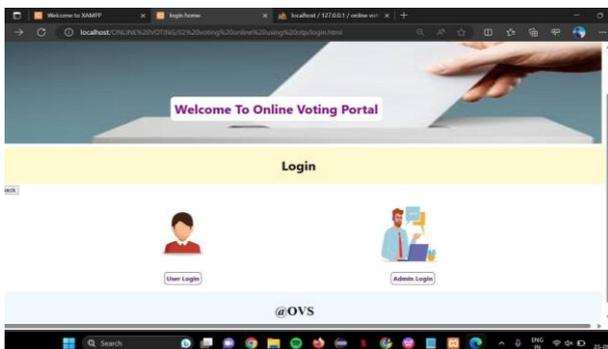


Figure 2 Sign-in Page

4.1 Admin Modules

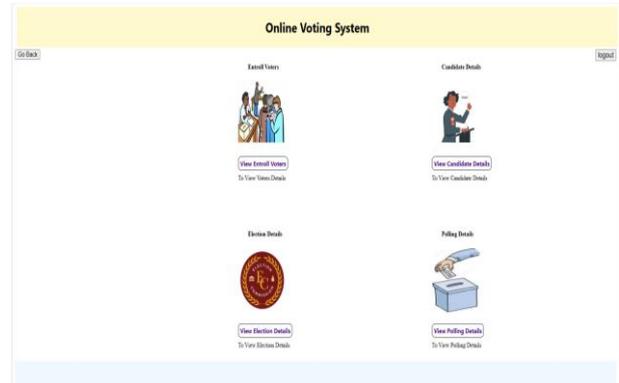


Figure 3 Home Page Admin

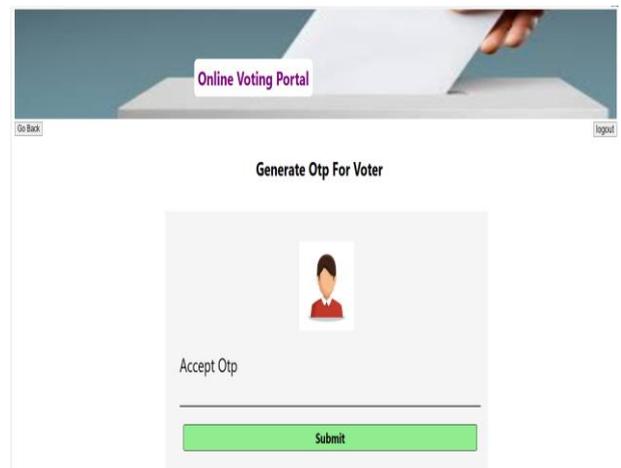


Figure 4 Generate OTP

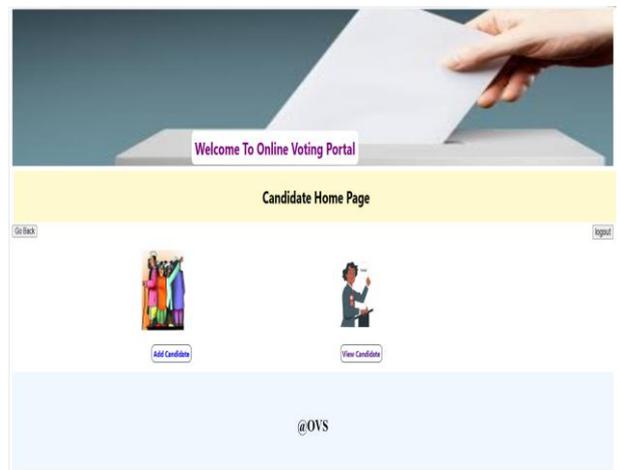
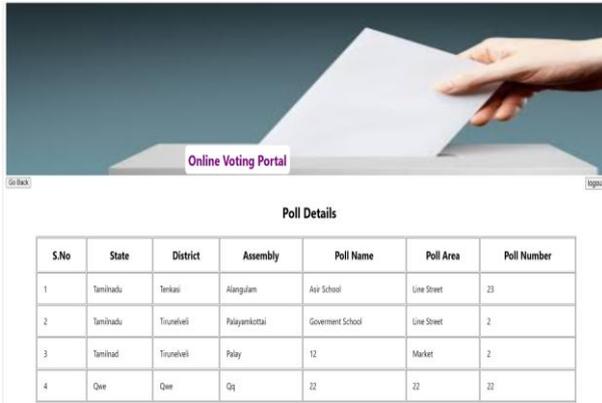
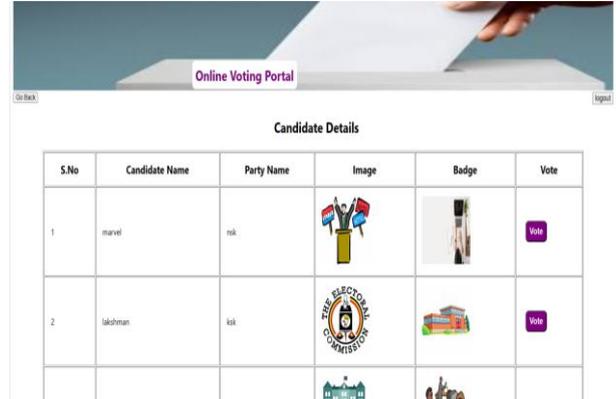


Figure 5 Home Page - Candidate



S.No	State	District	Assembly	Poll Name	Poll Area	Poll Number
1	Tamilnadu	Tenkasi	Alangulam	Asir School	Line Street	23
2	Tamilnadu	Tirunelveli	Palayamkottai	Government School	Line Street	2
3	Tamilnadu	Tirunelveli	Palay	12	Market	2
4	Odisa	Odisa	Orj	22	22	22

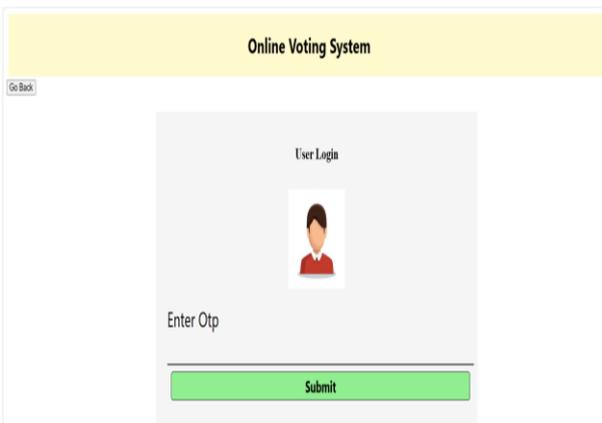
Figure 6 Poll Details



S.No	Candidate Name	Party Name	Image	Badge	Vote
1	marvel	ink			<input type="button" value="Vote"/>
2	lakshman	isk			<input type="button" value="Vote"/>

Figure 9 Candidate Details

4.2 User Modules

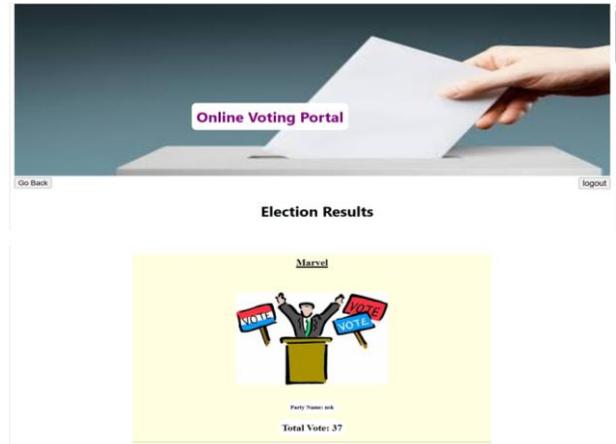


Online Voting System

User Login

Enter Otp

Figure 7 User OTP



Online Voting Portal

Election Results

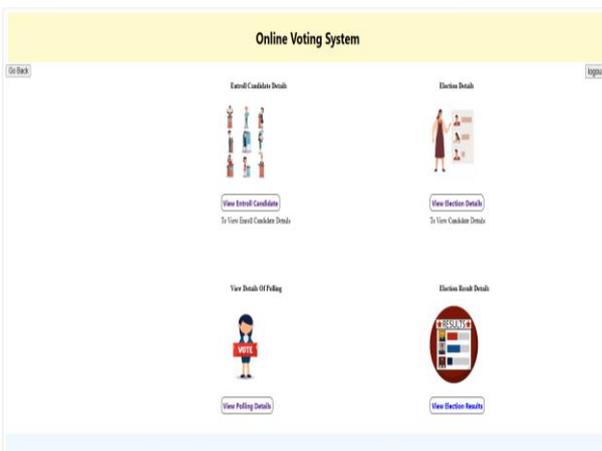
Marvel



Party Name: ink

Total Votes: 37

Figure 10 Election Results



Online Voting System

View Election Details

View Election Results

View Polling Details

View Election Results

Figure 8 User Page

Conclusion

In conclusion, the introduction of online voting with OTP verification marks a progressive step towards modernizing our election process. By leveraging technology, it aims to increase the accessibility, security, transparency, and efficiency of voting, thereby strengthening the core of democracy [18]. However, it is critically important that the development and deployment of this application strictly adhere to the highest standards of cybersecurity and privacy. These measures are necessary to protect election integrity and protect sensitive voter information. The main purpose of the app is to allow voters to easily participate from home while adding an extra layer of security through OTP verification to ensure that only authorized individuals vote. However, for this initiative to be successful, it is necessary to adopt strong cybersecurity

measures to prevent potential threats such as hacks and data breaches. This requires constant monitoring, regular security updates, and comprehensive vulnerability testing [19].

References

- [1]. Arnab Roy, divyank, Manish, avishrant, prof rural P. Pawar "Online voting system using face recognition and OTP (one-time password)",2023
- [2]. Rohit Patil, Yogesh Lokhande, Dhananjay Patil, Amitesh Dapke, "Review on the online voting system using face recognition and OTP"2023
- [3]. Sakshi Meher, Pradnya Muley, Sayali Pawar, Apurva Solanki "Smart online voting system using OTP authentication and face recognition",2022
- [4]. Sanjay Sange, Pranjali Gurao, Aishwarya Pawar, Shruti Ragade, Akshara Aware "Online voting system using face recognition and OTP (one-time password)",2021
- [5]. Rajesh m. Ghadi, Priyanka s. Shelar."online voting system",2017
- [6]. Priya B. Patil, Prof. Dr. S. S. Patil "Online Voting System Using Face Recognition with Aadhaar Card Number and OTP Authentication",2023
- [7]. Anurag Mishra, Ashwini Kumar Singh, Himanshu Sharma, Saurabh Gautam "A Secure Online Voting System Using Face Recognition and OTP Authentication" for Indian Elections, 2019
- [8]. Kiran Kumar, P. R. S. Krishna "Online Voting System Using Face Recognition and OTP Authentication",2018
- [9]. Rahul Verma, Sandeep Kaur A Secure "Online Voting System Using Face Recognition and OTP Authentication",2023
- [10]. Rajat Arora, Prashant Kumar Gupta, Neha Chaudhary, Prachi a Review "on Online Voting Systems Using Face Recognition and OTP",2020
- [11]. Agarwal, H., & Pandey, G. N. (2013, November). Online voting system for India based on AADHAAR ID. In 2013 Eleventh International Conference on ICT and Knowledge Engineering (pp. 1-4). IEEE.
- [12]. Anand, A., & Divya, P. (2012). An efficient online voting system. *International Journal of Modern Engineering Research*, 2(4), 2631-2634.
- [13]. Sridharan, S. (2013, July). Implementation of an authenticated and secure online voting system. In 2013 Fourth International Conference on Computing, Communications and Networking Technologies (ICCCNT) (pp. 1-7). IEEE.
- [14]. Specter, M., & Halderman, J. A. (2021). Security analysis of the democracy live online voting system. In 30th USENIX Security Symposium (USENIX Security 21) (pp. 3077-3092).
- [15]. Govindaraj, R., & Kumaresan, P. (2020, February). An online voting system using the cloud. In 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE) (pp. 1-4). IEEE.
- [16]. Moganapriya, C., et al. "Dry machining performance studies on TiAlSiN coated inserts in turning of AISI 420 martensitic stainless steel and multi-criteria decision making using Taguchi-DEAR approach." *Silicon* (2021): 1-14.
- [17]. Kaliyannan, Gobinath Velu, et al. "Development of sol-gel derived gahnite anti-reflection coating for augmenting the power conversion efficiency of polycrystalline silicon solar cells." *Materials Science-Poland* 37.3 (2019): 465-472.
- [18]. Velu Kaliyannan, Gobinath, et al. "An extended approach on power conversion efficiency enhancement through deposition of ZnS-Al₂S₃ blends on silicon solar cells." *Journal of Electronic Materials* 49 (2020): 5937-5946.
- [19]. Kandasamy, Suganeswaran, et al. "Corrosion behavioral studies on AA7075 surface hybrid composites tailored through friction stir processing." *Anti-Corrosion Methods and Materials* 67.4 (2020): 345-355.