



Advance Voting System Using Biometric Verification and Artificial Intelligence

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Abstract: Now a days Electronic Voting system is very popular system to collect the votes. E- Voting system is very popular but there is low security methods so to overcome this , We have proposed Advance Voting System where the high security verification applied , it verifies the user Phone Number, E-Mail Address and captures live image for verification purpose so that it can cancel out the proxy voting. This paper mainly focuses on Biometric security mechanism to overcome the drawbacks.

Elections are a key part of democracy, but traditional voting systems often face problems like voter impersonation, multiple voting, ballot tampering, and slow counting. This study explores an Advanced Voting System using Biometric Verification to solve these issues. The system uses unique biometric traits such as fingerprints and facial recognition to verify voter identities, ensuring that each person can vote only once. Votes are securely stored in a digital database and counted automatically, reducing human errors and speeding up the election process. Testing of the system shows that it is accurate, efficient, and reliable. By combining technology with secure voting practices, this system can increase transparency, prevent fraud, and build greater public trust in election results. The study highlights the potential of biometric technology to make elections safer, faster, and more trustworthy, contributing to stronger democratic processes.

Keywords: Proxy Voting Prevention, Transparent Election Process, Biometric Verification, Election Security, Voter Authentication, Fraud Prevention.

I. INTRODUCTION

Elections form the basis of any democratic nation, whereby its people get to decide over their leaders and the future course of their country. Traditional voting systems have often been plagued by fake voting, ballot tampering, and delays in result processing, ultimately diminishing public trust in election results. In various countries, manual or electronic systems of voting require the use of identity cards or paper-based verification; such a process is prone to human error and manipulation. In fact, studies have pointed out that even minor mismatching in the voter authentication process can create large-scale disputes and controversies in the credibility of the results of elections. Therefore, there is an increasing requirement for a safe, automated, and transparent system of voting that can guarantee one-person-one-vote authenticity.

Therefore, the root of this research suggests an advanced voting system using biometric verification and artificial intelligence. This system confirms that any given voter is indeed who they say they are with a special biometric trait, either fingerprints or face features, which all individuals have but in different and unique ways. No two human beings in the world possess the same physical features; therefore, biometric data serves as a very reliable authentication method. It ensures that no one can vote multiple times or impersonate someone else. Therefore, biometric verification eliminates the need for manual checks of voters, saving time and reducing errors during the election process.

Artificial Intelligence adds an added layer of security and efficiency to the process. The system can analyze real-time images through AI-driven facial recognition and machine learning algorithms for detecting fraudulent activities such as photo spoofing or fake biometric inputs. Deep learning models learn from large datasets and continuously improve the accuracy of recognition, thereby making the system more adaptive over time. AI assists in the automatic counting of votes, anomaly detection in voter patterns, and large-scale voter database management with both speed and accuracy.

The proposed system will also introduce multi-level verification in order to enhance voter authentication. In this regard, a user has to confirm their registered phone and email before voting, followed by biometric verification and capturing a live image to validate their identity. Votes are encrypted and stored in a blockchain-backed digital database, therefore ensuring integrity and tamper-proofing of data. Such a multi-step verification process minimizes human interference,



increases transparency, and ensures that all the voting data remains confidential and traceable without letting the identity of the voter be revealed. The integration of Artificial Intelligence and biometric verification elevates the proposed system to introduce accuracy, security, and transparency into the whole election process. It ensures no voter fraud or proxy voting occurs while also making the process easier for all citizens when casting their votes. Delays and human bias in result processing are reduced by automated vote counting and real-time data validation. In the end, this can help restore public trust in this election process, facilitating higher turnout and paving the way for the building of more credible democratic institutions.

II. METHODOLOGY

To introduce the "Advance Voting System Using Biometric" follows a systematic Approach aimed at ensuring transparent and accurate voting through its effectiveness and usability.

1. Tools used:

Database: Mongo DB
Backend: EXPRESS JS(API)
Frontend: React JS
API: Twilio

2. STEPS FOLLOWED:

The system follows three main steps:

1. Voter Registration: Personal and biometric data, such as fingerprints and facial images, are collected and securely stored.
2. Voting and Verification: At the polling station, the voter fingerprint or face is scanned and matched with stored data. Only verified voters are allowed to vote.
3. Vote Recording and Counting: Votes are stored securely in a database and counted automatically, ensuring accuracy and speed.

The system was tested to ensure reliability, accuracy, and fast processing.

III. MODELING AND ANALYSIS

The Advanced Voting System Using Biometric Verification is designed to create a secure, transparent, and efficient way of conducting elections. The system works through three main stages : Voter Registration, Biometric Verification and Voting, and Vote Counting and Result Generation.

A. Voter Registration Model

In this stage, each eligible voter registers by providing their personal details (such as name, ID number, and address) along with their biometric data, like fingerprints or facial images. All the collected data is stored in a central database using encryption to ensure privacy and prevent unauthorized access. This creates a unique voter profile that can't be duplicated or faked.

B. Biometric Verification and Voting Model

On election day, when a voter arrives at the polling station, their fingerprint or face is scanned using a biometric device. The system compares the scanned biometric data with the data stored in the database. If the data matches, the voter is verified and allowed to cast their vote.

If it does not match, the system denies access to prevent fake or multiple voting.

Once verified, the voter uses an electronic voting interface to select their preferred candidate.

This stage ensures that only legitimate voters can vote once, maintaining fairness and accuracy.

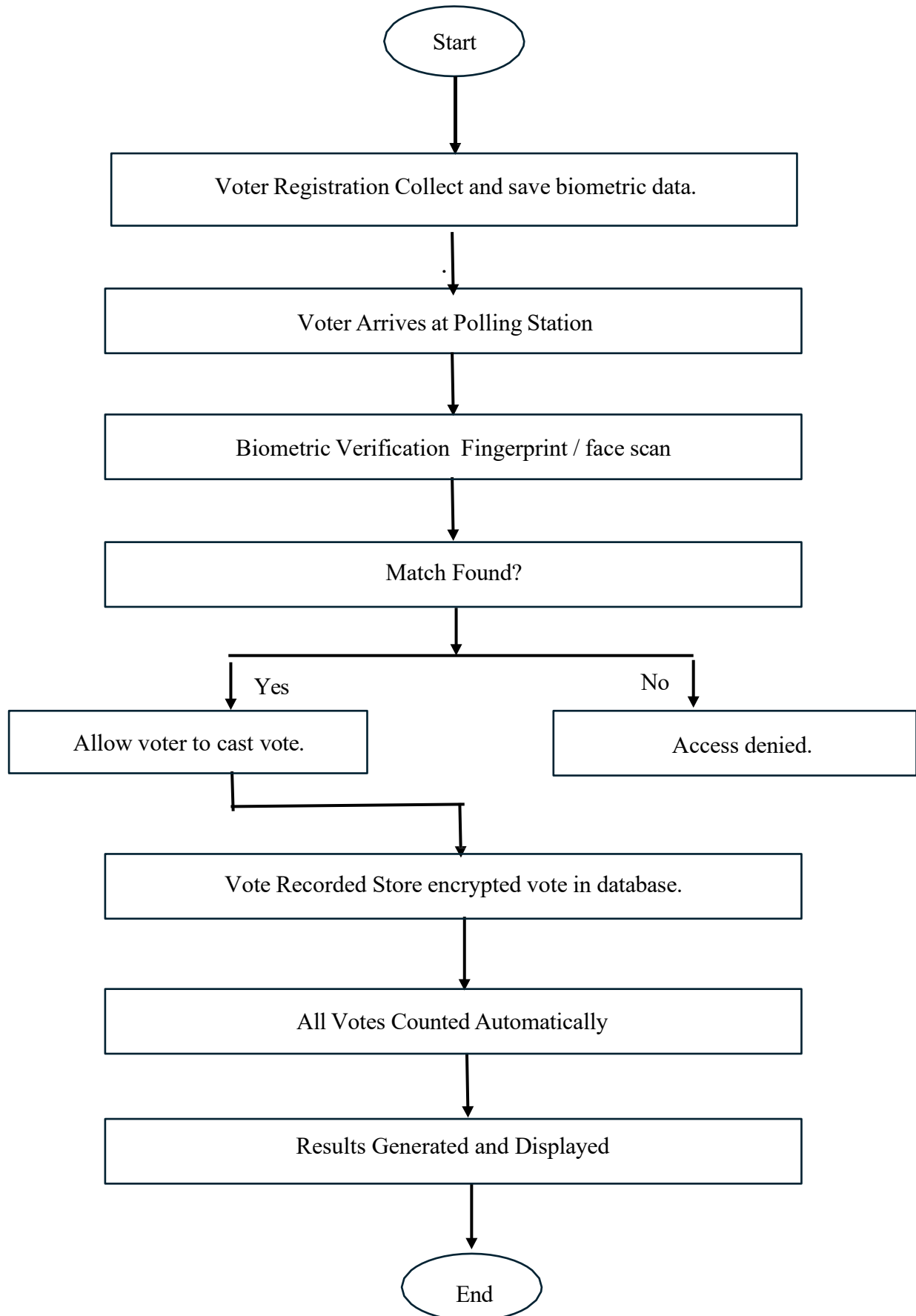
C. Vote Counting and Result Generation Model:

After the vote is cast, the system encrypts and securely stores it in the database.

All stored votes are automatically counted by the system, eliminating manual errors and ensuring faster results. The results are then displayed in real time or exported for official review. This process ensures accuracy, speed, and transparency.

D. FLOWCHART DESCRIPTION:

Here, how the system works step by step:





This flow ensures that each voter is uniquely identified, allowed to vote once, and that all votes are securely processed and counted.

E. Analysis:

This system provides a reliable and tamper-proof method for conducting elections. Accuracy: Ensures each voter is verified uniquely.

Security: Uses biometric data and encryption to protect information. Speed: Automates counting, reducing time and human error

Transparency: Prevents duplicate or fake votes, increasing public trust.

Overall, the model proves that integrating biometric verification into the voting process can make elections more secure, efficient, and trustworthy.

IV. RESULTS AND DISCUSSION

Results:

After testing the biometric voting system, it showed clear improvements over traditional voting methods. The system was able to correctly identify registered voters using fingerprints and facial recognition almost every time. No fake or duplicate votes were allowed, which shows the system is very reliable.

Voting and counting were much faster than paper-based methods. Votes were stored securely in the system and counted automatically, so there were no delays or mistakes. Overall, the system worked efficiently while keeping voter information safe and private.

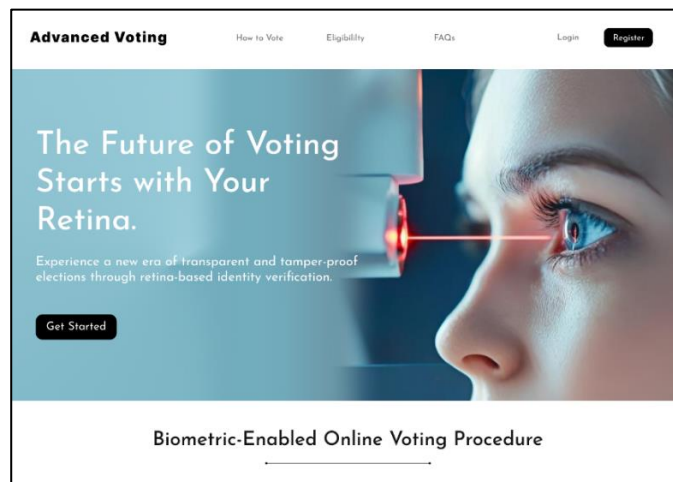


Fig: Homepage

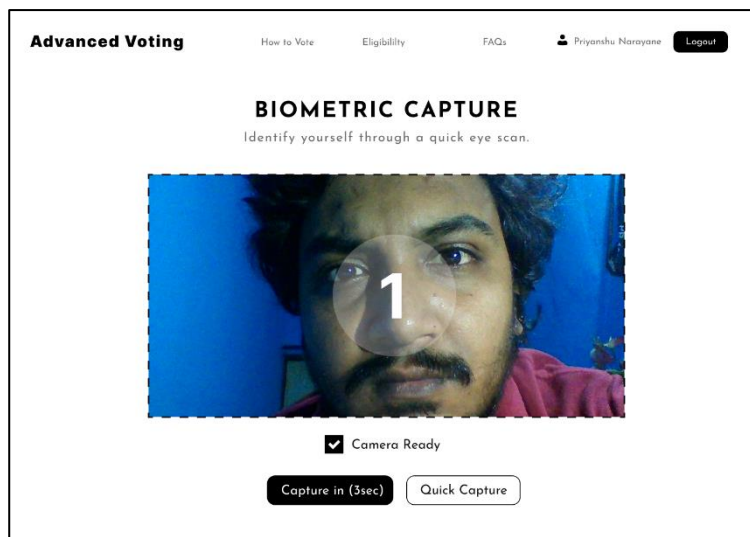


Fig: Biometric Scan While Casting Vote

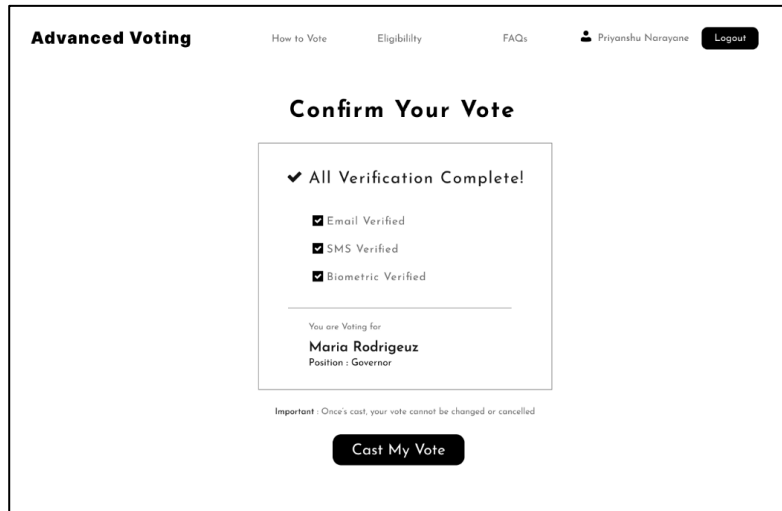


Fig: Cast Vote

Discussion

These results highlight the main advantages of biometric voting. Since each voter is verified through unique biometric traits, problems like impersonation or multiple voting are completely avoided.

Automatic counting and secure storage save a lot of time and reduce human errors. The process is also transparent because every vote is recorded digitally and can be checked if needed.

Compared to traditional methods, this system is faster, more accurate, and more trustworthy. While implementing it may require good hardware and voter education, the benefits are clear: safer elections, faster results, and stronger public trust in democracy.

V. CONCLUSION

The Advanced Voting System using Biometric Verification demonstrates a significant improvement over traditional paper-based elections. By verifying voters through unique biometric traits, the system prevents fraud, duplicate voting, and impersonation. The use of digital storage and automatic counting ensures that votes are secure, accurately recorded, and counted quickly. This reduces human errors and administrative workload, making elections more efficient and organized. Moreover, the transparency of the system allows voters and authorities to trust the process and the results. Implementing biometric verification can make elections safer, faster, and more reliable, increasing public confidence in the democratic process. Overall, this system represents a modern, technology-driven approach to strengthening democracy, improving voter experience, and ensuring fair and transparent elections for all citizens.

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