

Digital Voting Machine using Biometric and GSM

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Abstract: “Digital Voting Machine” is an innovative electronic system designed to conduct secure, fast, and transparent elections. The system utilizes biometric authentication and GSM technology to ensure accurate voter identification and real-time result transmission. The traditional voting process involves manual verification and paper ballots, which may lead to errors, delays, and malpractices. With increasing population and the need for fair elections, there is a demand for smart and reliable voting systems. This project aims to develop a secure electronic voting system that verifies voters using fingerprint authentication, records vote digitally, and sends voting results through GSM technology. The system enhances transparency, reduces human error, and ensures efficient election management.

Keywords: Digital Voting Machine

I. INTRODUCTION

Voting is a fundamental right in a democratic country. Elections play a vital role in selecting leaders and forming governments. In traditional voting systems, manual verification and paper ballots are used, which require more manpower and time.

As technology advances, there is a growing need to modernize the voting process. Electronic Voting Machines (EVMs) have already replaced ballot papers in many countries. However, there are still challenges related to voter authentication and result transparency.

The proposed **Digital Voting Machine** uses biometric fingerprint verification to ensure that only authorized voters can cast their votes. It also integrates GSM technology to transmit results securely to authorized officials. This system provides accuracy, speed, and reliability in election processes.

II. EXISTING SYSTEM AND ITS LIMITATIONS

The existing voting methods predominantly rely on traditional paper ballot systems, which require voters to manually cast their votes and officials to verify voter identity using ID cards or voter lists. This conventional approach involves physical ballot boxes and manual counting processes. However, it presents several limitations, particularly the possibility of human error during counting, invalid votes due to improper marking, and delays in result declaration. Additionally, the process is time-consuming and requires significant manpower and logistical arrangements.

- Another widely adopted approach is the use of Electronic Voting Machines (EVMs), which automate the vote recording and counting process. While EVMs reduce manual errors and speed up counting, they often depend on manual voter verification. This creates the possibility of impersonation or duplicate voting if proper identity checks are not strictly enforced. Moreover, basic EVM systems may lack real-time monitoring and secure remote result transmission capabilities.

- In recent years, technology-based voting solutions have been introduced, including digital voter databases and network-enabled systems. These systems aim to improve efficiency and transparency. However, they may still face challenges such as cybersecurity risks, insufficient authentication mechanisms, and limited adaptability to large-scale deployment. Many systems do not integrate biometric verification, which is essential for preventing fraudulent voting.



- The proposed “Digital Voting Machine” project seeks to overcome these limitations by introducing biometric fingerprint authentication, secure electronic vote storage, and GSM-based result transmission. By providing real-time verification and automated vote management, the system aims to enhance security, transparency, and efficiency in the election process while addressing the shortcomings of existing voting methods.

III. PROBLEM STATEMENT

Free and fair elections are the foundation of a democratic nation. However, traditional voting systems face several challenges such as voter impersonation, duplicate voting, manual errors, and delays in result declaration. During situations like pandemics or emergency conditions, physical crowd gathering at polling booths increases health risks and complicates election management.

Manual verification using voter ID cards may lead to identity fraud, while paper ballot systems are time-consuming and prone to counting errors. Even conventional Electronic Voting Machines (EVMs) depend largely on manual authentication processes, which may not fully eliminate fraudulent activities.

With the rapid growth of population and increasing demand for transparency, there is a strong need for a secure, automated, and technology-driven voting system. The proposed Digital Voting Machine using Biometric and GSM technology addresses these issues by ensuring accurate voter authentication, preventing duplicate voting, securely storing vote data, and transmitting results efficiently. This system enhances election transparency, reliability, and security.

IV. SCOPE OF PROJECT

The **Digital Voting Machine** project has a wide scope in improving election processes through automation, security, and real-time communication.

The primary objective of this system is to implement biometric-based voter authentication to eliminate fake voting and impersonation. By integrating fingerprint sensors, the system ensures that only registered voters can cast their votes.

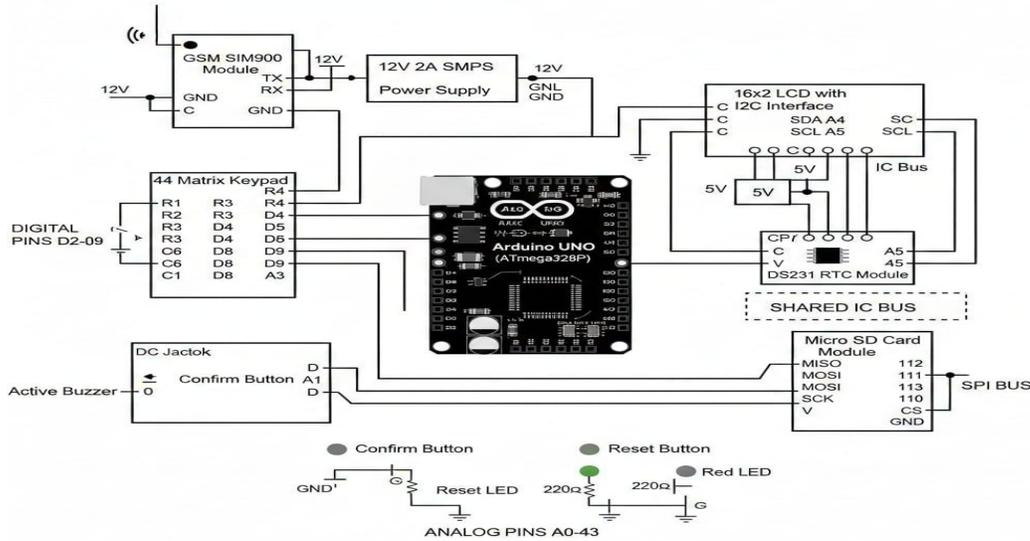
The project also focuses on:

- Secure electronic vote storage
- Prevention of duplicate voting
- Real-time result transmission using GSM
- Reduction of manual manpower
- Faster vote counting and result declaration
- Enhanced transparency and reliability

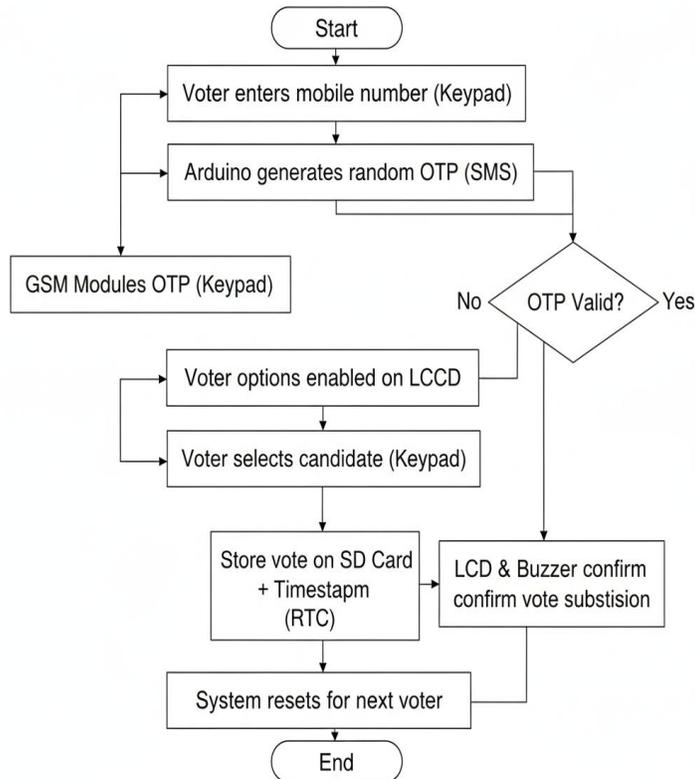
This system can be implemented in schools, colleges, organizations, and government elections. It aligns with the vision of Digital India and smart governance initiatives by promoting secure and technology-driven electoral processes.



SCHEMATIC DIAGRAM



FLOW CHART



Setup Specifications (Example Components)

- Microcontroller Board (Arduino / ESP32)
- Fingerprint Sensor Module
- GSM Module (SIM800L)
- 16x2 LCD Display
- Push Buttons
- Buzzer
- Breadboard
- Male to Female Jumper Wires (26 AWG, 20cm)
- Regulated 5V Power Supply

VI. CONCLUSION

In conclusion, the Digital Voting Machine using Biometric and GSM technology provides a secure, reliable, and efficient solution for modern election systems. By integrating fingerprint authentication, electronic vote storage, and wireless result transmission, the system eliminates major drawbacks of traditional voting methods.

This project enhances transparency, reduces human error, prevents fraudulent voting, and speeds up the counting process. It also minimizes manpower requirements and increases trust in the electoral system.

Furthermore, this system serves as an educational platform for understanding microcontrollers, biometric systems, and communication technologies such as GSM. The Digital Voting Machine represents a significant step toward secure and technology-driven governance.

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