International Journal of
DATA SCIENCE AND IOT MANAGEMENT SYSTEM
ISSN: 3068-272X www.ijdim.com Original Research Paper

VOTING MACHINE USING ARDUINO

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***Abstract*— The project "Voting Machine Using Arduino" aims to design and implement an electronic voting system that is efficient, reliable, and user-friendly. Traditional paper-based voting systems are time-consuming, error-prone, and vulnerable to manipulation. This project utilizes an Arduino microcontroller to automate the voting process, ensuring accuracy and transparency in election results. Each voter can cast their vote by pressing a corresponding button assigned to a candidate, and the system securely records the votes in real-time. After the voting session ends, the Arduino processes the data and displays the total votes for each candidate on an LCD display. Additional features such as password protection, voter authentication using RFID or keypad, and buzzer alerts can be integrated to enhance security and reliability. This system provides a cost-effective and scalable alternative to conventional voting methods, suitable for small-scale elections like schools, colleges, and organizations.**

Keywords— Arduino, Electronic Voting Machine (EVM), Microcontroller, Automation, LCD Display, Button Interface, Digital Election System, Secure Voting, Embedded System, RFID Authentication.

Received: 24-09-2025 Accepted: 29-10-2025 Published: 05-11-2025

I. INTRODUCTION

In today's digital era, the demand for efficient and dynamic information dissemination has significantly In today's digital age, automating manual tasks increases speed, accuracy, and transparency. One such important area is voting. Traditional voting methods can be time-consuming and prone to errors. This project introduces a simple electronic voting machine using Arduino, designed for small-scale use like schools, colleges, or local clubs.

The system allows users to vote for different candidates by pressing buttons. Each button represents one candidate. When a button is pressed, the Arduino counts the vote and stores it in memory. After the voting process, the Arduino compares the vote counts and displays the winner on an LCD screen.

This project demonstrates basic concepts of electronics, programming, and display interfacing using Arduino. It is a practical and educational example of how microcontrollers can be used to build real-world applications like a voting system.In democratic systems, voting plays a crucial role in selecting leaders and making decisions. Traditionally, voting has been done using paper ballots, which can be slow to process and vulnerable to human error or tampering. With the advancement of technology, electronic voting machines (EVMs) have become more common, offering faster results, improved accuracy, and greater efficiency.

This project presents a simple electronic voting machine using Arduino—a beginnerfriendly and versatile microcontroller. The system simulates a basic voting setup where voters can cast their votes by pressing push buttons, with each button representing a candidate. When a button is pressed, the Arduino registers the vote by incrementing a counter for that candidate.

II. LITERATURE SURVEY

[1] Arduino-based EVMs with biometric authentication
Several papers describe Arduino-based electronic voting machines that add biometric authentication (fingerprint scanners) to guarantee voter identity. These implementations typically use an Arduino Mega/Uno, a fingerprint sensor, an LCD or TFT for instructions and results, and local storage (SD card) or serial logging for recorded votes. They demonstrate feasibility for small-

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scale, controlled elections and show improved authentication over plain button-only systems.

[2] RFID-based voting systems for authentication and single-vote enforcement
Multiple works propose using RFID tags/cards to authenticate voters and prevent multiple votes. These systems pair an RFID reader (connected to an Arduino) with a voter database (local or cloud-backed) to ensure each registered card can vote only once; some integrate GSM/Firebase to transmit results or maintain an audit trail. RFID improves access control but raises concerns about lost/duplicated cards and the need for secure backend checks.

[3] Combined approaches: RFID + biometrics + visual feedback
Several designs combine RFID card authentication with fingerprint checks and an LCD/TFT interface to add layered security. The hybrid approach reduces impersonation risk (fingerprint) while making check-in fast (RFID). Papers report improved perceived trustworthiness for institutional elections (college/student bodies), but note increased cost and complexity.

[4] Low-cost Arduino EVM prototypes and educational projects
Open-source projects and GitHub repos demonstrate very simple Arduino EVMs that use push buttons for candidates, an LCD for results, and EEPROM to persist counts. These are useful teaching tools and rapid prototypes for labs or student elections; they highlight how quickly a working EVM can be built but also show limited security (no authentication, easy tampering).

[5] Security analyses and the limits of electronic voting
Independent reviews and security analyses of real-world e-voting systems stress that convenience must be balanced against confidentiality, integrity, and auditability. Academic and industry analyses argue that electronic voting systems must include: verifiable audit trails, resistance to tampering, strict chain-of-custody procedures, and independent testing. These works caution that simple prototypes (button-based Arduinos) are educational but insufficient for public elections without strong procedural and technical protections.

[6] Cryptographic and blockchain-based e-voting research
Recent survey and systematic reviews show growing interest in cryptographic protocols and blockchain for secure, verifiable, and privacy-preserving voting. These approaches aim to provide end-to-end verifiability and immutable audit trails, but they introduce complex key management, voter privacy concerns, and scalability challenges—making them more suited to research systems than low-cost Arduino prototypes.

III. SYSTEM DESIGN

1) Input Unit

The input unit is responsible for collecting votes from the users. Each candidate is assigned a separate push button connected to a digital input pin on the Arduino. When a voter presses a button, it registers one vote for the corresponding candidate. To prevent multiple votes by the same person, the system can be equipped with an optional authentication mechanism using a keypad, password, or RFID card. A buzzer provides audible feedback confirming that the vote has been recorded successfully.

2) Processing Unit (Arduino Controller)

The Arduino Uno (or any compatible microcontroller) acts as the core processing unit of the voting system. It continuously monitors the state of the input buttons, increments the vote count for each candidate, and stores the data in its internal memory during operation. The Arduino is programmed using the Arduino IDE to execute predefined logic for vote counting, result computation, and display handling.

here output unit uses a 16x2 LCD display to show system messages and voting results. It displays “Voting in Progress,” “Vote Recorded,” and “Voting Completed” during different stages of voting. After voting ends, it shows total votes for each candidate and declares the winner, such as “Winner: BRS Party” or “Winner: Any Other party” If there is a tie, it displays “Result: Vote Tied,” and if no votes are cast, it shows “No Vote Polled.” The data can also be saved to an SD card or sent to a computer for record-keeping.

3) Power Supply Unit

The entire system operates at 5V DC, supplied via an adapter or USB connection. A regulated power module ensures stable voltage for both the Arduino and connected components. If external modules such as RFID or GSM are used, an additional 12V power source may be required to ensure consistent performance.

IV. IMPLEMENTATION

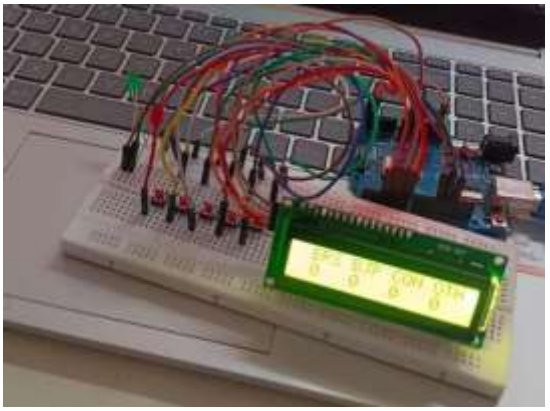

Fig. 1. Experimental Setup

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Figure 1 shows the experimental setup of the Arduino-based Electronic Voting Machine (EVM). The system consists of an Arduino Uno microcontroller, push buttons, an LCD display, parties along with number of votes polled. Each push button represents one candidate, and when a voter presses a button, the Arduino registers the corresponding vote by incrementing the count for that candidate in its memory. The LCD display provides real-time feedback, such as "Vote Recorded" or "Voting Completed," ensuring that the user is informed throughout the process

V. FLOW CHAT

Fig.2.Flow Chart

The flowchart illustrates the step-by-step working process of the **Arduino-based Electronic Voting Machine**. The system starts with the initialization of the LCD display, ensuring that the display is ready to show instructions and results. After initialization, the program continuously checks whether any voting button has been pressed. If no button is pressed, the system remains idle, waiting for a voter to cast a vote. When a button is pressed, it represents a vote for a specific candidate. The Arduino then increments the vote count associated with that candidate and displays a confirmation message such as **"Vote Recorded"** on the LCD.

After recording a vote, the system checks whether there are more voters left to cast their votes. If more voters remain, the process is repeated—allowing the next voter to vote. If no voters are left, the Arduino proceeds to compare all the stored vote counts for each candidate. Finally, it determines the candidate with the highest number of votes and displays the winner's name or ID on the LCD screen. The process then terminates, marking the end of the voting session. This flow ensures a smooth, accurate, and automated voting process while preventing human errors and ensuring transparency in result computation.

VI. EXPERIMENTAL RESULT

"Fig 3" The Arduino Uno receives real-time messages over Wi-Fi from a web interface and instantly displays them on the P10 LED panel for public updates or vote results.

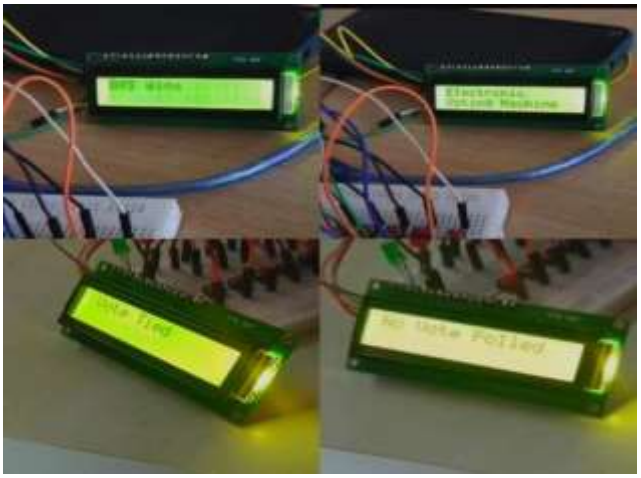

Fig 3.Results

VII.CONCLUSION

The development and implementation of an electronic voting machine (EVM) represent a vital step toward enhancing the efficiency, security, and integrity of the electoral process. This project aimed to design a functional prototype that not only simplifies the voting process but also addresses common issues associated with traditional paper- based voting systems, such as time consumption, human error, and the potential for manipulation.The proposed EVM prototype successfully demonstrates core functionalities, including candidate selection, vote casting, secure data storage, and real-time result display. By leveraging simple yet reliable electronic components, the machine ensures that each vote is counted accurately and anonymously. Additionally, the user interface has been designed to be intuitive, reducing the likelihood of user error and making the system accessible to a wider range of voters, including those with limited technical knowledge.Throughout the development process, emphasis was placed on reliability, simplicity, and security. The EVM eliminates the need for manual counting, significantly reducing the time and resources required to conduct an election. Moreover, the system design helps in minimizing electoral fraud by restricting each voter to a single vote and by ensuring that vote data cannot be easily tampered with.Despite these achievements, it is recognized that this model serves as a foundational framework. There is ample opportunity for future enhancement, including the integration of biometric authentication, secure remote voting options, real-time data analytics, and blockchain technology for transparent and tamper-proof vote recording. Furthermore, ensuring compliance with national electoral regulations and accessibility standards will be critical in scaling such systems for real-world use.

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