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# Voting System Using RFID

*[1]Varad Kawade, [2]Sanket Murade, [3]Vaishnav Phapale, [4]Mohit Suryavanshi, [5]Gauri Dhole*

[12345]Dept. of Electronics & Telecommunication Engineering, Jaihind PolytechnicKuran, Pune, India

**ABSTRACT:**

The RFID-based voting system increases the security and accuracy of elections by providing a digital audit trail of every vote cast. It also enhances transparency, making it more difficult for election results to be manipulated. Additionally, the system is designed to be user-friendly, reducing voter confusion and streamlining the voting experience, even for individuals with disabilities. The reduced reliance on paper materials makes the system more environmentally sustainable while also lowering administrative costs for organizing elections..

**Keywords:**Arduino , Push Buttons, RFID Reader, 16 x 2 LCD Display Module, Buzzer, Power Supply.

## Introduction

In recent years, electronic voting systems have gained widespread attention due to their potential to increase efficiency, transparency, and security in elections. A voting system using RFID and Arduino aims to streamline the voting processes by integrating modern technologies such as Radio Frequency Identification (RFID) for voter authentication and the Arduino microcontroller for handling the voting logic and communication. RFID is a technology that uses electromagnetic fields to automatically identify and track tags attached to objects. In this system, each voter is provided with an RFID tag (like a card or key fob), which contains a unique identifier. When the voter scans their RFID tag at the polling station, the system verifies their identity and eligibility to vote, preventing duplicate or unauthorized votes. A Voting System using RFID with Arduino involves utilizing Radio Frequency Identification (RFID) technology to authenticate and register votes securely. In this system, an RFID reader scans RFID tags (which could be assigned to voters), and Arduino processes the voting data. The system is simple to implement and ensures that each voter can only vote once, enhancing the integrity of the voting process.

The RFID-based Voting System with Arduino helps ensure that voting is automated, accurate, and secure. Each voter is uniquely identified through an RFID tag, and the system ensures that each voter votes only once. The feedback system (using LEDs and LCD) keeps the voter informed about the status of their vote. This kind of system can be extended to more complex voting applications by integrating with larger databases for more advanced scenarios. The Voting System using RFID with Arduino is an innovative approach to secure and efficient voting that leverages the power of Radio Frequency Identification (RFID) technology combined with the flexibility and accessibility of Arduino microcontrollers.

The system is designed to streamline the voting process, ensuring accuracy, security, and ease of use. By integrating RFID technology, the system uniquely identifies voters, preventing duplicate voting and ensuring that each person can cast only one vote. In this system, an RFID tag is assigned to each eligible voter, and when a voter scans their RFID card through the RFID reader, the system checks if the card is valid. If the card has not been used before, the system allows the voter to press a button to cast their vote.

## Literature survey

**Tiwari, P., & Gupta, A. (2020) Design and Implementation of an IoT-Based "Voting System using RFID Technology". Springer. This book covers the design and implementation of an IoT-based voting system, including RFID technology and related architectures**

**Described:**

Tiwari and Gupta's (2020) paper propose an innovative solution for modernizing the electoral process using RFID for voter identification and IoT for secure data management and real-time vote monitoring. This combination of technologies significantly enhances the speed, security, and transparency of elections, making the process more efficient and reducing the risk of fraud. This system is especially useful in contexts where voter authentication and data security are critical, and the integration of IoT provides the ability to monitor elections remotely, offering better accessibility and transparency Traditional voting systems are often prone to fraud, errors, and delays in the election process. They are also cumbersome, involving manual efforts in both registration and vote counting. The paper addresses the need for an automated, secure, and efficient voting system. The proposed system leverages RFID for voter authentication and IoT for data storage and real-time monitoring.

**Patel, S., & Patel, H. (2021). RFID-Based Voting System: Design, Implementation, and Applications. Wiley-IEEE Press. This reference explores the application of RFID in voting systems and how RFID technology is integrated with other IoT devices for secure and accurate voting.**

**Described:**

The RFID-Based Voting System proposed by Patel and Patel (2021) demonstrates a promising approach to modernizing electoral systems. By combining RFID for secure voter identification with IoT devices for real-time vote management and monitoring, the system ensures accurate, secure, and efficient voting processes. The integration of these technologies not only addresses the challenges of traditional voting systems but also provides a scalable and cost-effective solution for future elections. The paper highlights the growing need for modernized election systems that can improve voter authentication, prevent fraud, and increase efficiency in the voting process. Traditional voting methods, such as paper ballots, are prone to errors, inefficiencies, and manipulation. The authors propose using Radio Frequency Identification (RFID) technology as a solution to address these issues. RFID-based systems ensure accurate voter identification, faster authentication, and streamlined vote collection.

**Jain, A., & Arora, A. (2019). RFID-Based Authentication and Voting Systems. Journal of Computer Science and Technology, 34(2), 115-124.This paper explains the integration of RFID technology for secure user authentication and vote casting in electronic voting systems. Described**:

This paper explores the application of Radio Frequency Identification (RFID) technology in electronic voting systems. It addresses the challenges of voter authentication and ballot integrity in conventional e-voting mechanisms. The authors propose a secure and user-friendly RFID-based framework for reliable vote casting. Each voter is issued an RFID card linked to a secure database. The system verifies voter identity through RFID card scanning before granting voting access. This eliminates impersonation and ensures only authorized individuals can vote. The architecture includes microcontroller units, RFID readers, and an LCD interface. The proposed model also features real-time vote counting and monitoring. Security measures like encryption and unique ID mapping are incorporated. Experimental results demonstrate increased efficiency and reduced voting time. The system minimizes human intervention, reducing chances of manipulation. It also allows scalability for larger electoral processes. The research highlights RFID's potential to enhance democratic processes. Limitations and future improvements are also discussed. Overall, the study presents a cost-effective and secure voting solution. It is especially suitable for institutions and small-scale elections.

**Lee, J., & Kim, S. (2020). An Advanced Electronic Voting System Using RFID and Blockchain Technology. International Journal of Computers and Applications, 42(5), 382-391.Discusses the use of RFID alongside blockchain technology to improve the security and transparency of electronic voting systems**

**Described**:

This paper presents an innovative electronic voting system combining RFID and blockchain technologies. The system aims to enhance security, transparency, and trust in electronic voting processes. FID is used for fast and secure voter authentication. Each voter is assigned a unique RFID card linked to their digital identity. Blockchain is implemented to ensure vote integrity and immutability. Once a vote is cast, it is encrypted and recorded on a decentralized blockchain ledger. This prevents tampering, duplication, and unauthorized access to voting data. The system architecture includes RFID readers, secure nodes, and cryptographic protocols. A consensus mechanism validates and confirms vote entries across the network. Blockchain enables end-to-end verifiability without compromising voter anonymity. The authors conduct simulations to test the system's performance under different scenarios. Results show improved efficiency, transparency, and resistance to cyber-attacks. The model reduces dependency on centralized authorities. It also provides a transparent audit trail for all vote transactions. Voter privacy is protected through encryption and digital signature techniques. The study emphasizes the importance of combining physical and digital security layers. This dual-technology approach strengthens the credibility of e-voting systems. The system is suitable for national and institutional-level elections. Challenges like scalability and cost are acknowledged with suggestions for future work. The paper concludes that RFID and blockchain can revolutionize digital democracy. It offers a secure, trustworthy, and modern voting alternative.

**Smith, R. (2018). ESP32: Internet of Things Projects with Micro Python. Pack Publishing. This book provides comprehensive knowledge on the ESP32, detailing how it can be used for IoT applications, including integration with RFID systems.**

**Described:**

This book offers an in-depth guide to developing IoT projects using the ESP32 microcontroller. It focuses on programming the ESP32 with Micro Python, a lightweight Python implementation. The author introduces the core features and capabilities of the ESP32 chip. Readers are guided through setting up the development environment for Micro Python. The book covers key IoT concepts such as sensor integration, wireless communication, and automation. It provides hands-on projects to build practical skills in real-time data handling. One major focus is using ESP32 in combination with RFID modules. The book explains how RFID readers can be interfaced with ESP32 for identification systems. These applications include smart access control, attendance tracking, and security systems. It also covers working with Wi-Fi, Bluetooth, and cloud services for IoT data exchange. MQTT protocol and REST APIs are used for remote monitoring and control. Projects are presented with clear schematics, wiring diagrams, and source code examples. The author emphasizes low-power operation and real-time responsiveness. Readers also learn debugging techniques and performance optimization tips. Security practices for IoT systems are discussed, including data encryption and secure boot. The book is suitable for students, hobbyists, and professionals entering IoT development. Its project based approach enhances learning by doing. By the end, readers can confidently build and deploy IoT systems using ESP32 and MicroPython. It bridges the gap between embedded systems and modern networked applications. RFID integration makes it especially useful for identity and automation projects. The book empowers readers to innovate with ESP32 in real-world scenarios.

## Methodology

The Arduino Uno is an open-source microcontroller board based on the microchip ATmega328P Microcontroller & developed by Ardunio.cc. The board is equipped with sets of digital & analog Input/output (I/O) pins that may be interfaced to various expansion boards (shields) & other Circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, & is Programmable with the Arduino IDE (Integrated Development Environment), via a type B USB Cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 & 20 volts.

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