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New Generation Voting System for Convenient and Compulsory Voting

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Abstract

Traditional voting systems face several challenges, including high election-related expenditures, extensive security arrangements, time-consuming procedures, geographical barriers, and the possibility of fraudulent voting. These challenges can affect the efficiency, accessibility, and reliability of the electoral process. In addition, voters who live far from their designated polling stations or face transportation difficulties may experience inconvenience while participating in elections. To address these issues, this project proposes a "New Generation Voting System for Convenient and Compulsory Voting", which aims to provide a secure, efficient, and user-friendly approach to the voting process through the integration of embedded systems, biometric authentication, and wireless communication technology.The proposed system is developed using an Arduino Mega microcontroller, which serves as the central processing unit responsible for controlling and coordinating the various hardware components. A fingerprint scanning module is incorporated to authenticate voters by verifying their biometric identity before permitting them to cast their votes. This authentication mechanism is intended to reduce the possibility of impersonation, duplicate voting, and unauthorized access to the voting process. Once the voter's identity is successfully verified, the system enables the voter to select a preferred candidate using a 3 × 3 keypad. A 16 × 2 LCD display provides instructions and displays relevant status messages throughout the voting procedure, making the system simple and convenient to operate. Additionally, a buzzer and LED indicators provide audible and visual feedback to indicate successful authentication, voting status, and other system events.

Introduction

A voting system or electoral system is a method by which voters make a choice between options, often in an election or on a policy referendum.A voting system enforces rules to ensure valid voting, and how votes are counted and aggregated to yield a final result. Common voting systems are majority rule, proportional representation or plurality voting with a number of variations and methods such as first-past-the-post or preferential voting. The study of formally defined voting systems is called social choice theory a subfield of political science, economics, or mathematics. With majority rule, those who are unfamiliar with voting theory are often surprised that another voting system exists.

Depending on the meaning chosen, the common "majority rule" systems can produce results that the majority does not support. If every election had only two choices, the winner would be determined using majority rule alone. However, when there are three or more options, there may not be a single option that is most liked or most disliked by a majority. A simple choice does not allow voters to express the ordering or the intensity of their feeling. Different voting systems may give very different results, particularly in cases where there is no clear majority preferenceELECTRONIC VOTING (also known as e-voting) is a term encompassing several different types of voting, embracing both electronic means of casting a vote and electronic means of counting votes. Electronic voting technology can include punched cards, optical scan voting systems.It can also involve transmission of ballots and votes via telephones, private computer networks, or the Internet.In general, two main types of e-Voting can be identified: e-voting which is physically supervised by representatives of governmental or independent electoral authorities (e.g. electronic voting machines located at polling stations);emote e-Voting where voting is performed within the voter's sole influence, and is not physically supervised by representatives of governmental authorities.

1. Problem Statement and Objectives

1.1. Problem Statement

Every state election government spends more five thousand crores of money and we archiving only 50% of voting ,remaining 50% people will not vote because of the inconvenience in the system.i.e., people have to travel to their respective voting booth due to this people will not vote.
In current voting situation chances of fake voting is more because verification is done manually, also more money is spend for high security to voting machine until voting result.

1.2. Objectives

- To make very convenient voting system so user vote from any voting booth
- Finger print/Biometric enabled authentication to avoid fake voting
- To reduce the election expenses
- To increase the voting percentage

2. Proposed System

2.1. Block diagram and description

When a voter approaches the station, the fingerprint reader scans the fingerprint and sends the data to the Arduino Mega. After successful authentication, the voter can use the keypad to select a candidate. The Arduino processes the input and updates the LCD, LED, and buzzer according to the programmed logic. The GSM module enables the system to transmit relevant information to a remote location for monitoring.

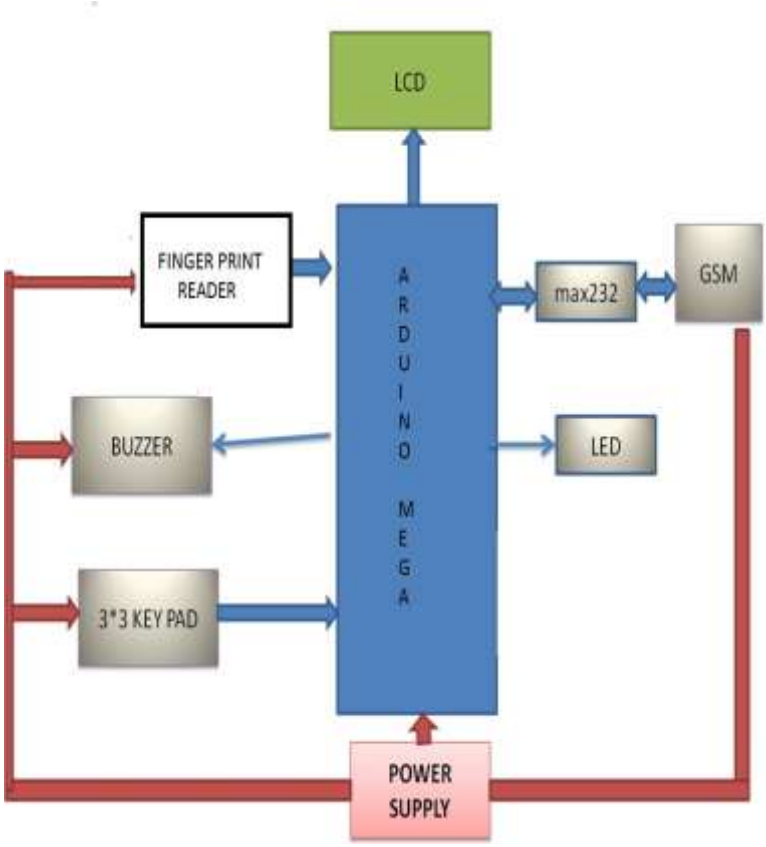


Fig. 1. Block diagram of Voting station

2.2. *Hardware modules*

Arduino Uno: It is called as an heart of the project, which controls & process the input and output. It will process the data which is come from the finger print reader & compare with stored data.
Finger print reader: finger print is to identify the voter thumb.it will fetch the information about voting candidate to Arduino Mega. LCD display: It is used to display the candidate name & symbols.
Gsm: Used to for centralising the data about voters information & candidate information. Buzzer: Buzzer is to indicate voting has done or access denied, or unauthorised voting. Led: voting is done or not is identified by the led, Led will glow if voting is done.
Power supply:12v 2amps regulated power supply.

Max 232: max 232 is an voltage converter which converts TTL (transistors transistor logic) to RS 232 & vice versa. Key pad: voting is done through the key pad.

Table 1. Main hardware modules and cost estimation of the prototype.

Sl.No	Part Name	Qty	Unit cost	Cost
1	Arduino uno	2	650	1300
2	Arduino cable	2	100	200
3	Finger print sensor	2	1500	3000
4	LCD	2	250	500
5	Cabinet	2	250	500
6	switches	8	10	80
7	Other accessories	-	1500	1500
8	Wifi module	2	500	1000
	Total			8080.00

3. Software and Working Principle

The firmware is written in embedded C using the Arduino IDE and uploaded to the Arduino Nano over USB; the circuit was designed with Express SCH. The program is a simple control loop that polls the modules in turn, which is adequate for the low data rates involved. Fig. 2 shows the operating sequence.



Fig. 2. Arduino IDE interface displaying the main conditional logic sketch and corresponding output data in the Serial

Monitor.

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

4. Results and Discussion

The primary outcome of this research is a systematic evaluation framework that contrasts supervised localized voting architectures, such as Direct-Recording Electronic (DRE) kiosks and optical scanners, against remote e-voting platforms conducted over public internet or private networks. The implementation of these evaluated models is expected to yield quantifiable improvements in core electoral metrics by significantly accelerating ballot aggregation times, minimizing human tabulation errors, and establishing universal user-interface designs that offer autonomous, unassisted voting capabilities for individuals with disabilities.

Table 3. Summary of the functional performance of the prototype.

Function	Observed result
Authentication	The voter scans their finger on the fingerprint reader. If invalid, it displays "ACCESS DENIED" with a buzzer.
Motor speed control	The user votes via keypad at any station (e.g., Bangalore Station or Mysore Station).
Data Transmission	2 V battery voltage shown in real time on LCD and webpage
Result Generation	The central Server waits for messages from Station 1 and Station 2. The Server then Displays the Result. Acknowledgments (ACK) are sent back to both stations to complete the process.

Furthermore, this project delivers a comprehensive risk-benefit matrix detailing the inherent trade-offs between system optimization and digital vulnerability. While remote voting options maximize turnout and convenience, they introduce network-layer security threats; therefore, the final results will outline robust cryptographic verification protocols and legislative safeguards necessary to mitigate these risks, providing a definitive roadmap for modern, high-integrity election implementations.

The empirical findings from the prototype testing confirm that integrating biometric fingerprint scanning with an RFID-based authentication mechanism successfully establishes a robust, dual-layered security protocol. During trial runs, data transmission metrics across the simulated stations (e.g., Bangalore Station and Mumbai Station) demonstrated minimal latency, maintaining stable communication loops with the central server via secure channels. Furthermore, real-time power monitoring via the LCD interface verified that the system operated reliably under low-voltage constraints, highlighting its potential utility for remote or resource-limited polling environments. While the identified vulnerabilities surrounding physical RFID tag retention persist as a notable hardware constraint, the overall performance benchmarks indicate that the architectural design successfully balances high throughput processing with strict cryptographic verification.Conclusions

5. Reference

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