ELECTRONIC VOTING MACHINE USING ZIGBEE

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Abstract

The main objective of the paper is to design and develop an electronic voting machine using ZIGBEE communication system for sorting out the wired e-voting problems. In this paper, fingerprint technique is also used to design a secure e-voting system. The design is based on the (ATMEGA328p) microcontroller, RS232 cable which is used for interfacing between ZIGBEE and the microcontroller, Liquid Crystal Display (16X2) for displaying the instruction, fingerprint sensor for scanning voter's fingerprint before voting, ZIGBEE transmitter, ZIGBEE receive, security alarm and visual basic for creating display page in computer. Simulation is done using Proteus software, coding and the .hex file is generated for microcontroller using Arduino software. Each voter can vote only once thus protecting the identity of the voter in making the process unbiased and fair. Database comprising details of all voters with their personal details and fingerprint are stored in microcontroller for comparing and verification during polling. This design of Electronic Voting Machine will save considerable amount of time and manpower. Thus, the proposed EVM system is more reliable and fast as compared to existing e-voting system. At the end of the polling, just by pressing a button the results can be obtained. This paper gives the complete design details of the building blocks of the entire system.

Keywords: *Fingerprint; security; microcontroller; vote; ZIGBEE.*

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1. INTRODUCTION

Voting is a method by which the electorates appoint their representatives. In current voting system the voter has to show his voter ID card whenever a person goes to the polling booth to poll one's vote. This process is a time consuming process as the person has to check the voter ID card with the list he has, confirm it as an authorized card and then allow the person to poll his vote. Thus, to avoid this kind of problems, we have designed a finger print based voting machine where the person no needs to carry his ID which contains his entire details.

These days AADHAAR CARD has been implemented by the government of India as an ID proof for each individual. In this card all the details like name, address, age, gender, fingerprint of the person is mentioned. These fingerprints can be used as an identification mark in the voting system. In this system, the fingerprint details of the entire eligible voter will be stored in the memory and the voter at the polling booth has to verify his Finger. The Finger print sensor senses the details from the tag. This data is passed to the controlling unit for the verification. The controller reads the data from the reader and compares this data with the already existing data. If the data matches with the already stored information, the person is allowed to poll his vote. If not, a message is displayed on LCD, security alarm will ring and the person is not allowed to poll his vote. The polling mechanism carries out manually using the switches.

In present Indian system, EVMs is powered by an ordinary 6 volts alkaline battery. This design enables the use of EVMs throughout the country without interruptions because several parts of India do not have power supply.

But security is lacking in this system as it tends to malpractices. The voting in most cases is not a fair one because sometimes same voters vote more than once in order please others. This results in large scale fraud.

Overcoming the above disadvantages of the present voting system, this paper provides a reliable and microcontroller security based voting system and Figure1 shows the detailed methodology of the same.

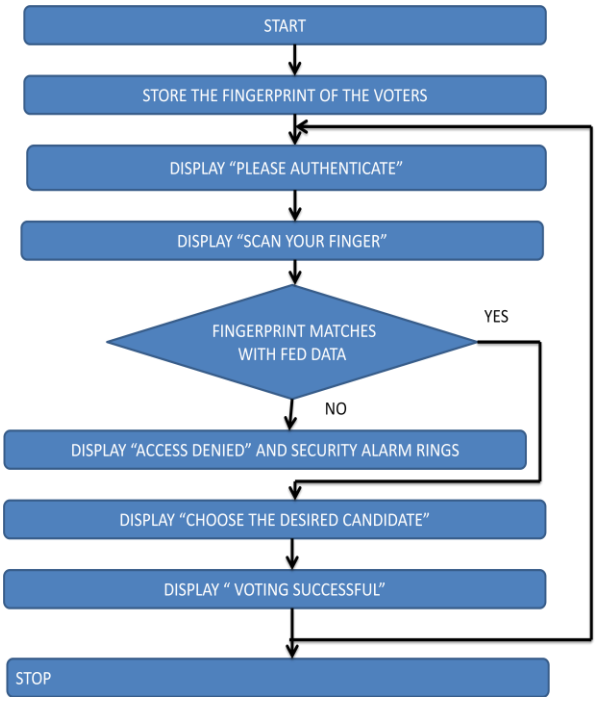
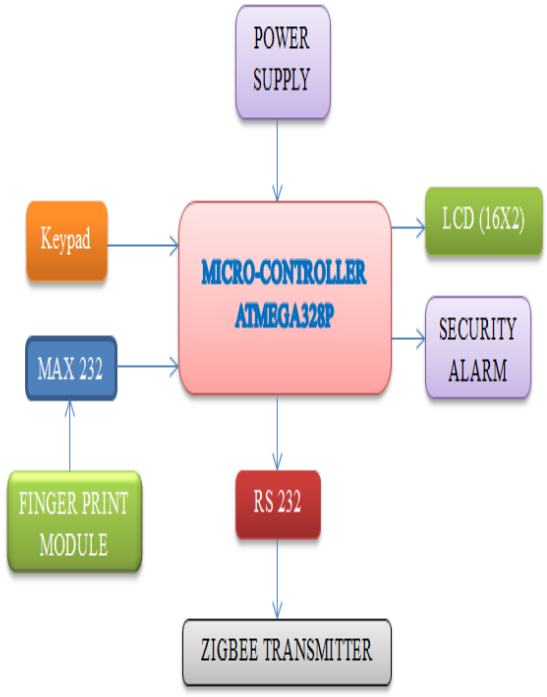


Fig 1. Flowchart of EVM

2. BLOCK DIAGRAM

The block diagram of the electronic voting machine using ZIGBEE is shown below in the figure 2.



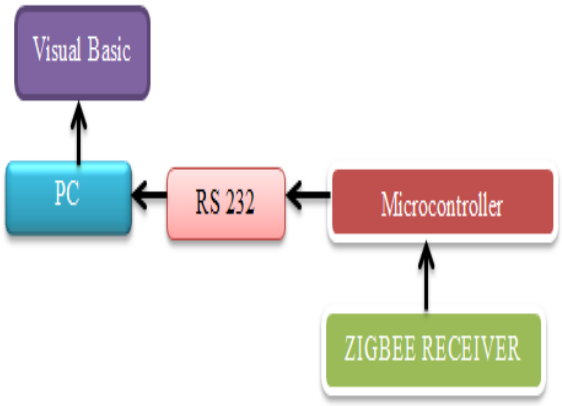


Fig 2. Block diagram of Electronic Voting Machine using ZIGBEE

3. OVERVIEW OF THE PROJECT

The project deals with theFinger print sensor, microcontroller, the interfacing unit to allow the communication between the microcontroller and Finger print module, the LCD and ZIGBEE module for transferring data. The EVM consists of two units:

1. Controlling unit
2. Balloting unit

The Controlling unit has an application program to allow the microcontroller to interface with the Finger print module, LCD and the switches. The fingerprint sensors senses the data from the tag, passes the data to the microcontroller and the controller verifies this data with the already existing data in the controller's memory and then implement the commands directed by the controller section. The performance of the design is maintained by controlling unit.

Balloting unit has the buttons for voting which is controlled by ATMEGA328p Microcontroller along with the buttons, the LED indications are used for safe voting. Security alarm is used for the alarming purpose when the voting is not valid. Interfacing of control and ballot unit is shown in figure 3.

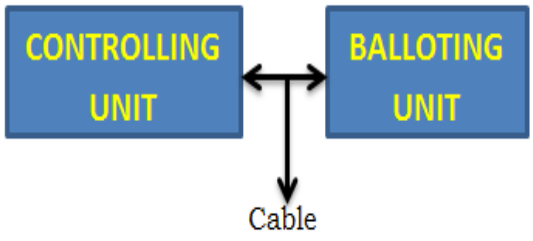


Fig 3 Interfacing of control and ballot unit

4. DESCRIPTION

4.1 Power Supply

The input power supply applied to the circuit is from the regulated power supply which supplies constant 5V to the microcontroller. The a.c input of 230V from the mains supply is fed to the step down transformer to step down the voltage to 12V which is supplied as input to the rectifier. The output obtained from the rectifier is a pulsating d.c voltage. Now in order to obtain pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. This voltage is given to a voltage regulator (7805) to obtain a pure constant 5V dc voltage. The block diagram of regulated power supply is shown in the figure 4.

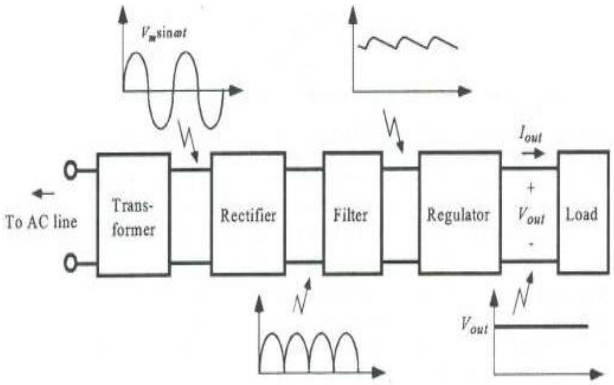


Fig 4 Block diagram of power supply

4.2 Microcontroller (ATMEGA328p)

The microcontroller is used for controlling purpose and is connected to the controlling unit. The ATMEGA328p is used in this project because of the following features like

a) 28-pin AVR Microcontroller
b) Flash Program Memory: 32 kilobytes
c) EEPROM Data Memory: 1 kilobytes
d) SRAM Data Memory: 2 kilobytes
e) Input-Output Pins: 23
f) Timers: Two 8-bit or One 16-bit
g) Analog-Digital Converter: 10-bit Six Channel
h) PWM: Six Channels
i) RTC: Yes with Separate Oscillator
j) MSSP: SPI and I²C Master and Slave Support
k) USART: Yes
l) External Oscillator: up to 20MHz

All other equipment's (like fingerprint scanner, LED glow, switches, LCD etc.) function is controlled by the programming the microcontroller. The fingerprint verification of the voters with the already stored data in its database is done inside the microcontroller. Pin mapping of ATmega328 and Arduino is shown in the figure 5.

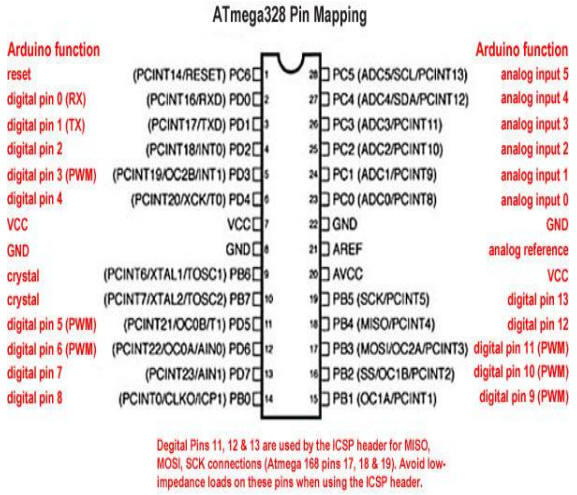


Fig 5 Pin mapping of ATmega328 and Arduino

4.3 Liquid Crystal Display and Security Alarm

LCD screen (16X2) functions as interface between the user and microcontroller. The main function of the LCD is to display the instruction "what the voter has to do after what". If the voter tries to vote twice or his fingerprint does not matches with the already stored data then it will display "ACCESS DENIED" and security alarm will ring to inform the higher officers that voter is not valid for voting and for correct person it will show "PROCEED". After completion of correct voting process by the voter it will display "VOTED SUCCESSFULLY". LCD is shown in figure 6.

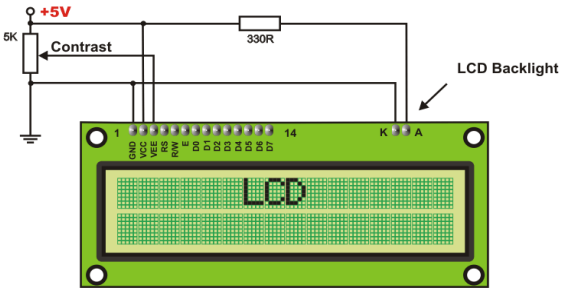


Fig 6 Liquid crystal display (16x2)

4.4 Switches

The switches are connected to the LCD and are controlled by microcontroller. Here, the switches are used to cast vote. Besides every switch the name of the candidate is printed so that the voter can choose their candidate and by pressing the switch can cast the vote to their respective candidates. This EVM is auto-reset which means when one voter will complete the voting process after few seconds the machine will be reset for the next voter to process.

4.5 Fingerprint Module

Finger print module is the important part of the EVM. It is used for scanning the finger print of the voter before starting the voting process and all the process of scanner is controlled by the ATMEGA328p. The scanner is connected to the controller through a cable called "MAX232". This cable is connected to an IC called RS232 which is used to convert the binary (0's or 1's) data of the scanner into TTL (Transistor-Transistor Logic) which is understood by the microcontroller. Figure 7 shows feature of fingerprint scanner and figure 8 shows conversion of machine language into TTL using Max 232.

ITEM	FIM3030-LV/HV FIM3040-LV/HV
Capture Speed	0.2(normal) / 0.7(secure) sec
Verification Speed (Normal Mode)	1.0 [sec] (Capture + Extract + Match)
Boot Up Time	Max. 0.5 [sec]
Data Encryption Method	AES for saving data

Fig 7. Feature of fingerprint scanner

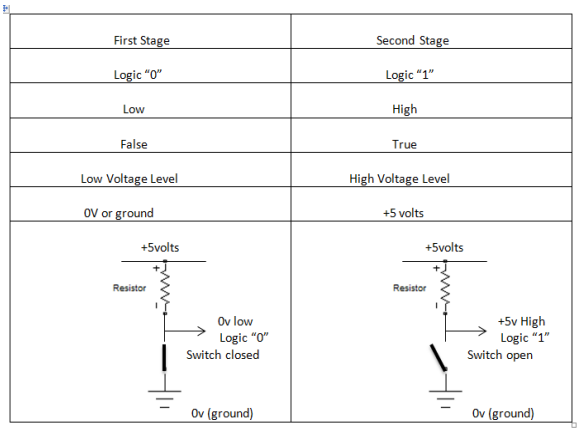


Fig 8 Conversion of machine language into TTL using Max 232

4.6 Zigbee Module

ZIGBEE is an open global standard for wireless technology designed to use low-power signals for personal area networks. It is a low power spin off WiFi. ZIGBEE operates on the IEEE 802.15.4 specification and is used to create networks that require a low data transfer rate, energy efficiency and secure networking. It is employed in a number of applications such as building automation systems, heating and cooling control and in medical devices. ZIGBEE is designed to be simpler and less expensive than other personal area network technologies such as Bluetooth.

The ZIGBEE module is used in both transmitter and receiver side. Transmitter side for transferring data from the microcontroller to the receiver side and receiver ZIGBEE is for receiving data and storing them to the connected microcontroller.The figure 9 shows the comparison between different communication devices.

	ZigBee™ 802.15.4	Bluetooth™ 802.15.1	Wi-Fi™ 802.11b	GPRS/GSM 1XRTT/CDMA
Application Focus	Monitoring & Control	Cable Replacement	Web, Video, Email	WAN, Voice/Data
System Resource	4KB-32KB	250KB+	1MB+	16MB+
Battery Life (days)	100-1000+	1-7	.1-5	1-7
Nodes Per Network	255/65K+	7	30	1,000
Bandwidth (kbps)	20-250	720	11,000+	64-128
Range (meters)	1-75+	1-10+	1-100	1,000+
Key Attributes	Reliable, Low Power, Cost Effective	Cost, Convenience	Speed, Flexibility	Reach, Quality

Fig 9 Comparison between different communication devices

5. SOFTWARE USED

5.1 Arduino

Itis an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It consists of a development environment (IDE) and the core libraries. The IDE is written in Java and based on the Processingdevelopment environment. The coding of the microcontroller is done using this software. It automatically generates .hex file in the temporary file location of "C drive".

5.2 Proteus

It is an software for microprocessor simulation, schematic capture, and printed circuit board (PCB) design. It is developed by Labcenter Electronics. In this software by connecting the all the devices properly and saving the correct path of .hex file in microcontroller, the desired output can be obtained. Figure 10 shows the simulation in proteus.

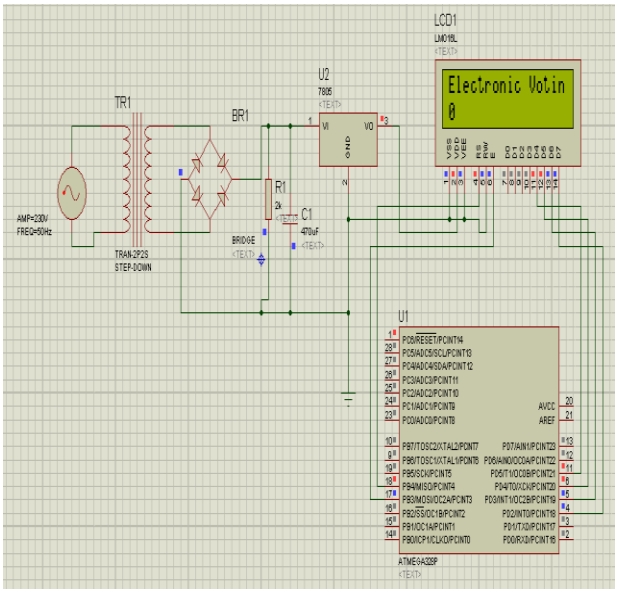


Fig 10 Simulation

6. HARDWARE DESCRIPTION

6.1 Transmitter Module

It consists of fingerprint scanner, LCD, microcontroller, ZIGBEE transmitter and switches. Firstly, the database comprises of voter's identification details and fingerprints are fed into microcontroller before the voting process. During the voting process the officer authenticates before every vote that is being casted then the voter has to scan the fingerprint which is being compared with the saved data. If the fingerprint matches with it then the voter is allowed to choose the desired candidate. If not the alarm will start buzzing, which has to be reset by the officials.

Figure 11 shows the hardware of transmitter module.

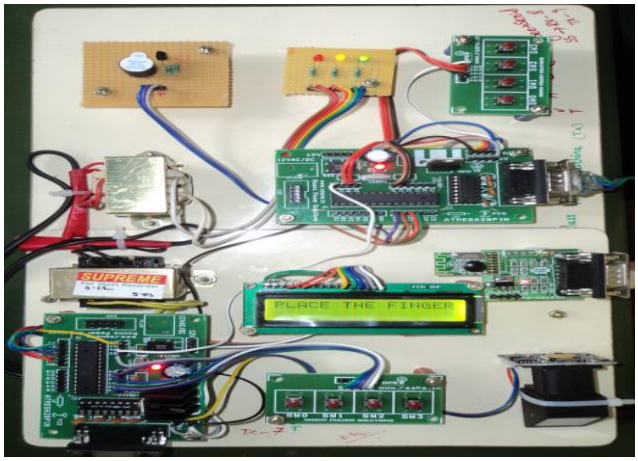


Fig 11 Transmitter module

6.2 Receiver Module

It consists of microcontroller, LCD, switches and ZIGBEE receiver. The main purpose of the receiver is to receive the details comprising number of votes acquired by each candidate. LCD is used to display voting procedure in order to track the process followed by voters which will be under constant surveillance of the officials. The display page of desktop is designed using Visual Basic which is connected to ZIGBEE receiver using RS232 to view the results. Figure 12 shows the hardware module of receiver.

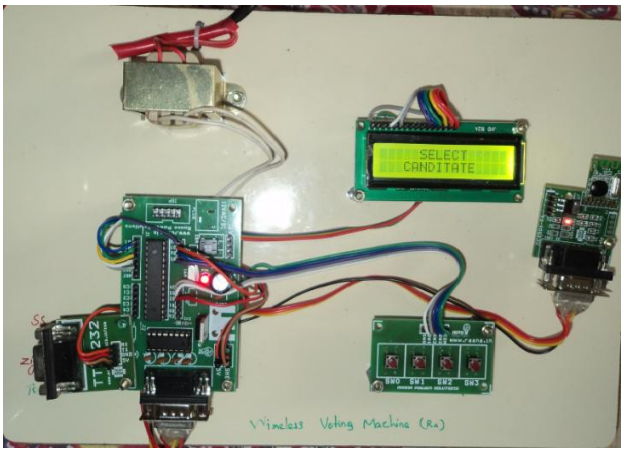


Fig 12 Receiver module

7. CONCLUSIONS

The Electronic Voting Machine using Fingerprint and ZIGBEE module has been designed successfully. Database

consisting of the details like name, address, age, gender, fingerprint of the people should be updated every time before election. This system affords additional security by allowing voter to vote only once by imparting unique identification. It is very difficult to design an ideal e- voting system which allows perfect security and privacy with no compromise.

Our future work is to interlink all the polling booths within a state with proper internet security so that voter can vote from any booth belonging to the same state. Hence, the design implemented in the present work provides portability, flexibility and the data transmission is also done with low power consumption. This system is fast and more secure then the existing system and also reduces the manpower. Thus we can conclude that this e- voting system has several advantages over the traditional way of voting.

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BIOGRAPHIES

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