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Aadhar based fully Automated EVM with High End Security Network using ARM7 and Arduino

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Abstract - *The paper proposes a fully secured embedded system with lot of security features to avoid misconceptions which takes place during the elections. The system is provided with two security measures namely "Arduino based Security System" and "ARM7 based Automated System". The Arduino based Security System consists of alcohol sensor, metal detector which detects the drunken voters and voters with metal weapons such as guns, bombs through a buzzer and LEDs, which alerts the authorized persons or constables who are on election duty. ARM7 based Automated System uses fingerprint technique which checks for the aadhar number and fingerprint of the voter with the already stored data in the memory of microcontroller. GSM technology involves in the transmission of information to voters through messages. The system provides efficient, quicker, and reliable and blunder error free voting process as the voting is of crucial importance in the society where people determine their government.*

Keywords*: *Aadhar Card, Arduino Uno, ARM7, Fingerprint technique.

1. INTRODUCTION

Voting is the fundamental right in the democracy of the country. Government is the part of the democracy. It is the most pivotal process that expresses the decision of the general population and maintains the exceptional importance of a framework represented by the general population's decision. Electronic Voting Machine (EVM) is an electronic device that gets votes from voters, stores the votes and numbers the votes soon after the casting of vote process.

Aadhar card system was introduced in India years back. Now a day's, aadhar services are very easy, popular and realistic. Since each aadhar card comes with a unique identification number, details of a person and biometrical identifications, government of India is allowing many services which are purely dependent on this aadhar process. Hence in this system, a unique number enrolled for each person and the fingerprints taken during the enrollment of the aadhar card is utilized as identification during the election process.

Each individual is required to carry and show the voter ID card while going to the polling booth to poll his vote during elections. This is a tedious procedure and time consuming process as the individual's voter ID card has to be checked and verified with the government list, confirm it as an approved card and then the individual will be permitted to poll his vote. Thus, to avoid these kinds of problems, fingerprint based system with security measures such as alcohol and metal detection has been designed where the voter ID card is not required.

2. LITERATURE SURVEY

A ballot is an electronic device used in an election in order to cast the votes. The election officers verify a person's right to vote by comparing their personal information with the data listed on the electoral roll. If a person has the right to vote, the election documents and the ballot paper are provided to the voter. The voter then fills out the paper ballot in the polling booth and puts their completed ballot in the ballot box. The box has to be totally locked and sealed until counting session starts so as to ensure that the ballot papers cannot be manipulated. Once the voting has formally finished, the ballot boxes will be opened under close supervision and the ballot papers will be tallied according to the national voting laws. It requires more papers, more power for security, and time for counting [1].

EVMs were first utilized as a part of the by-election to north paravur assembly constituency of Kerala in 1981. EVM has a Control Unit and the Ballot Unit. A five-meter cable connects the two units [2]. Control Unit is placed in Presiding Officer's compartment or with a Polling Officer. The Balloting Unit will be kept inside the voting compartment. Primarily, the voter needs to get his voter ID checked and verified with the list. If he is eligible, then he will be permitted to vote. The voter then can make his choice by pressing the switch on the balloting unit to a particular party. Illegal voting can be done as one candidate can poll the vote of other members in the electoral list [2].

Voters can cast the votes through GSM mobile. Just like the voter ID, a mobile ID is given to all eligible voters by election committee board. The person who has mobile ID can cast the vote through GSM mobile. On the day of voting the voter has to send a message which contains his mobile ID and candidate's ID which he/she assigns to vote in terms of messages, which comes from voters mobile. There may be false vote by the individual who can fabricate the SIM having a similar number and furthermore if the individual looses ID number then false voting can be done [3].

RFID system consists of RFID tag and RFID reader [4]. Each tag contains the information of individual voters such as name of the voter, voter ID. When RFID tag is placed near RFID reader, it reads the tag ID. The reader then communicates with the MCU and checks for tag ID that is stored in the database. If it is present, an OTP is sent to his registered mobile number. If correct password is entered, the switches get activated and the person can poll his vote. In case the ID is not present, the session is terminated [4]. RFID systems are often more expensive.Tags may be vulnerable to Electro-Static discharge.

In secured Electronic Voting Machine using Biometric [5], the personal computer is utilized to gather and store the database of the considerable number of people before the voting process. The processor is connected with the computer to access the database which is stored. An optical fingerprint module is used to scan and it sends the scanned signal for the verification. A touch screen is used to give the input to the processor for selecting the candidate [5]. Database stored in the personal computer are not secure and safe. Illegal voting is possible.

3. PROPOSED ARCHITECTURE

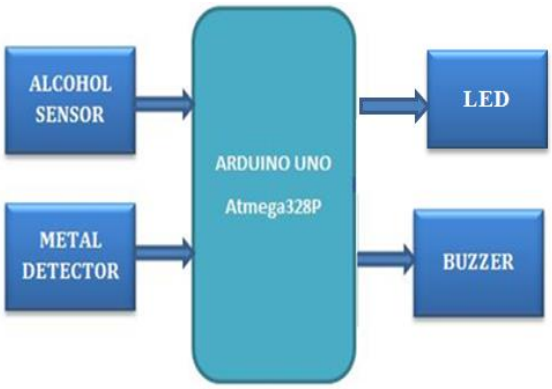

Figure 1: Arduino based Security System

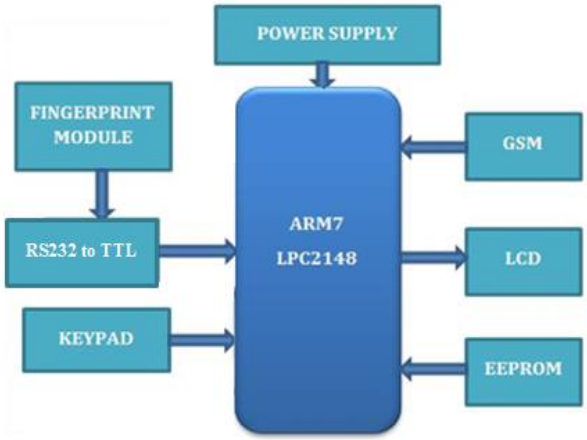

Figure 2: ARM7 based Automated System

3.1 WORKING PRINCIPLE

At the entry level, the person at the polling booth will be checked for alcohol consumption and metal detection by an embedded unit interfaced with Arduino Uno. If the person has consumed alcohol or if any metal is detected, the system alerts the authorized persons through a buzzer and LEDs. Buzzer produces a continuous tone. An alert message is sent through GSM and also a blank call to authorized persons. Hence further the person will not be allowed to cast the vote.

At the next level, the ARM7 Microcontroller has been used. Keypad, LCD, GSM and Fingerprint module are connected to the Microcontroller. The fingerprint module is connected to MAX 232 because it converts the RS-232 serial port levels of the fingerprint scanner to the TTL logic level which is understood by microcontroller. Fingerprint Processing includes two modes: Fingerprint Enroll mode and Vote Casting mode. For enrolling, the person has to enter his 12 digit aadhar number. If it is valid it asks for fingerprint of the voter then the person needs to enter the fingerprint twice. The image template will be stored in the memory i.e. EEPROM of microcontroller. For vote casting, the person needs to enter his 12 digit aadhar number, scan his fingerprint once and can cast the vote by pressing a particular number on the keypad for their favorable party. After casting of votes, a message will sent through GSM to the voted people regarding the results of the election conducted.

3.2 COMPONENTS DESCRIPTION

A. ARDUINO UNO (ATmega328p)

The Arduino Uno is a microcontroller board dependent upon ATmega328p manfactured by ATMEL. It is a central unit which monitors the alcohol sensor and metal detector. It is used for controlling purpose.

Figure 3: Arduino Uno Board

Features	Specifications
Pin Count	28
Flash Memory	32KB
SRAM	2KB
EEPROM	1KB
Digital I/O pins	14
Analog Pins	6
USART	1
Operating Voltage	5V
Clock Speed	16Mhz

Table 1: Specifications of Arduino Uno

B. ALCOHOL SENSOR (MQ3)

A MQ-3 Alcohol Sensor detects the presence and the amount of the alcohol gas (ethanol) present in the air and an analog voltage is an output reading. The sensor can be actuated at temperatures ranging from -10 to 50˚C with a power supply of less than 150mA at 5V. The sensing range starts from 0.04 mg/L to 4mg/L, which is suitable for breathalyzers.

Figure 4: MQ3 Alcohol Sensor

C. METAL DETECTOR

Metal detector is a device that detects weapons such as knives, blades, bombs and firearms. Metal detectors are diagnostically useful because of their low cost, ease of use and absence of radiation exposure.

Figure 5: Metal Detector

D. BUZZER

A buzzer is an audio signaling electronic device used to produce a continuous sound when a person is drunked or detected with metal.

Figure 6: Buzzer

E. ARM7 MICROCONTROLLER (LPC2148)

It is a microcontroller board manufactured by Philips which is used to for controlling purpose of the unique fingerprint module, when to receive the information and provides commands to LCD for displaying the data.

Figure 7: ARM7 Microcontroller Board

Features	Description
Bit	16/32
Pin Count	64
Flash Memory (Bytes)	32kB to 512kB
SRAM (Bytes)	8kB to 40kB
Analog Inputs	14
UART	2
32-bit Timer/Counters	2
CPU Operating Voltage	3V to 3.6V
Clock Speed	60Mhz

Table 2: Specifications of Arduino Uno

F. Fingerprint Module (R305)

Finger print module is the essential part of the EVM. The module is utilized for scanning and storing the finger print and can configure it in 1:1 or 1: N mode for identifying the person. All the process of scanner is controlled by the ARM7 microcontroller. The scanner is connected to the controller through "RS232 to TTL". RS2232 has an IC called MAX232 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 8: Fingerprint Module R305

Features	Description
Image Capture Surface	15-18 mm
Verification Speed	0.3 sec
Scanning Speed	0.5 sec
Character File Size	256 bytes
Template Size	512 bytes
Storage Capacity	250
Resolution	500 DPI
Voltage	3.6 - 6.0V DC

Table 3: Specifications of R305 Fingerprint Module

G. MATRIX KEYPAD (4X4)

The keypad 4x4 is utilized for loading the numeric aadhar numbers into the microcontroller by the voter. It comprises of 16 buttons organized in a form of an array containing four rows and four columns.

Figure 9: 4x4 matrix keypad

H. LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display unit and a 16x2 LCD can display 16 characters for each line and there are 2 such lines.

Figure 10: 16x2 LCD

I. GSM

Global System for mobile communication is used to send messages if the voter is drunked or with metal detected. It also sends the results immediately after the elections gets over.

Figure 11: GSM Modem

4. RESULT

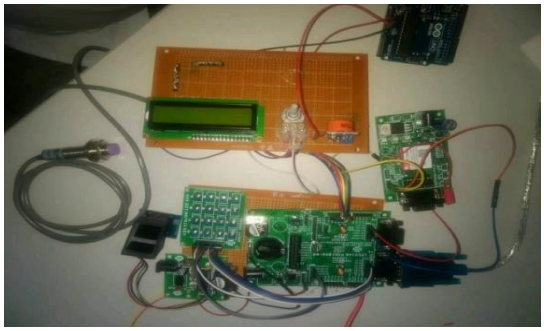

Figure 12: Model of proposed system

If the range of alcohol is greater than 800, the buzzer and Red LED turns ON and it indicates that the person is drunk. Similarly, if the percentage of metal is more than 25 it indicates the person has some metal and again the buzzer and Red LED turns ON.

For enrolling, the person has to enter his 12 digit aadhar number. If it is valid it asks for fingerprint of the voter then the person needs to enter the fingerprint twice. If it is valid he can go to vote casting mode, where aadhar number has to be entered again and has to scan fingerprint once. If both the fingerprint matches, the person can cast the vote to his/her favorable party.

5. CONCLUSION

The system provides safety from alcoholic persons and Maoists who come to polling booth to blast polling booth. The system is linked to AADHAAR to avoid vote duplication and provides portability, flexibility. Data transmission also consumes low power. If face recognition based retinal scan method is adopted the problem of authentication can be solved up to 100%.

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BIOGRAPHY

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