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IoT based Online Referendum using Trusted Endorsement System

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Abstract— Voting is the way to express the opinion of a citizen in a democratic nation and to exercise their rights .The purpose of every government is to develop and implement various policies for the benefit of its citizens. Voting is done with the Electronic Voting Machine which has the functionalities of voter information verification and authentication of voter , balloting process ,calculating the vote and generate the result/report . In this paper , voter information is acquired from the AADHAR data during voter verification process. Voters/Users are authenticated and authorized by biometric identification. Transparency is additional advantage for the above system. The process of Control unit and Ballot unit is automated through IoT. Data of electoral and voters are stored in cloud real time databases. Communication over control and ballot unit is secured through some basic security features.

Keywords—Electronic Voting Machine Ballot, Fingerprint , Arduino Uno, RF module, Raspberry pi, cloud real-time database.

INTRODUCTION

In developing countries like India the number of voters are increasing day by day. And a corruption free voting system is a burning question at present. There is huge scope of corruption in these countries due to manual voting system. Each voting season lots of voting panel's vote get suspended due to corruption. Corruptions are like submitting someone else vote, same voter tries to

vote again removing the voted ink mark from his/her hand. Lots of people do not come to participate in vote. Some corrupted persons take advantage of that and submit vote on behalf of absent people. Also sometime candidates submit unlimited amount of vote through bribe or arms. These types of corruptions can be stopped only through automated voting system. And the trust can be gained through a transparent voting system like ours one.

India requires secured and an efficient voting system in the 21st century. This project aims to develop a Electronic Voting Machine which provides gateway for Aadhar based smart voting system. This paper provides more importance to the Data Security of voters and to reduce money which government is spending money for conducting public elections. Today we are facing many problems like Booth capturing [2], long queue in front of voting booths, voting booths are far away from residence and senior citizens are facing major issues, which decreases voting percentage. The purpose of Democracy will be fulfilled when each and every citizen are involved in voting. Key solution for all the above problems is IoT based Electronic Voting system.

Until finger print of the voter will be verified, the voting machine will not be unlocked. After unlocking the machine user will submit his vote through push button. And the voting machine will be locked again. This system is also under internet of things as the voting machine is connected with internet through Wi-Fi. To maintain the transparency each time a user submits a vote a tweet will be generated that specific user has submitted his vote and the total number of votes increases. This way any citizen who didn't submitted his/her vote can claim if any false voting occurred.

I. EXISTING VOTING SYSTEMS

A. Electronic Voting machines

India has an outdated method of conducting elections using Electronic Voting Machines, which is prone to fraud and it is tedious to handle the voting machines. Most of the EVMs are foreign manufactured, which means the secret codes that control the EVMs are in foreign hands and that can be used to influence the election results. EVMs which are used in India do not have any mechanism by which the voter can verify their identity before casting votes, due to which fake voters can cast numerous fake votes. EVMs can be tampered during manufacturing [3] in such case it can manipulate the actual voting [1]. Remote votes cannot be casted using conventional EVMs. EVMs are very costly, and Government has to spend a lot money for conducting public elections. Citizens will be in queue to fulfill their Right to Vote, which in turn result in huge loss for nation. After elections government has to maintain these machines with full security till counting process. Counting is again a tedious process for government. Many countries namely Germany, Netherland, Italy, France have banned EVMs. Indian EVMs are manufactured in Japan but Japan is using ballot system.

B. Paper Ballot system

Paper Ballots were used in India before 1997 for conducting the public elections. Even though this method gives uninterrupted voting, Votes captured in ballots can be stored for a very short period as the ink used in voting my discharge or ballot paper may lose its quality. Proper care has to be taken in maintaining these ballots to protect them from humidity, sunlight and other factors, which affect the ballot papers. Once the ballot is corrupted, we cannot recover the original data. After the election process, it takes more time and effort for counting the votes manually by checking each ballot paper. Paper is an Inflammable material accidentally I may catch fire in case all record will be lost and cannot be recovered and hence government has to spend extra money for conducting re-elections. Bogus ballots can be made and in-numerous fake votes can be casted. Physically disabled peoples were facing difficulties in casting their votes, in those cases they need others help, but privacy while casting votes is vomited.

C. Online Voting

Online voting system has merits than existing system but it has many demerits. It is difficult to ascertain the identity of the person casting vote. It is not always reliable. It is vulnerable to hackers and malicious software programmes. Since many proposed system are web based there are chances of illegal access of data. Hackers can steal the login credentials of voters and can cast illegal votes.

II. PROPOSED SYSTEM

With new advancement in Technologies like IoT, operation/functionalities of Electronic Voting System can be improved. It ensures the security over voters data . It simplifies the process of voting and accuracy of the result is more. Here ,



Fig 1. Embedded Communication

The process of Control unit and Ballot unit is automated through IoT .Communication over control and ballot unit is secured through some basic security features.

Voters/Users are authenticated and authorized by bio metric identification.

C. Control Unit Operation:

Arduino based control unit is made for voter authentication.

- Desktop app is developed
- Using fingerprint verification of the voter.
- After authentication , the voter data is transferred wirelessly to the ballot unit.
- Send data from arduino uno to the ballot unit.
- While receiving the voter data the ballot will start its functionality automatically.
- Implement the basic encryption and decryption algorithms of the voter data .

D. Ballot Unit Operation

Process of voting happens in the ballot unit.

- Ballot will ask the voter to select the electoral candidate to whom he is interested to vote.
- After voting acknowledgement will be send to the application.
- Here , the voter details with his appropriate vote information are transferred from the ballot unit to the cloud real time database.
- Process is handled by the programmable functions of raspberry pi .
- The data of electoral and voters are stored in cloud real time databases.

- Which has the communication of data transmission between the raspberry pi and arduino connected in the ballot unit.
- Concept of distributed storage of voter data is to be implemented.
- Storage of voters data with his appropriate vote are stored in the cloud db using raspberry pi .
- Analytics of the voters and result are further generated from the db through Mobile Apps Basic voting algorithm is executed .
- Some big data analytics also to be done for accurate results.

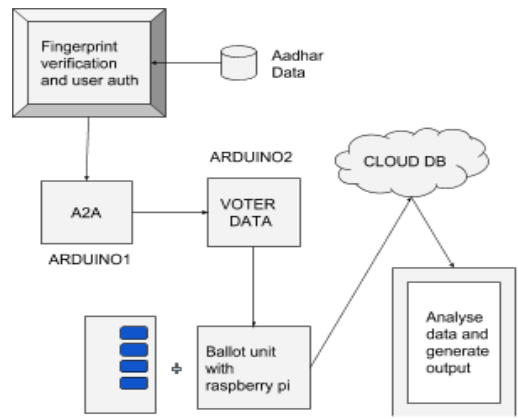


Fig 2. IoT based EVM

Architecture

III. HARDWARE REQUIREMENTS

E. Arduino Uno

Arduino is open source physical processing which is base on a microcontroller board and an incorporated development environment for the board to be programmed. Arduino gains a few inputs, for example, switches or sensors and control a few multiple outputs, for example, lights, engine and others. Arduino program can run on Windows, Macintosh and Linux operating systems (OS) opposite to most microcontrollers' frameworks which run only on Windows. Arduino programming is easy to learn and apply to beginners and amateurs. Arduino is an instrument used to build a better version of a computer which can control, interact and sense more than a normal desktop computer. It's an open-source physical processing stage focused around a straightforward microcontroller board, and an environment for composing programs for the board. Arduino can be utilized to create interactive items, taking inputs from a diverse collection of switches or sensors, and controlling an assortment of lights, engines, and other physical outputs[9].It has its own IDE for dynamic programming. It has 14 digital **input/output pins** in which 6 can be used as **PWM outputs**, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a **reset** button[9].



Fig 3. Arduino Uno

F. Radio Frequency Module

An RF module is a small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency communication.

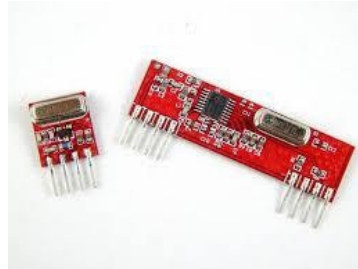


Fig 4. RF Module

G. Raspberry pi 3+

Raspberry Pi could be a low price, credit-card sized pc that plugs into a pc monitor or TV, and uses a regular keyboard and mouse. it's a capable very little device that permits folks of all ages to explore computing, and to be told a way to program in languages like Scratch and Python. The Raspberry Pi three Model B+ is that the latest product within the Raspberry Pi three vary, boasting a 64-bit quad core processor running at one.4GHz, dual-band a pair of.4GHz and 5GHz wireless LAN, Bluetooth four.2/BLE, quicker LAN, and Edgar Allen Poe capability via a separate Edgar Allen Poe HAT. The dual-band wireless LAN comes with standard compliance certification, allowing Firstly discussing regarding statistics concentration comes on Fingerprint scanner [7-8]. For this the R305 has high voltage module as a scanner. This module has in-built fixed storage, DSP and RAM. this could store up to one hundred users fingerprint. This module will operate in two modes they're Master mode and User mode. The Master mode is employed to register the fingerprints which is able to be hold on within the fixed storage gift on the scanner with a singular id. once the module is interfaced to the arduino, user mode is employed. This mode verifies the scanned pictures with the hold on pictures. once coming back to our application the pictures of the scholars are hold on within the module with a singular id[10].

This scanner is interfaced to arduino through the cable sanctionative serial communication. By victimization this controller we are going to be dominant the scanning method. when the scanning has been completed the result's hold on within the microcontroller. By merely pressing a switch we are able to get the list of absentees for that day. This uses regulated 5V, 500mA power provide. 7805 3 terminal transformer is employed for voltage regulation. Bridge sort full wave rectifier is employed to rectify the ac output of secondary of 230/12V step down electrical device



Fig 5. Raspberry pi 3 B+

D. Biometric Module:

Firstly discussing about Biometrics concentration comes on Fingerprint scanner [7-8]. For this the R305 has high voltage module as a scanner. This module has in-built ROM, DSP and RAM. This can store up to 100 users fingerprint. This module can operate in 2 modes they are Master mode and User mode. The Master mode is used to register the fingerprints which will be stored in the ROM present on the scanner with a unique id. When the module is interfaced to the arduino, user mode is used. This mode verifies the scanned images with the stored images. When coming to our application the images of the students will be stored in the module with a unique id.

This scanner is interfaced to arduino through the cable enabling serial communication. By using this controller we will be controlling the scanning process. After the scanning has been completed the result is stored in the microcontroller. By simply pressing a switch we can get the list of absentees for that day. This uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.



Fig 6. Fingerprint Module

A. Features:

- Fingerprint reader can conduct secondary development, can be embedded into a variety of end products.
- Optical fingerprint sensors for reliability.
- Multiple module to select from as per your application needs.
- Full development support and reference designs.
- Quick development and product launches.

- Integrated image collecting and algorithm chip together, ALL-in-One.
- Low power consumption, low cost, small size, excellent performance.
- Good image processing capabilities, can successfully
- capture image up to resolution 500 dpi.

B. Principle of Operation

Fingerprint processing includes two parts: fingerprint enrollment and fingerprint matching (the matching can be 1:1 or 1:N). When enrolling, user needs to enter the finger two times. The system will process the two time finger images, generate a template of the finger based on processing results and store the template. When matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. For 1:1 matching, system will compare the live finger with specific template designated in the Module; for 1:N matching, or searching, system will search the whole finger library for the matching finger.

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CONCLUSION

Expected outcome of our proposed architecture is safe and secure voting system with accurate and fast voting results our proposed architecture will definitely overcome the drawbacks of the traditional methods and the successful and secure results will be obtained.

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