



**Article Title: Advanced and Secure Biometric Voting System**

## **Advanced and Secure Biometric Voting System**

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### **ABSTRACT**

India is world's largest democracy and the essence of any democracy lies in the fact that people choose the own representatives. But in present era, the fair election process is facing a lot of problems like booth capturing, rigging, fake voting, tampering with the Electronic Voting Machines (EVMs) etc. The main objective is to enhance the security in order to prevent duplication and provide a system which reduce the burden for people on conducting a voting. In the commonly used EVMs, the voting process takes place electronically and this eliminates the use of ballot paper to cast votes in elections as it is very time consuming and errors might crawl in intentionally or unintentionally. Today authenticity of the voter is a big concern and it also should be made sure that a same voter is not able to vote two times. This issue can be dealt with by introducing biometric based voting system, where the authenticity of a voter is established based on fingerprints. Hence, the principle shall be one person, one authentic vote. In the present work, a prototype fingerprint based biometric voting machine has been developed. It is proposed that a feature that will link the Aadhar database of Unique Identification Authority of India (UIDAI), Govt. of India, New Delhi; can be embedded. This shall facilitate all the voter to get registered on the portal automatically, which can be classified on the basis of regions and constituencies based on their unique identification i.e. their fingerprints.

**Keywords:** Aadhar, Arduino, biometrics, EVM, finger- print scanning, rigging, UIDAI.

### **1 Introduction**

For conducting and controlling voting in India, a separate commission was introduced called Election Commission of India (ECI). This commission is not favorable or does not support any political party. Security is the heart of e-voting process. Therefore, the necessity of designing a secure e-voting system is very important. Currently, the voting system in India is inefficient and vulnerable to outer threats, the only thing is that the security checks is a voter ID card, which these days are faked by many. It is slow and counting the votes manually can take a long time. Through this project, we propose developing a novel biometric based voting system in order to curb the above illustrated problem.

The human fingerprint also can be used as human biometric system whereby the fingerprint on every individual are different and unique which shows that the fingerprint cannot be duplicated and manipulated. The purpose of using the fingerprint is for user identification and authentication. In current voting system voter has to go pooling booth and show their voter



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ID then officer check their ID from the list that he has. If it's information is matched, then officer allow voter to cast their vote this system is time consuming and there may be possibility of occurring mistake i.e. fake voting, errors in counting of votes or may user can vote twice hence to avoid such type of problems we designed biometric voting machine using Aadhar authentication. In this system there is no need to carry voting card simply voter has to press their thumb on fingerprint module, this fingerprint already exists Aadhar card database i.e. Person's citizenship, age is more than 18 years etc. If this database is matched, then system allow person to cast his vote and if it's does not match then system will not allow voter to vote and show 'INVALID VOTER' message on LCD screen.

## 2 Recent Works

Kumar and Begum [1] have described a voting system which involves minimalistic electronics machine and majorly depends on paper work. A ton of desk work is included to spare the data of voter who needs to go to polling booth carrying voter ID card for validation. When validation is done by election officer then voters cast their votes utilizing electronic machine. A list of all the candidates contesting the elections is present on the machine and by pressing the respective button; the voter can cast his/her vote to the candidate of choice. To beat this customary election framework, there is a need to contemplate the digital innovations and their security.

Benjamin et al. [2] have clarified in their research that in paper-based elections, voters cast their votes by saving their voting forms in fixed boxes which are dispersed over all the constituent circuits in a given nation or state. When the election period ends, all the ballot boxes are open in the supervision of the confirmed authorities, the votes are tallied physically. There can be mistakes in counting of vote sorat times voters vote more than once in this procedure. In some cases, vote count is even manipulated to change the result of the election in favor of a particular candidate. Along the selines they propose dan electronic voting frame work that will consequently perform confirmation, approval and checking with the assistance of UIDAI. The proposed electronic voting system can be executed alongside the customary election system as well [3]. The proposed approach will utilize the data given by the UIDAI. The system proposed and the strategy completed has basically the following stages: enrolment, confirmation and approval.

Chaum [4] and Shalini et al. [5] have proposed a finger print verification system utilizing "minutiae extraction technique". All the fingerprint recognition systems are pretty much dependent on minute matching and database hashing, which have been all round contemplated.

Acker manetal.[6]have stated the consequences and future possibilities if the smart e-voting system is implemented practically. There are two basic level principle objective sthatha veas ended from the voting procedure-(I)an individual's fingerprint won't change the structure normally after around one year after birth(ii)the fingerprints of people are different. Even the



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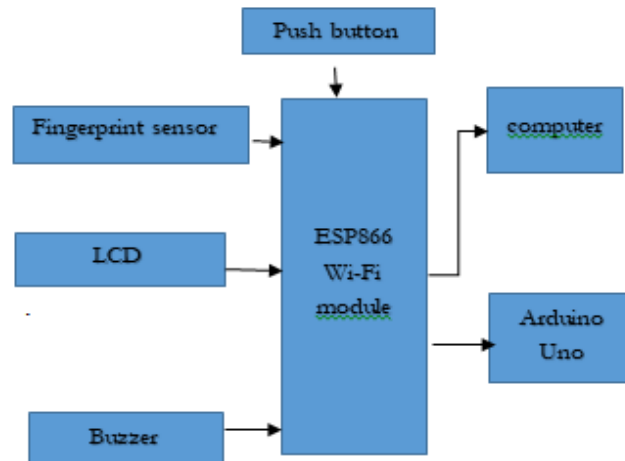
twins don't have the same finger prints [7]. The possibility of matching huge number of fingerprints with large amount of electoral voters' data raises a question of speed. But the technique of Advanced Hashing eliminates the speed concerns and adds remarkable speed to the entire process [8]. Another research [9] has addressed the idea of "digital pseudonyms" and "untraceable electronic mail", which can apply for e-voting and its security and anonymity. The concept of Block chain was used in an attempt to establish a fair election process, but the system turns out to be too complex to be actually implemented [10]. Gajabe [11] has introduced the concept of remote elections in his research. Few researchers during recent years propose that the Aadhar database that the government of India already has can be linked with the database of the Election Commission of India and thus the entire electoral process can be modified so as to involve biometric verification before a voter casts his/her vote [12]. Due to the feasibility of the idea proposed in these papers, a lot of research is being done lately for developing more efficient fingerprint extraction techniques [13]. In Ref. [14-15] an "adaptive pore model" for "fingerprint pore extraction" has been proposed where automated recognition is done using the sweat pores. A computationally expensive "skeletonization method or unitary scale isotropic pore model" has been utilized. All the research works show the vast possibility and large scale merits of actually implementing the Biometric fingerprint based electronic voting machines for conducting the unbiased election procedure. Hence, the same has been attempted in the present work. A fingerprint based remote EVM using Arduino is proposed to ensure fair and square election process.

### **3 Proposed Methodology**

In the present work it is proposed to use a fingerprint sensor to confirm the authenticity of voters by taking their biometrics into the framework. The tools and hardware is used in order to develop the system. Since there are many available software and hardware today, so it must be chosen based on the requirement. The system consists of fingerprint module, Arduino Uno, power supply, LCD screen, ESP8266 and the buzzer. Following is a block diagram of the system.



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**Figure 1:** Block Diagram of process flow

### 3.1 Arduino IDE

**Arduino IDE** is a software, it stands for Integrated Development Environment. It comes with the physical programmable circuit board which known as Arduino Boards. This software is specifically used for write, compile and upload source code into the Arduino devices. Moreover, Arduino IDE is an open source software and available to install and start to compiling the code. It is also support both C and C++ languages which making it understandable and learn it easier.

### 3.2 The Arduino Uno



**Figure 2:** Arduino Uno microcontroller board

The Arduino Uno a microcontroller board and it is used to make a prototype of the system. It contains 14 digital input or output pins, six analog inputs, a 16MHz crystal oscillator, a power slot, a usb port, an ICSP header and a reset button. To use Arduino Uno is by power it with AC-to-DC adapter or connect it to a computer with a USB cable to get started.

### 3.3 Fingerprint module

Fingerprint module is an input device which used for fingerprint processing and capturing a



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digital image of the fingerprint pattern. For fingerprint enrolling process, user needs to enter the finger two times in order for the system generate a template of the finger based on processing results and store the template.

### 3.4. LCD (Liquid Crystal Display)

It is an electronic display module and find a wide range of applications. This LCD has two registers which are command and data. The command register is used to store the command instruction given to LCD. This command is used to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The ASCII value of the character which is displayed in LCD can be stored in data register.



**Figure 3:** *LCD Display*

### 3.5 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices.



**Figure 4:** *Buzzer*

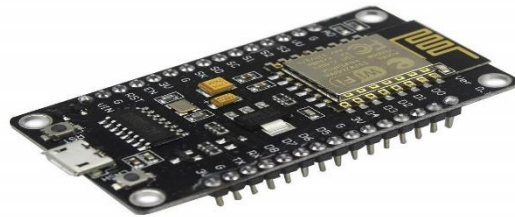
### 3.6 ESP8266 WIFI Module

ESP8266 is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection. The module can even be programmed to act as a standalone Wi-Fi connected device. In this system, Wi-Fi is used to



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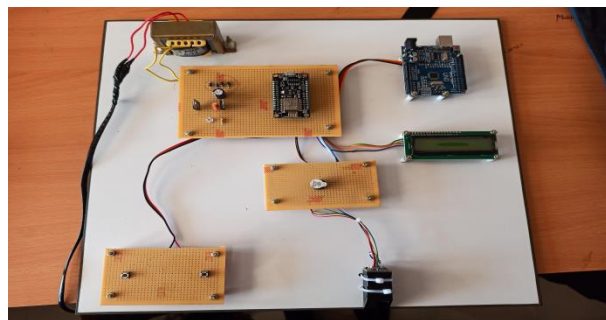
transfer the collection of votes to the server so that vote information can be updated to the server.



**Figure 5: ESP266**

#### 4 Result

The Fingerprint Voting System is to allow user to put their vote on their chosen candidate by using a fingerprint authentication. The main objective as stated before is to enhance the security in order to prevent duplication and provide a system which reduce the burden for people on conducting a voting. Thus, by implementing this system, user can put their vote with fingerprint instead of paper without doubting about their security. Before proceeding to the hardware implementation part the simulation of the whole system was done by software. After successful simulation, the hardware system was build.



**Figure 6: Completed Hardware setup**

Figure.7 shows the full hardware setup after completing the setup. The setup consists of the fingerprint sensor module which will take the fingerprints from the voters. It also consists of a LCD display to guide the voters to successfully cast the votes. It also shows if a voter is registered or not. It has 2 pushbuttons for giving votes to different candidate.





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