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SECURE VOTING SYSTEM USING AADHAR AND BIOMETRICS

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Abstract - *From the recent Loksabha and Assembly elections, it is evident that there is increase in illegal voting. Also the migration within the country for various reasons such as education, employment and so on has led to decrease in voter turnout. This demands the need to revamp the current system with better authentication, which is easily accessible to vote. This paper focuses on providing three tier security for voting. The first level of security is achieved by scanning the QR code on the aadhar card which is followed by fingerprint authentication and face recognition which is verified with the existing database. This proposed system allows a person to cast the vote in his/her nearest voting booth irrespective of their home constituency.*

***Key Words*: Aadhar card, QR code, fingerprint sensor, face recognition, Wi-Fi**

1. INTRODUCTION

India is the largest democratic country in the world and it is necessary to have an efficient leader for the country wherein elections play an imperative role. Being the second most populated country, the process of conducting elections in all the states is challenging. As time has passed, the voting system has evolved from paper based system to electronic voting system. As India is moving towards the digital era it is necessary to impart digitalisation in the voting process. In regard to this and to overcome the drawbacks of the current voting system a prototype that enables a person to vote irrespective of his hometown has been developed [1]. This system also provides authentication using biometrics [2]. The proposed system is flexible, secure and user friendly [3].

2. RELATED WORK

In the current system the votes are cast through EVMs and voters cast their votes in their respective constituency [3]. To improve the process of voting VVPAT (Voter Verified Paper Audit trail) was introduced. This system enables the EVMs to record each vote cast by generating a EVM slip. If a person's name is present in the electoral roll then he/she can cast their vote by showing any of the government issued id card.

3. PROBLEMS WITH THE EXISTING SYSTEM

In the present system government issued id cards are the only form for authenticating a person's identity. Since these cards can be duplicated easily there is high possibility of illegal votes. Due to migration within the country, most of the people are not able to cast the vote at their respective constituency.

4. PROPOSED SYSTEM

In the proposed system the voting process is implemented in four steps [4]:

a. **Voter Registration:** This is the first phase of the voting process wherein a person registers by providing his/her personal information as well as the biometrics.
b. **Voter Authentication:** The QR code present on the Aadhar card is scanned and the voter is validated through fingerprint authentication and face recognition. The person is allowed to vote only if the authentication succeeds otherwise the buzzer beeps [5].
c. **Vote Casting:** Based on the address present on Aadhar card, the corresponding candidate list is displayed on the server screen and the voter can cast his vote to the desired candidate.
d. **Vote Statistics:** Only the authorized person with login credentials can login to the server and obtain the voting statistics [6].

5. SYSTEM ARCHITECTURE

The proposed system is implemented using ARM Cortex M-3 microcontroller, fingerprint sensor, Wi-Fi module, LCD display and buzzer. The QR code scanner and face recognition is implemented in python, while the server is built on java platform. The basic block diagram of the system is as shown in fig 1.

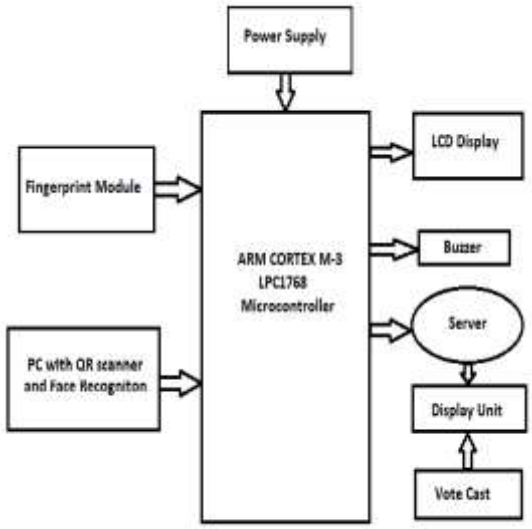


Fig 1: Block diagram

5.1 METHODOLOGY

The methodology followed in the proposed system is:

- Aadhar Card (QR Code) Scanning
- Connect to server Fetch and Display Aadhar Card Related details
- User Authentication Using Fingerprint
- Matching Database and Captured Fingerprint
- If the fingerprint matches, then go for face recognition
- Face Recognition Using PCA Algorithm
- Matching Database and Live Detected Face
- If Face Matches, the constituency details (based on the address present on Aadhar card) are shown allowing the person to vote
- If authentication fails, the person will not be allowed to vote
- Storing the cast votes in Database

6. HARDWARE IMPLEMENTATION

The interfacing diagram of the system is as shown in fig 2.

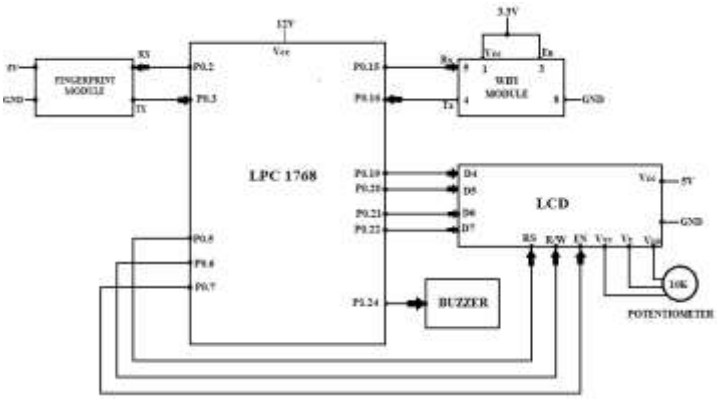


Fig 2: Interfacing Diagram

LCD and Buzzer are interfaced using GPIO pins of the controller. The following UART pins are used:
UART 0: For Connecting Fingerprint Module
UART 1: For Connecting Wi-fi Module
UART 3: For Interfacing between Python program and the controller

The working of Fingerprint authentication is depicted by the fig 3.

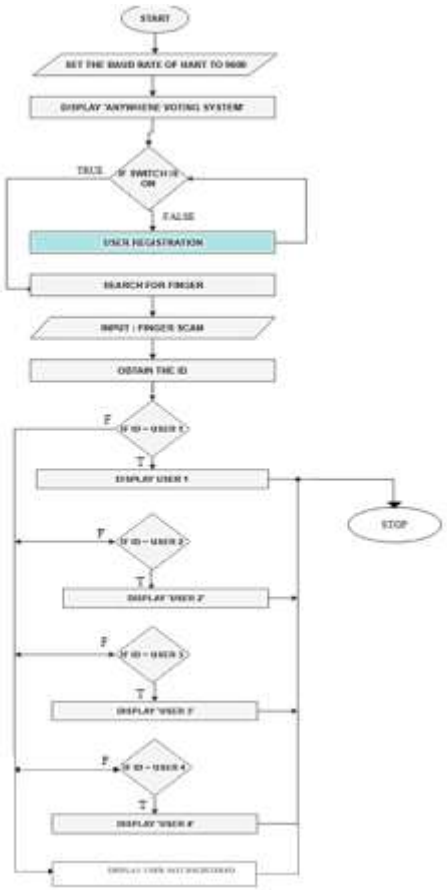


Fig 3: Flowchart for fingerprint authentication

7. SOFTWARE IMPLEMENTATION

The QR code scanner and the face recognition is executed in Python.

a. Face Recognition: It is achieved through Principle Component Analysis (PCA) Algorithm [7]. PCA algorithm involves orthogonal transformation of M correlated training face images to K uncorrelated eigen faces. Covariance matrix of the training set image is calculated to obtain the eigen faces. The projection of test image onto the subspace of eigen faces results in recognition. The classification is performed by calculating minimum Euclidean distance. The flowchart for face recognition is as shown in fig 4. The test image is transformed into eigenface components. Each value represents a weight and is saved to vector Ω^T. Mathematically, recogniton is finding the minimum Euclidean distance $\acute{\varepsilon}_k$, between a testing point and training point. It is given by the following equation [7].

$$\varepsilon_k = \sqrt{\|\Omega_{test} - \Omega_i\|^2}, \text{ where i=1, 2, 3.....k.}$$

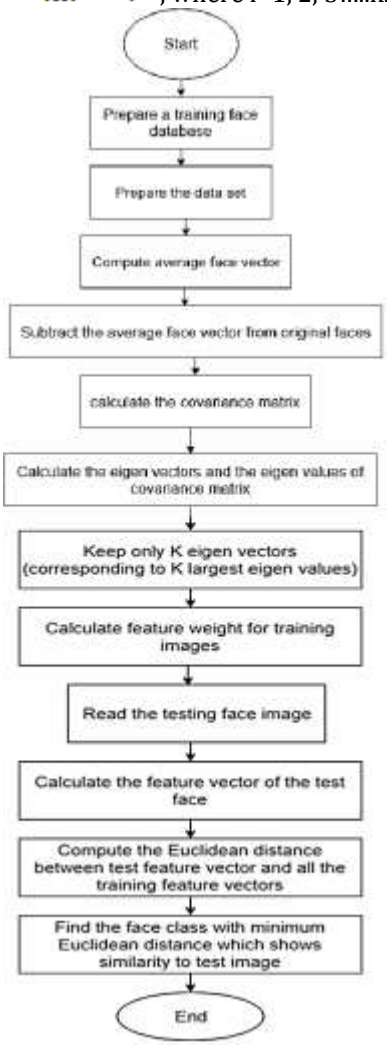


Fig 4: Flowchart for face recognition

b. QR scanner: QR (Quick Response) code is a two dimensional barcode which is capable of storing information per unit area. Once the QR code is scanned and image is obtained, it is passed to a dedicated Python decoding library, Zbar. This library decodes the code and processing is done before displaying the result. The flowchart is as shown in fig 5.

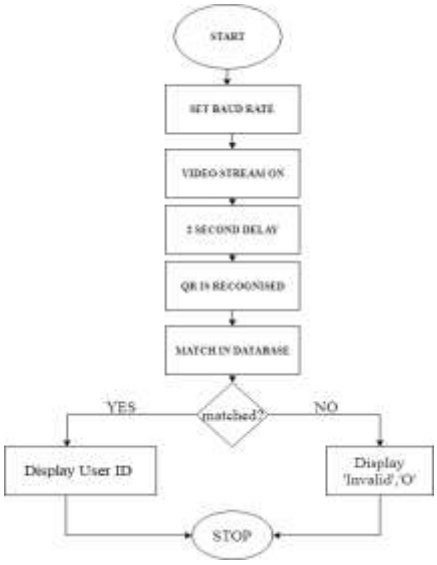


Fig 5: Flowchart for QR scanning

c. Server: The software requirements of the server are:

- Operating System: Windows XP/7/8/10
- Coding Language: Java
- Web Technology: Servlet, JSP
- Web Server: TomCat 6.0
- IDE: Eclipse Galileo
- Database: MySQL 5.0

8. RESULT

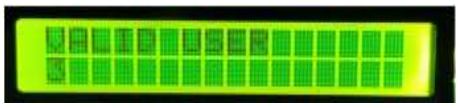
The following images depict the various messages displayed as output in the model:

- To Register new votes

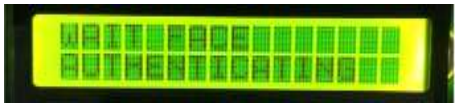
- Display after successful registration

- Display after QR code scanning

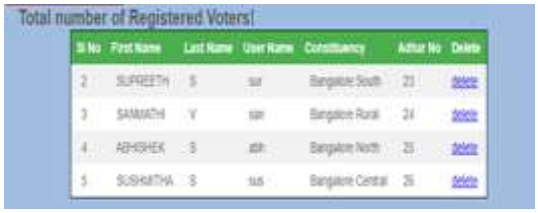
- Display after successful fingerprint authentication



- Display for face recognition



The server pages are as below:



9. CONCLUSIONS

- The proposed voting system uses Aadhar Card for authentication
- This makes use of additional security by allowing voter to vote only once by comparing unique identification
- User can cast his vote away from his constituency and this system also helps us to reduce the proxy vote
- Due to easy and secure voting the voting percentage also increases drastically

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