Bio Metric Authentication System Based on Aadhar Card

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Abstract: This paper proposes the need of authenticated voting system in our election due to the increase in illegal voting or bogus voting in Loksabha and Rajyasabha election. Here the authentication of an individual is done using biometric and eligibility of the voter is verified using the Aadhar card. In this project, the database stored in the Aadhar card provides the reference data. Moreover, added tier of security is enforced as biometrics. The key functions of this paper are enrolment and matching. Initially, the voters' fingerprints are enrolled and stored. Once the fingerprints are stored it can be retrieved at any time for authentication. During election, when the voter keeps his/her fingerprint the already stored Aadhar card details will be displayed from the database. An individual's details can be deleted from the database if not required. The use of biometric requires less man power, saves much time for voters and personnel, ensure accuracy, transparency and avoids bogus voting.

Key words: Fingerprint · Biometric · Aadhar card · Authentication

INTRODUCTION

India is one of the democratic country with a population of 700 million people. The government in India is democratic which stands for "for the people, by the people and of the people". Every citizen has the right to vote and elect the leader of his/her choice. The voting system of India began in the 18th century. The voting eligibility of every citizen is 18 years and above. The security issues in the current voting system led to e-voting. In order to decrease the faults occurring in e-voting, we use biometric voting system. Biometric refers to the unique identification of each individual such as the speech, iris, fingerprint, face and palm.

Now-a-days, it is mandatory for every citizen of India to have an Aadhar card. It plays an important role in many fields such as ticket bookings, gas bookings, internet banking, etc. The Aadhar card contains a unique 12 digit number for each individual. It contains the details such as name, address, date of birth, sex, fingerprint of all ten fingers and the image of iris. This Aadhar card can also be used for safe voting.

During the time of election, the user places his/her fingerprint on the fingerprint sensor which is interfaced with Arduino which contains the database of the Aadhar card. When the fingerprint matches with the database it allows the user to vote. This system reduces bogus voting and decreases manual power.

Previous Work: The voting system in India began in the 18th century. Many methods and technologies are used for voting in India.

Paper Based Voting: This method is an ancient method of voting. A ballot is used to cast votes in an election. In this method every individual above 18 years casts his/her vote in a piece of paper and elects the leader.

This method requires manual power for each purpose. There must be presence of an official during the casting of votes in the booth and during the time of counting.

Drawbacks:
- It is very difficult to collect the ballot boxes and transport to main centres.
- Errors may occur during manual counting.
- Need more man power for security.
- Need more time to vote.
- Chances of invalid voting.
- Need more time for counting.

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E-Voting: E-voting is the voting process electronically, without the use of paper and ballot boxes. This system was developed to overcome the drawbacks of the paper based voting system. In this the data are stored which allows the user to press the button to elect the desired candidate. The information here is stored in digital format. This method does not provide security and privacy. So further development should be implemented to prevent these kinds of activities.

Drawbacks:
- Security problems- One can change the program installed in the EVM and can change the result after the polling.
- Illegal voting which is faced in every electoral procedure. One candidate, casts the vote of all members in the electoral list illegally. This results in loss of votes for other candidates participating in election.

Biometric System (Fingerprint Recognition): The main focus of the proposed system is the use of fingerprint image of a voter to authenticate him/her and to cast the vote very securely. A biometric system is a pattern recognition system that operates by acquiring parametric data of an individual. It can be used either in the verification mode or identification mode. Identity verification is typically used for positive recognition, where the aim is to prevent multiple people from using the same identity. In the identification mode, the system recognises the individual by searching the identities in the database for a match. Therefore, the system conducts one-to-many comparisons to establish an individual's identity.

A biometric system is designed using the following four main modules.
- Sensor module, which captures the biometric data of an individual. An example is a fingerprint sensor that images the full structure of a user's finger.
- Feature extraction module, in which the biometric data is processed to extract a set of salient features.
- Matcher module, in which the feature is extracted during recognition are compared against the stored templates to generate matching scores. Example, fingerprint-based biometric system.
- System database module, which is used by the biometric system to store the biometric templates of the enrolled users.

Proposed System: The main components of the voting system is listed as follows,

- Arduino mega 2560
- Fingerprint Scanner
- PC
- Power supply

Arduino Mega 2560: The Arduino is an easy tool for fast prototyping. It adapts to the new needs and challenges based on the needs of the users. Development of the products based on IOT applications, 3D printing and embedded environments is easily done by using Arduino boards. When comparing to the other microcontrollers, Arduino boards are very inexpensive. Most microcontroller systems are limitations to the windows, but Arduino software runs on windows, Macintosh OSX and Linux operating systems. It can be connected via USB slot.

The Mega has a resettable polyfuse that protects your computers USB from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse automatically breaks until the short or overload is removed.

Features:
- *Power*-The mega 2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically.
- *Memory*-It has 250 KB of flash memory for storing code, 8 KB of SRAM and 4KB of EEPROM.

Specifications:
Microcontroller – Atmega 2560
Operating Voltage – 5V
Input Voltage(Recommended) – 7-12 V
Input Voltage(Limits) – 6-20 V
Digital I/O pins – 54
Analog I/O pins – 16
DC current per I/O pin – 20mA
DC current for 3.3V pin – 50mA
Flash memory-256KB
SRAM – 8KB
EEPROM – 4KB
Clock speed – 16MHz
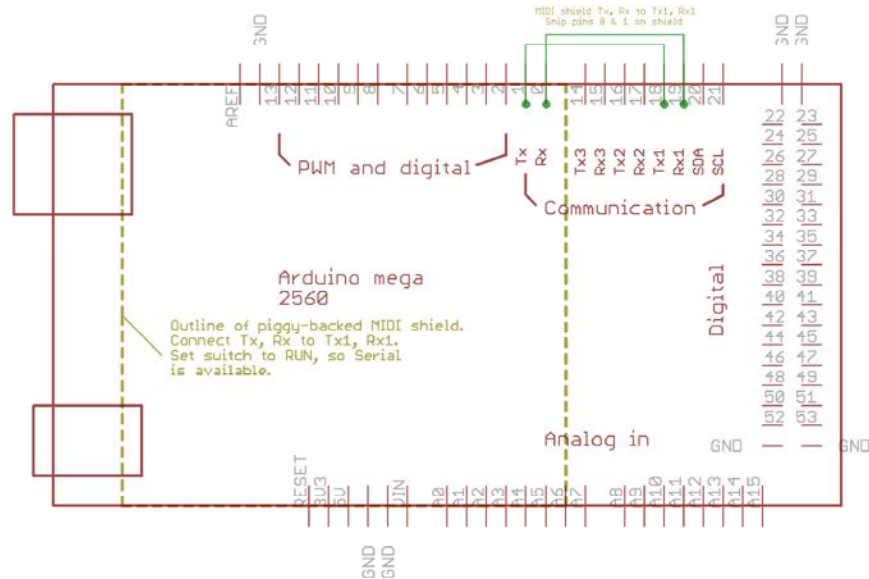Length – 101.52mm
Width – 53.3mm
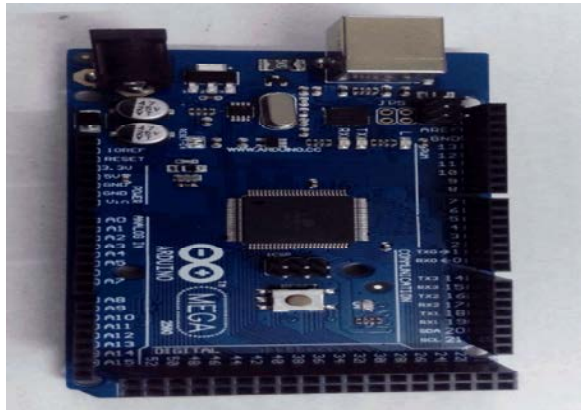Weight – 37g
LED Built-in - 13

Fig. 1: Arduino Mega-Pin Digram

Fig. 2: Arduino Mega 2560

Fig. 3: Fingerprint Scanner

Fingerprint Sensor: Fingerprint enrolment and fingerprint matching are the two processes taking place in fingerprint processing. When the voter places his/her finger on the fingerprint scanner, it creates an unique ID which contains the details of the voter. This process is fingerprint enrolment. During fingerprint matching, the current fingerprint is matched with the already stored database.

Hardware Connection: Via serial interface, the Module may communicate with MCU of 3.3V or 5V power: TD (pin 3 of P1) connects with RXD (receiving pin of MCU), RD (pin 4 of P1) connects with TXD (transferring pin of MCU). Should the upper computer (PC) be in RS-232 mode, please add level converting circuit, like MAX232, between the Module and PC.

PC: Here the PC is used to store the database of the voters and is programmed using visual basics. It is also used to display the details of the voter when the finger print is recognized.

Power Supply: Power supply is an essential component for the processing of entire system. Arduino mega 2560 requires a voltage of 5 volt and minimum current of 700mA to work. In this project we have decide to use Samsung USB charger with power supply 5V/2A.

Software Used

Visual Basic 6.0: Visual Basic is a third-generation event-driven programming language and integrated development environment(IDE) from Microsoft for its Component Object Model (COM) programming model first released in 1991 and declared legacy in 2008. Microsoft intended Visual Basic to be relatively easy to learn and

useVisual Basic was derived from BASIC, a user-friendly programming language designed for beginners and it enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects and creation of Active Xcontrols.

A programmer can create an application using the components provided by the Visual Basic program itself. Over time the community of programmers developed third party components Programs written in Visual Basic can also use the Windows API, which requires external function declarations.
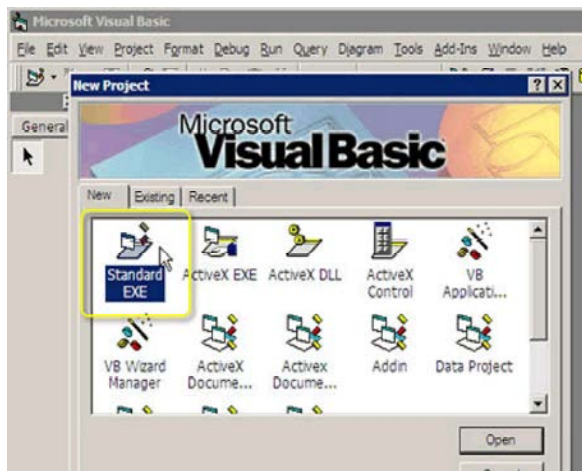
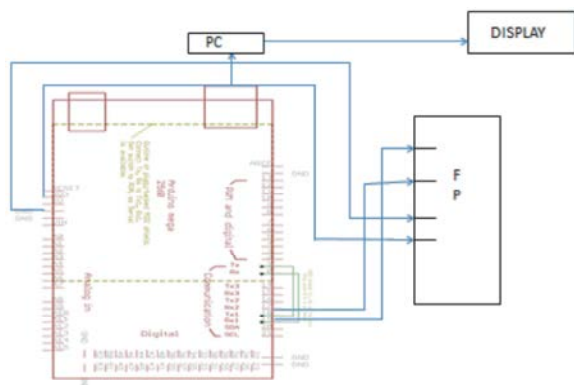Fig. 4: Visual basic 6.0

Block Diagram:

Fig. 5: Block diagram of proposed system

Working: The first process of the project is the storing of the fingerprint of the individuals. The voter keeps his finger print in the sensor which is recognized. There are three main functions in storing the fingerprint. The functions are:

Enrolment
Match
Delete

Enrolment: Once the voter keeps his finger on the sensor which is interfaced with the arduino, the first function is enrolment.In enrolment when the fingerprint is correctly interfaced with the arduino a message "Ready to enrol a fingerprint. Please type in the ID you want to enrol" appears on the screen.
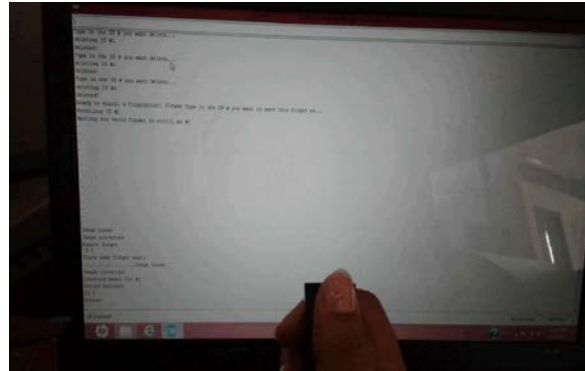

Fig. 6: Enrolment of fingerprint

Match: The next function after enrolment is match. In this function, the fingerprint of the voter is checked with previously stored fingerprints.

If the fingerprint matches with any of the stored fingerprints then a message appears on the screen stating "Waiting for a valid finger".
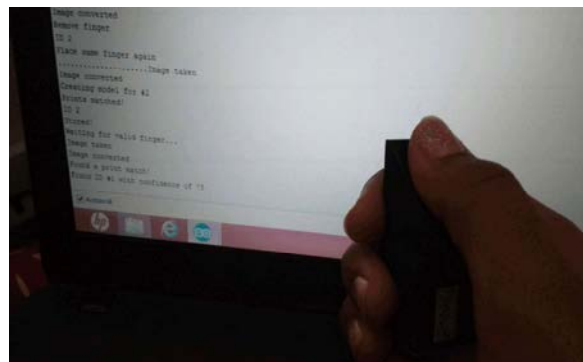

Fig. 7: Accuarcy of matched fingerprint

Delete: If in case a voter is not eligible or migrates to another country then the ID of that particular voter can be deled permanently or removed from the database. This increases the storage space by deleting the unwanted ID's. All this can be done using the delete function.

When an unauthorised person casts his/her fingerprint on the sensor a message pops up on the screen stating that the fingerprint doesn't match.
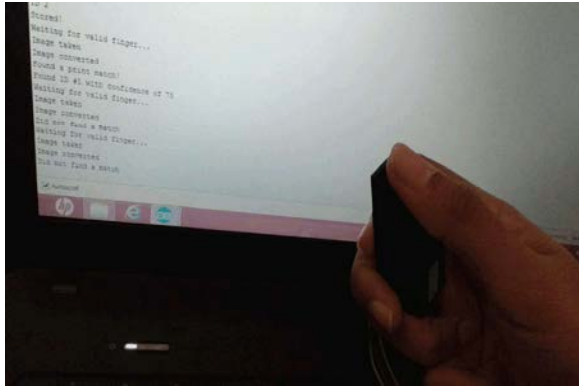
Fig. 8: Deletion of fingerprint

The next process in the project is creating the database of the voters using the Visual Basic 6 studio. Since the Aadhar card database cannot be accessed without the permission from the Government of India we create a sample database which resembles the Aadhar card database.

Initially, a database is created which consist the fields like date of birth, voter's photo, vote status, finger data ID, voter's name, voter's ID, age, sex and address. The details of each voter is entered in this database.

Once the database is generated the next step is fingerprint recognition. If the fingerprint of the voter is recognized then the dialogue box containing the finger ID of the voter is displayed on the screen.
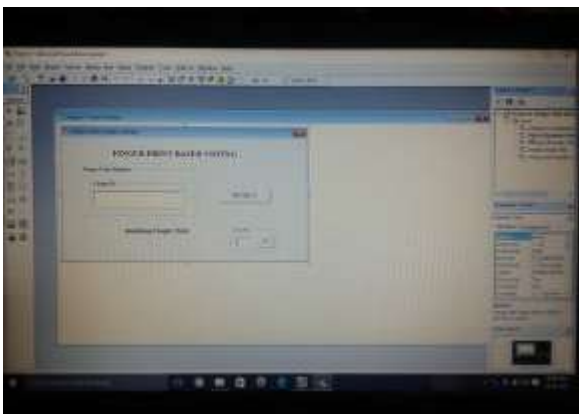

Fig. 9: Recognition of ID

When the fingerprint is matched and the finger ID dialogue box pops up, in the next step the details of the voter is displayed as of the Aadhar card.
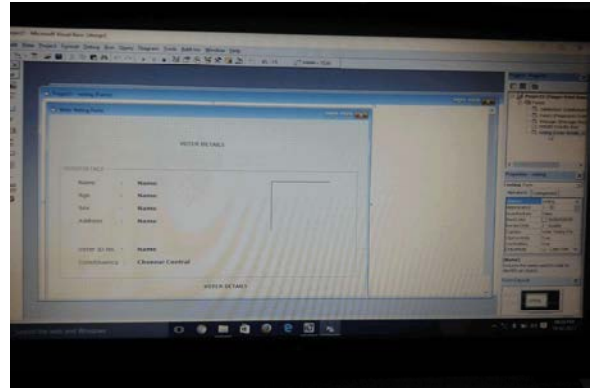

Fig. 10: Display of database

Once the voter details are displayed it allows automatic voting process. In this a screen displaying the parties along with their symbols. The voter is allowed to vote for the desired party.
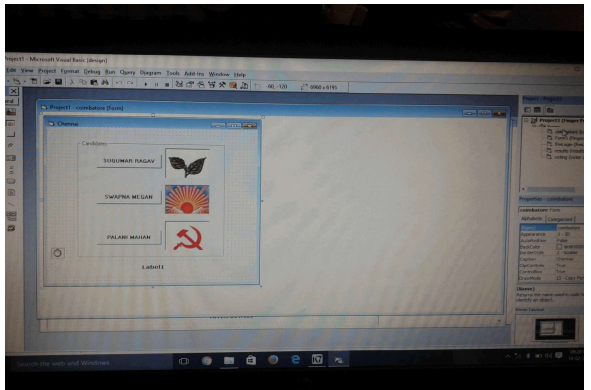

Fig. 11: Candidate details

When the voting process is completed the results get stored. The stored results can be accessed later only by the authorized person who is provided with a unique authentication ID and password.
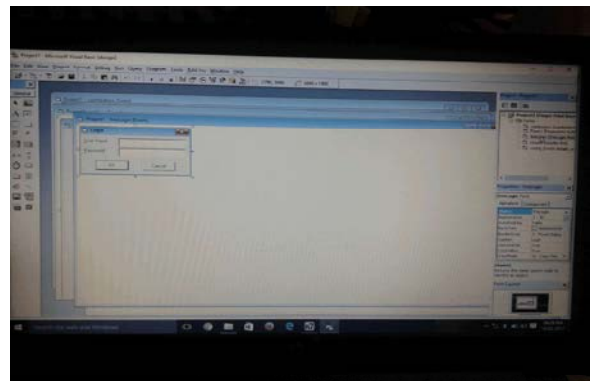

Fig. 12: Security Authentication

CONCLUSION

The biometric voting system based on Aadhar card can be used as an alternative for the traditional voting method. The main objective of this system is to eliminate bogus voting and vote repetition, less election expenditure, more transparency and fast results.

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