Design and development of a secured electronic voting system

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A project in the Department of Computer Science and Engineering presented
In partial fulfillment of the requirements for the Degree of
Bachelor of Science in Computer Science and Engineering

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Declaration

We, Al Mamun, S.M. Mahadi Masnad, Abu Zahed, declare that this project, Design and development of a secured electronic voting system and the work presented in it are our own. We confirm that:

- This work was done wholly or mainly while in candidature for a BSc degree at United International University.
- Where any part of this project has previously been submitted for a degree or any other qualification at United International University or any other institution, this has been clearly stated.
- Where we have consulted the published work of others, this is always clearly attributed.
- Where we have quoted from the work of others, the source is always given. With the exception of such quotations, this project is entirely our own work.
- We have acknowledged all main sources of help.
- Where the project is based on work done by ourselves, we have made clear exactly what was done by others and what we have contributed ourselves.

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Certificate

I do hereby declare that the research works embodied in this project entitled "**Design and development of a secured electronic voting system**" is the outcome of an original work carried out by Al Mamun, S.M. Mahadi Masnad, Abu Zahed, under my supervision.

I further certify that the dissertation meets the requirements and the standard for the degree of BSc in Computer Science and engineering.

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Mohammad Mamun Elahi, Asst. Professor, CSE

Abstract

This electronic voting system using biometric method is a voting system where there is no chance of vote fraud in case of voting. Through biometric voting, it is possible to take the voting system to an unadulterated, corruption-free level. Voter secrecy will be maintained at every stage in this system. This system is a secret, reliable, and secure voting system.

Our biometric voting system consists of a device, server and database. Here the user is verified by matching with the saved data with the fingerprint of the server and then voting can be done only with the verified user. Counting votes in this system is very easy and can be done in the shortest time.

Acknowledgement

Our project has been completed with the support of our honorable teacher Mohammad Mamun Elahi Sir. He provided us insight and expertise, gave guidelines that greatly assisted the project, who deserves our highest gratitude. The end of this project gives us much pleasure. Although all the faults are our own and the reputation of this honorable person should not be tarnished.

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Chapter1

Introduction

Voting in Bangladesh means festival. This long-standing culture is changing. Billions of money are being spent on organizing the polls. But voters are not going to the polls that way. Voters' disinterest in the voting system is growing. There is a crisis of confidence among the people about the electoral system and that is why the voters are not going to the polls. Voter turnout is now declining day by day compared to the general voter turnout. Voters are no longer interested in elections. So, in this chapter we will discuss about the problem statement and motivation to develop this system.

1.1 Problem Definition

Existing voting problems: It is seen that the ruling parties have come and occupied the centers and taken them away. Not allowing agents to stay. It is also seen that ballot papers were snatched and sealed during the election. A person gives the vote of another person.

Existing E-Voting problems: There are many types of problems in our existing electronic voting system. It can be seen that after the fingerprint verification, someone else is voting while the voter is still there. There are many times when voting is stopped for several hours due to problems in the system, which causes a lot of suffering to the voters. There is also a problem arise with the voter's fingerprint, then the presiding officer is voting.

1.2 Motivation

So, this electronic voting system using biometric method will play an important role in creating an environment of trust by making elections free and fair is the motivation behind the project to build. Only registered voters will have the opportunity to vote here. In this system, the voting process has to be completed by verifying the data of the registered voters with fingerprint. Where there is no chance of fake voting, he can vote his own vote to anyone. There is no chance of one voting more than once.

Chapter 2

Background and Literature Review

It is very important to know the background of a project. Everything is known from the background part including the goals, objectives and motivation of a project. This chapter discusses the literature review and background of our project.

2.1 Background

The background of our project is to giving people the gift of a complete voting system. Thinking of various irregularities in the voting system to bring back the people who are reducing their participation in the voting. Our target is to Preventing vote rigging, banning duplicate voting and gifting people with fair normal elections. We think that is possible with this Secured electronic voting system using biometric method we have created. The irregularities that can be noticed in the voting system through our voting system will no longer be an opportunity to do so.

Again, the existing voting system that we use in the voting system has many problems such as when a voter enters a secret room after fingerprint verification to cast his or her vote, someone else is casting his or her vote while the voter is present. It is often seen that the voting system is closed for hours due to a technical problem in one of the booths, this is increasing the suffering of the voters. This method sometimes causes problems that the fingerprints of the voters are not matching, then it is seen that the presiding officers are voting. This is creating suspicion among the people about the method. There are also doubts in the minds of the people about the safety of this method.

We have developed our system by thinking about all the problems such as vote theft, vote fraud, ballot papers were snatched and sealed during the election, giving one vote to another, the general public not being able to reach the ballot box etc. I think all the problems will be solved through our developed system.

So, we are developing our system to fix these problems are as follows.

Required features for a solution:

Privacy: Only voters will be able to know about their voting information.

Fraud Resistance: Only registered voters can vote.

Uniqueness: A voter can only vote once.

Low Cost: The cost of this system is also very low.

Speed: Voting results can be given in the shortest possible time..

Accuracy: All votes will be counted correctly.

2.2 Visualization Summery

We can easily understand that there is no scope for vote fraud in our Secured Electronic voting system using biometric method, only registered voters will be able to vote, only voters will know about their vote. It can prevent vote selling and coercion.

2.3 Literature Review

In [1] proposed a biometric voting system that will work with RFID as voter id, fingerprint sensor for verification, LCD display, database and a buzzer.
At first they scan the RFID and match with saved fingerprint in database for verification. They use active reading equipment technology for reading data. After that, the voter further have to give fingerprint. If the fingerprint match with the database information voter can cast vote. Otherwise the buzzer will be alarmed. LCD is being used for showing the information of the voter. A message will also transfer to the voter registered phone number from the voter information database.

In [2] we studied a lot of things which are related to our work, such as. Sensor module that captures the data, feature extraction that acquires biometric data processed to extract, Matcher module that extracted feature during comparison with the saved data in database, system database module etc. We also read the features of how biometric characteristics works and how to stores.

In [6] they proposed a method of online fingerprint identification using fast and distortion hashing method. Their proposed method not only takes fingerprints faster, but also increases the accuracy of the system.

In [4] they proposed a voting system using Arduino. They collect information of voters through a registration process. The voter can fill the registration form with the help of a user id and password. In their system, at first they enroll fingerprint and then check the fingerprint with the database fingerprint. After verification voter can cast vote. They keep a buzzer for alert in giving a wrong vote.

In [5] discuss about how to improve fingerprint verification using. In this paper they show an algorithm of fast fingerprint verification using level-2 minutiae and level-3 pore and ridge features. Their proposed algorithm uses a two-step method for fingerprint image registration.

In [3] we see a fingerprint based voting system. They used MATLAB for storing the fingerprint, photo, phone number and all other information. They also used temper proof card which is used for storing all database. In this system, at first voter have to give fingerprint then it will be checked with the database fingerprint for verification. At that time voter photo with details information will be displayed. If voter fingerprint doesn't match with the saved fingerprint in database, the system will lock the process and a warning sound produced through the buzzer.

In [7] Using minutiae extraction technique, they proposed a fingerprint verification system. Most fingerprint verification system are made by using this technique.

In [8] their proposed voting system relies entirely on paper work and electronics machines. This method involves a lot of paper work to keep the voter information and the voter must go to the ballot box with ID for authentication. After authentication, voter will be able to vote through electronics machine. The electronics machine has a list of candidates and a button next to each candidate to vote. By pressing the button, the voter will be able to complete the voting. In this method, after the voting is over, all the ballot boxes are placed in one place for counting vote. This method of counting votes is done

manually by certified people. Khasawneh, said There is a possibility of vote rigging in this method. In this case, it is seen that in order to give results in favor of a particular candidate, the vote count is rigged [9].

In [10] they have proposed a voting system that automatically verifies, validates and counts votes through UIDAI. The information that UIDAI provides in the electronic voting system, their system works on the basis of that information.

Chapter 3

Proposed System Architecture

Our proposed system architecture is given below.

3.1 System Architecture

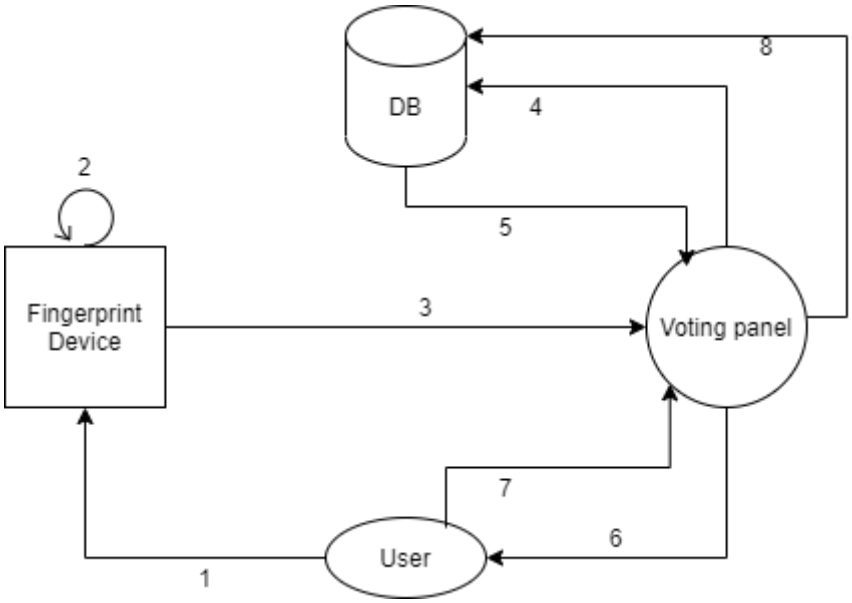

Figure 1: System architecture of Biometric Voting System.

In this architecture:

1. User have to give fingerprint.
2. Checking the given fingerprint.
3. Voting panel got the result of matching.
4. Check the user information with database.
5. Voting panel got the user information
6. Allow user to give their vote.
7. User can select their desired candidate to vote.
8. The voting result will be stored in database.

3.2 Activity Diagram

An activity diagram is the collective term of a system that represents a set of current or dynamic relationships in a system. This diagram shows all the activities of our project, how our project works.

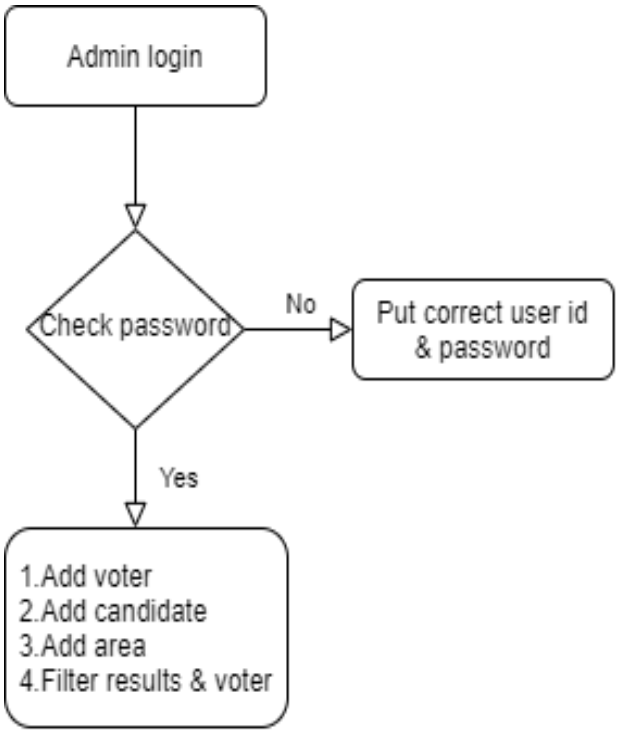

Figure 2: Biometric Voting System activity diagram of Admin Panel.

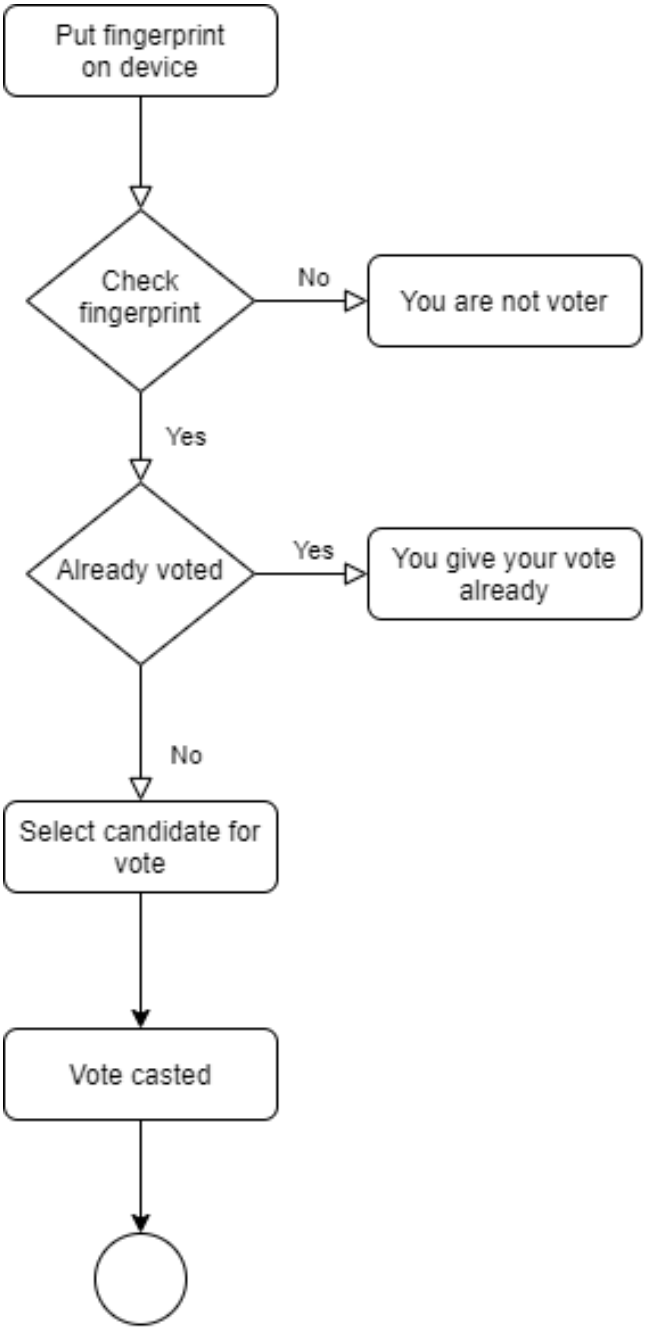

Figure 3: Biometric Voting System activity diagram.

3.3 Technological

3.3.1 NodeMcu ESP8266

NodeMcu ESP8266 is a development board that has open-source Lua based firmware. It is mainly used for IoT based applications. It is ESP-12 module based hardware.

Use of NodeMcu Esp8266

- Network project.
- Making I/O interfaces with Wi-Fi and Bluetooth functionalities projects.
- Low power battery operated projects.

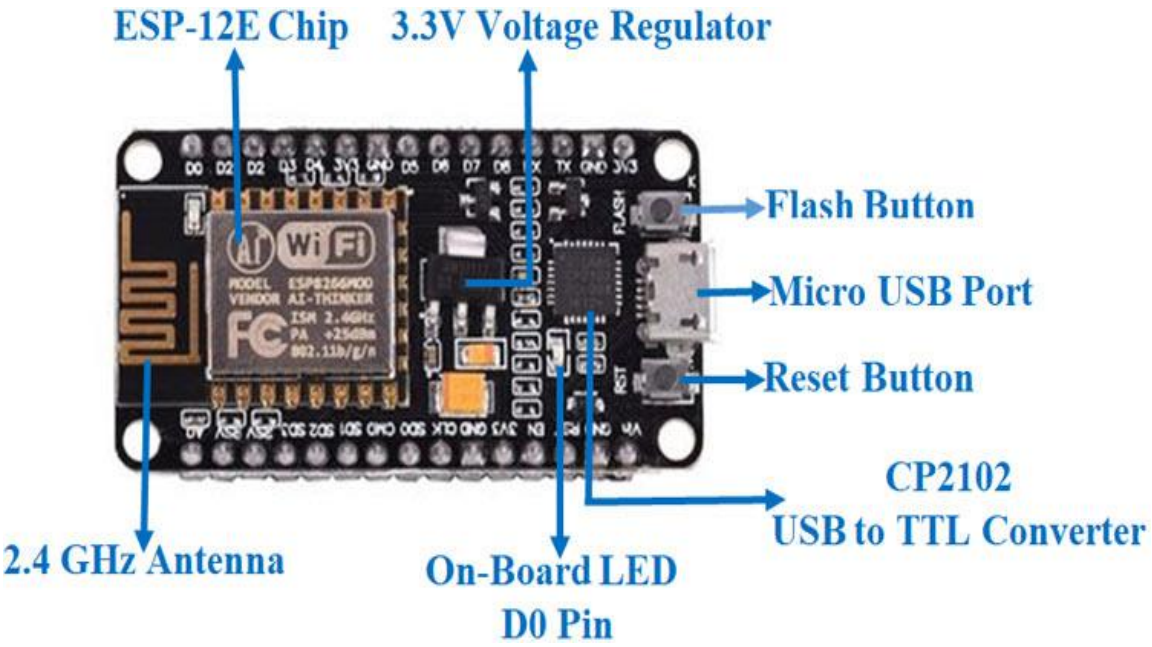

Figure 4: NodeMcu ESP8266

3.3.2 Finger print sensor R307

R307 fingerprint sensor has TTL UART interface. It has the feature of independent fingerprint collection. It has fingerprint searching function, fingerprint registration function and comparison function.

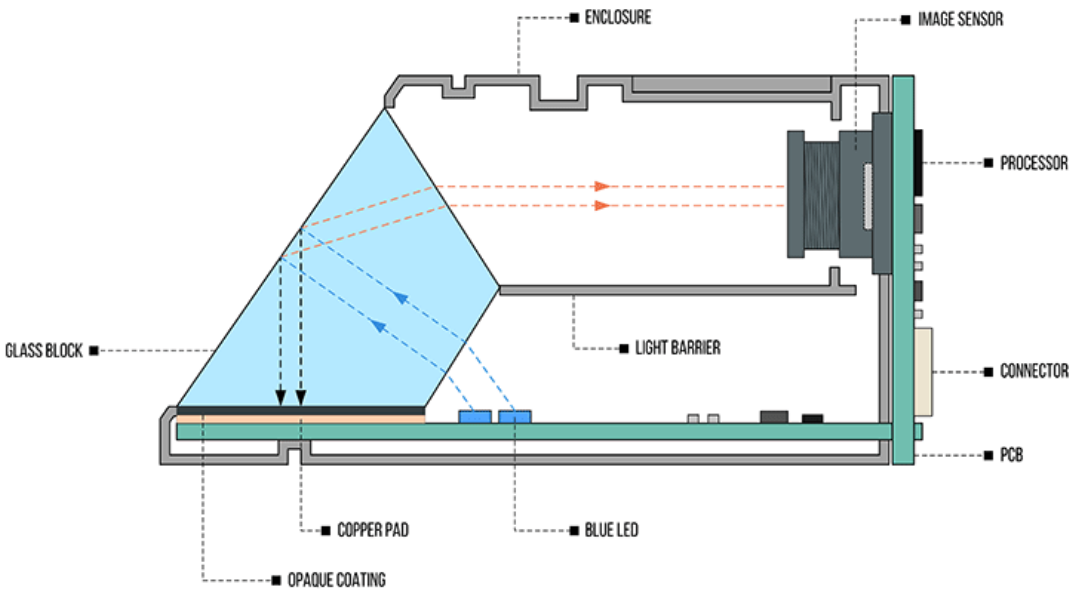

Figure 5: Finger print sensor R307

3.3.3 Hardware implementation

We have used C for hardware backend development to get fingerprint.

The hardware we have used for our project are following

Hardware component:

- NodeMcu ESP8266
- Finger Print Sensor R307
- Breadboard

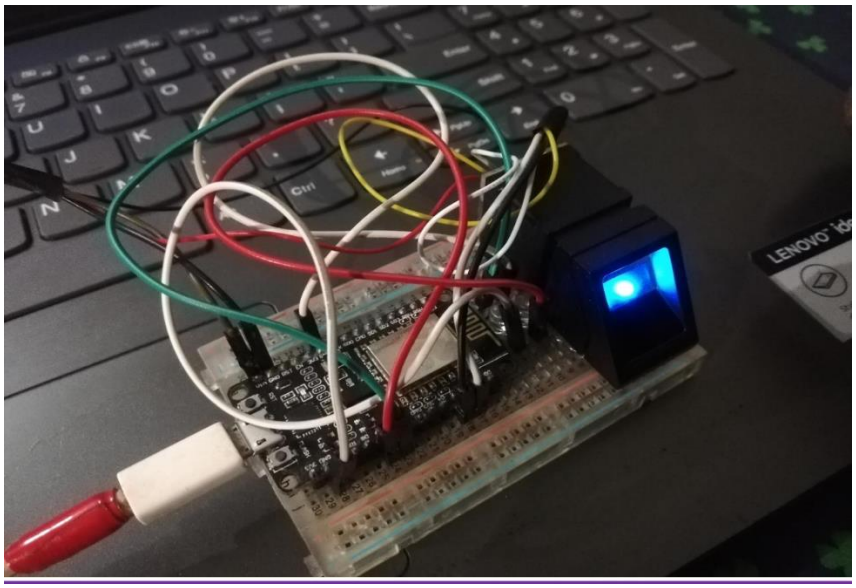

Figure 6: Hardware implementation.

In this following figure shows that how we develop hardware part of our project. We upload the required code to NodeMcu through Arduino IDE for getting fingerprint.

3.3.4 Software development

We have used those languages for developing our project are following

Front-end development:

- JavaScript
- HTML
- CSS

Back-end development:

- PHP
- MySql

The tools we have used for our project

IDE:

- Visual code editor
- Draw.io
- Arduino IDE

Chapter 4

System output and results

In our project “Design and development of a secured electronic voting system” we studied on how fingerprints can be saved in a database and various logical things prior to our project implementation.
In this project, mainly admin panel can know all the information of the user and candidate, who are the registered users, who got the vote, who are the voter from which area, who are the candidates from which area and the result of voting.

4.1 Description of Project

With those modules, we can describe about “Biometric Voting System”. Each one of following modules has various functionality.

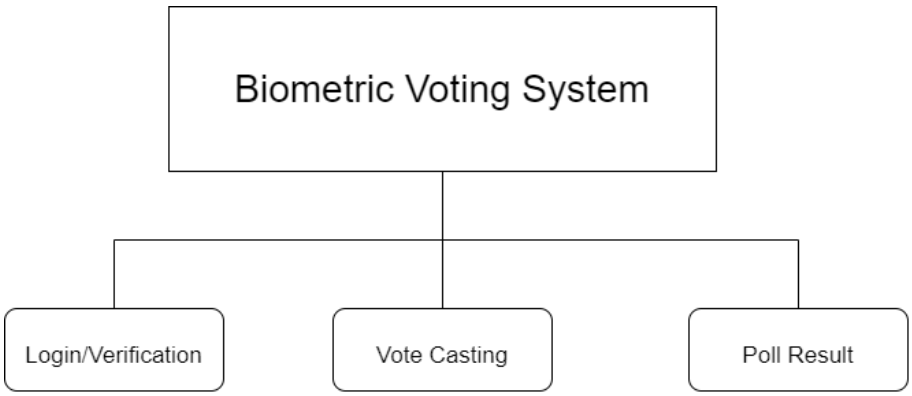

Figure 7: Description of Biometric Voting System.

4.1.1 Login/Verification

If anyone wants to vote, they must first verify with a fingerprint that they are a registered voter. If not he will have to complete the registration with his NID number, Fingerprint and other necessary information.

4.1.2 Vote Casting

Once logged in after fingerprint verification, then the voter will go to the voting page. There they will see their name, voter area in which they are belong to and they will also see the candidates. Then they will complete their voting by selecting their desired candidate to vote. Once the vote is complete, the voting machine will be ready for taking another vote.

- In this phase, the system is ready for verification with finger print before voting. At first have to click on “Verify fingerprint” button, then the system will be ready for taking fingerprint. If the given fingerprint in this part matches with the saved data in the database that he is a registered voter, then you can go to the next part to vote.

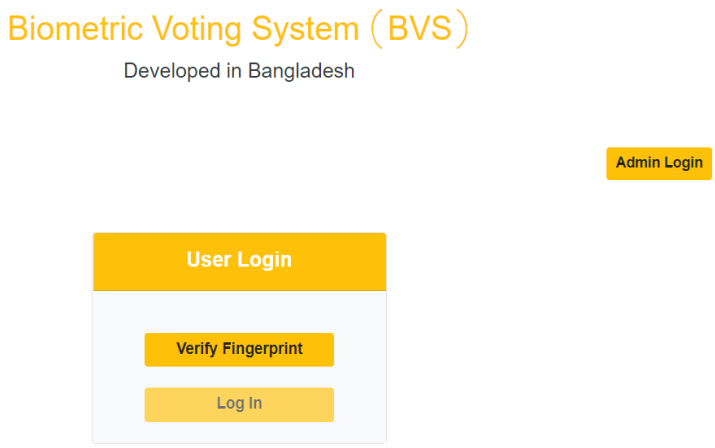

Figure 8: Home page of Biometric Voting System.

- If the fingerprint matches with the database data, then he will login and go to the voting page.

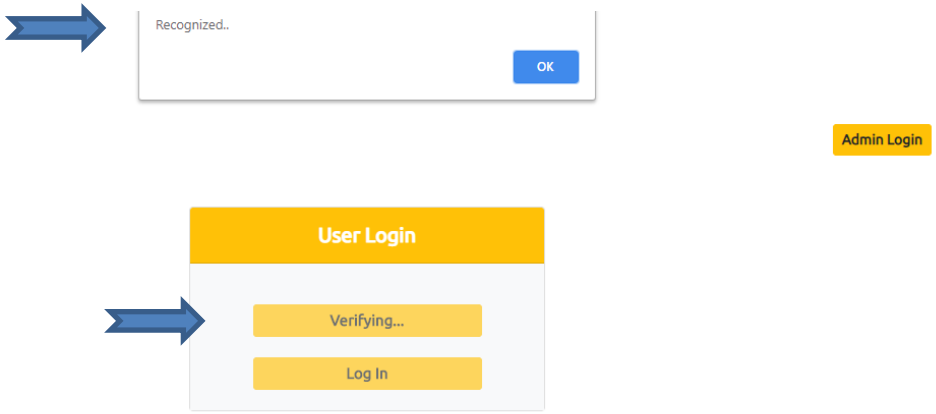

Figure 9: Verifying stage of Biometric Voting System.

- After login, voter can see the candidate. At that time voter can choose the desired candidate and give to vote. After voting, the system will be ready for taking another vote,

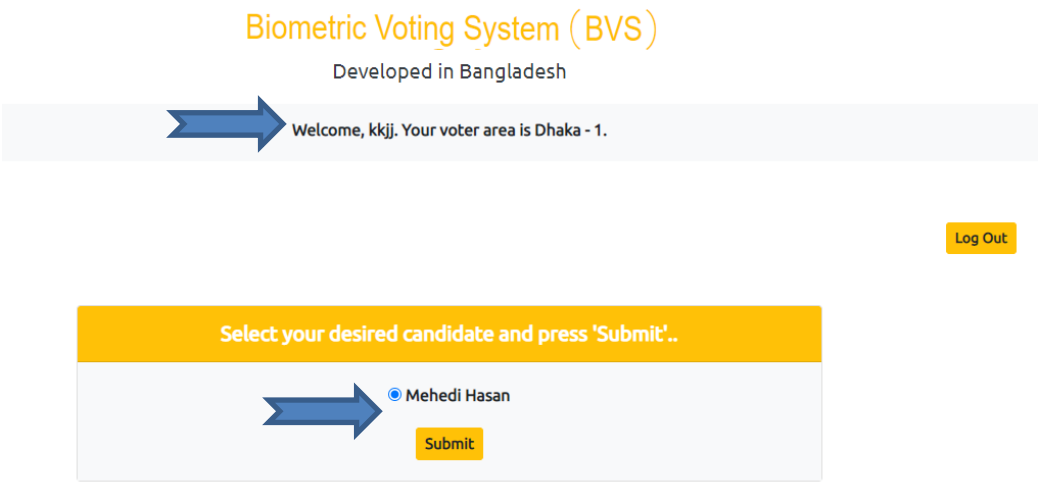

Figure 10: Voting page of Biometric Voting System.

- If someone has already voted, they will not be able to vote a second time

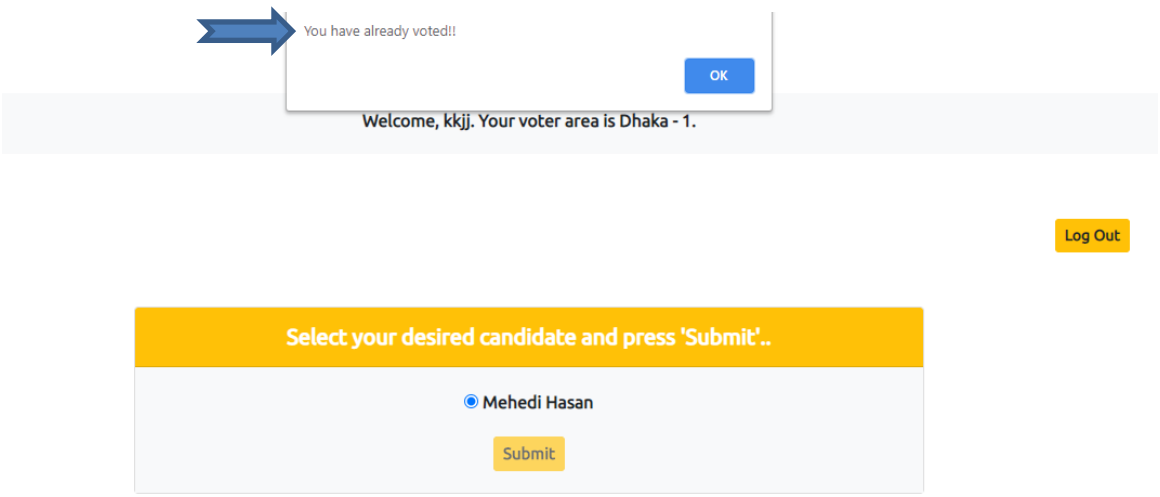

Figure 11: Prevent duplicate voting.

4.1.3 Poll Result

The admin panel will be able to see the poll results after the voting program is completed. By the time of casting vote, the number of vote will be a real time count. So, there will be no need to delay for voting result.

4.2 Features

- **Login/Verification:** Only the registered voter whose information was recorded in the database, can participate in the voting program.
- **Vote Casting:** After checking the voter's validity by fingerprint, voters can be able to participating in voting program by choosing their desired candidate.
- **Voter Registration:** Those who are not the voter yet, they can be registered by giving their name, NID number, age, address, mobile number, in which area he is a voter and finger print.
- **Manage Candidate:** Only the admin panel can add or remove candidate.
- **Manage Voters:** The admin panel can manage voter's info. The panel can also be able to manage the number of voters in an area on an area basis.
- **Manage Voter/Candidate Area:** Admin panel can add or remove voter area also the candidate area.

- **Poll Result:** After the ending of vote casting admin panel can see the voting result. Voting results are done though the real time counters, so that it is not too late to give result. Admin panel can see the poll result area basis.

4.3 Benefits

The purpose of making this Biometric Voting System is to make a fair election. So that the desier to vote awakened in the people and confirm that people don not face any problem in the polling station. More benefits of Biometric Voting are following.

- Through this project we are able to prevent vote theft.
- There is no chance of trouble with the result of the vote. We are able to show results in the shortest time.
- There is no chance of duplicate voting, a registered voter can vote only once.

In this way, it is possible to get a fair vote by maintaining peace and order.

4.4 Drawbacks

We have tried our best so that we can build a functioning voting system. But even then there are some limitations in our project that we can't solve. Limitations are given bellow.

- Disabled people, such as those who do not have hands, will not be able to vote through our project.
- With our fingerprint device, only 1000 people can vote, because it cannot save more than 1000 fingerprints. In this case, if there are more voters, many devices will be needed.

We will try to overcome these limitation of our project in the future.

Chapter 5

Conclusion and future work

At the present time we see that people are losing interest in voting due to various irregularities. It is seen that people cannot go to the center and cast their vote by themselves. It is often seen that one's vote is completed before one goes to the polling station. It can be seen that ordinary people cannot reach the ballot box. There are many types of irregularities in voting. Our goal is that through biometric voting system, people can participate in voting with confidence while maintaining peace and order in a normal way. We think Biometric Voting System will increase the interest of the people to vote and the election will be fair.

Future work: We have tried to fulfill most of the requirements of our project. We will try to complete the rest of the requirements with more time and effort. In future we will also work for disabled people who doesn't have hand. We will also add "Cornea Recognition" feature for disabled people who doesn't have hand. So that it gets acceptance as a self-contained project.

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Appendix A

Fingerprint sensor r307 and NodeMCU ESP8266 access code.

Code of getting fingerprint.

```
uint8_t getFingerprintEnroll() {
  int p = -1;
  msg = "Waiting for valid finger to enroll on device as ID" + String(id);
  uploadMessage(msg);
  while(p != FINGERPRINT_OK) {
    p = finger.getImage();
    switch(p) {
      case FINGERPRINT_OK:
        msg = "Image taken..";
        uploadMessage(msg);
        break;
      case FINGERPRINT_NOFINGER:
        msg = "Waiting for finger..";
        uploadMessage(msg);
        break;
      case FINGERPRINT_PACKETRECIEVEERR:
        msg = "Communication error!!";
        uploadMessage(msg);
        break;
      case FINGERPRINT_IMAGEFAIL:
        msg = "Imaging error!!";
        uploadMessage(msg);
        break;
      default:
        msg = "Unknown error!!";
        uploadMessage(msg);
        break;
```