BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 416 (January 2022) **A2**
Microprocessor and Embedded Systems Laboratory

Final Project Report

IOT based Electronic Voting Machine using Fingerprint Sensor

Evaluation Form:

STEP	DESCRIPTION	MAX	SCORE
1	Report (Format, Reference)	10	
2	Design Method and Complete Design (Hardware Implementation)	15	
3	Video Demonstration	10	
4	Novelty of Design	15	
5	Project Management and Cost Analysis	10	
6	Considerations to Public Health and Safety, Environment and Cultural and Societal Needs	10	
7	Assessment of Societal, Health, Safety, Legal and Cultural issues relevant to the solution	10	
8	Evaluation of the sustainability and impact of designed solutions in societal and environmental contexts	10	
9	Individual Contribution (Viva)	20	
10	Teamwork and Diversity	10	
	TOTAL	120	

Signature of Evaluator: _____

Academic Honesty Statement:

IMPORTANT! Please carefully read and sign the Academic Honesty Statement, below. Type the student ID and Write your name in your own handwriting. *You will not receive credit for this project experiment unless this statement is signed in the presence of your lab instructor.*

"In signing this statement, We hereby certify that the work on this project is our own and that we have not copied the work of any other students (past or present), and cited all relevant sources while completing this project. We understand that if we fail to honor this agreement, We will each receive a score of ZERO for this project and be subject to failure of this course."

Full Name: Asif Billah **Student ID: 1706038**	**Full Name: Tajwar Al Mamun** **Student ID: 1706039**
Full Name: Habibullah Khan **Student ID: 1706040**	**Full Name: Deb Indronil Sajib** **Student ID: 1706041**

Table of Contents

Evaluation Form: 1

Academic Honesty Statement: 1

1 Abstract 1

2 Introduction 1

3 Design 2

3.1 Design Method 2

3.2 Circuit Diagram 2

3.3 Full Source Code of Firmware 2

4 Implementation 6

4.1 Description 6

4.2 Results 6

4.3 Github Link 6

4.4 YouTube Link 6

5 Design Analysis and Evaluation 6

5.1 Novelty 7

5.2 Project Management and Cost Analysis 7

5.2.1 Bill of Materials 7

5.2.2 Calculation of Per Unit Cost of Prototype 7

5.2.4 Timeline of Project Implementation 7

5.3 Practical Considerations of the Design to Address Public Health and Safety, Environment, Cultural, and Societal Needs 8

5.3.1 Considerations to public health and safety 8

5.3.2 Considerations to environment 8

5.3.3 Considerations to cultural and societal needs 8

5.4 Assessment of the Impact of the Project on Societal, Health, Safety, Legal and Cultural Issues 8

5.4.1 Assessment of Societal Issues 8

5.4.2 Assessment of Health and Safety Issues 8

5.4.3 Assessment of Legal Issues 9

5.5 Evaluation of the Sustainability the and Impact of the Designed Solution in the Societal and Environmental Contexts 9

5.5.1 Evaluation of Sustainability 9

5.5.2 Evaluation of Impact of Design in Societal Context 9

5.5.3 Evaluation of Impact of Design in Environmental Context 10

6 Reflection on Individual and Team work 10

6.1 Individual Contribution of Each Member 10

6.2 Mode of TeamWork 10

6.3 Diversity Statement of Team 10

6.4 Log Book of Project Impelementation 10

7 References 11

1 Abstract

In this EEE416 sessional course we have built a IOT Based Electronic Voting Machine with Fingerprint Sensor. The basic idea of this project is to create an electronic voting machine that will help to eradicate defrauding of the manual voting systems and prior versions of electronic voting. The system is provided with n number of the switch where n is the number of candidates. Here the voter will be allowed to proceed for choosing their preferred candidate from the panel of buttons. The final vote is then displayed onto an LCD for the satisfaction of voters. In the end, the result can be automatically calculated and will be uploaded in the IOT Thingspeak cloud server using GSM module.

2 Introduction

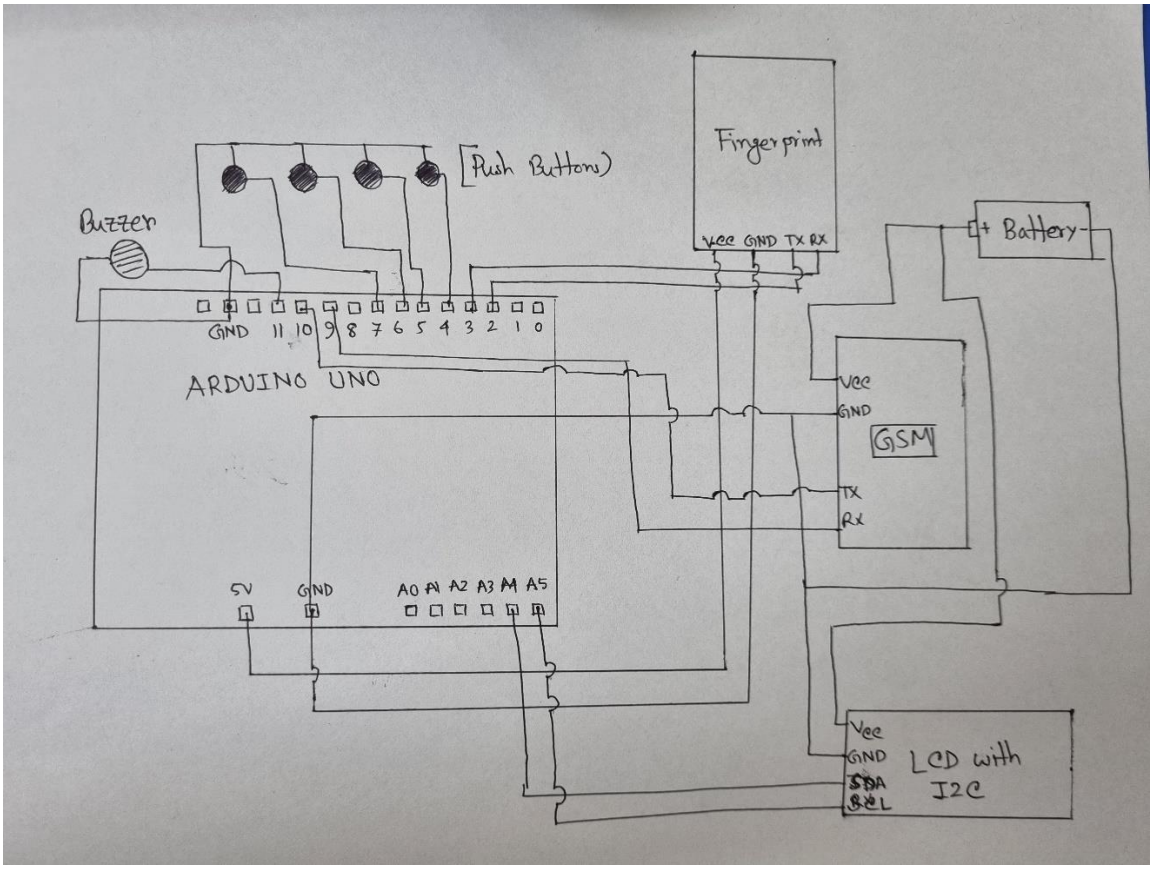
Electronic Voting Machine (EVM) is a simple electronic device used to record votes in place of ballot papers and boxes which were used earlier in conventional voting system. Fundamental right to vote or simply voting in elections forms the basis of democracy. All earlier elections be it state elections or center elections a voter used to cast his/her favorite candidate by putting the stamp against his/her name and then folding the ballot paper as per a prescribed method before putting it in the Ballot Box. This is a long, time-consuming process and very much prone to errors. This situation continued till election scene was completely changed by electronic voting machine. No more ballot paper, ballot boxes, stamping, etc. all this condensed into a simple box called ballot unit of the electronic voting machine. Because biometric identifiers such as fingerprint sensor R305 cannot be easily misplaced, forged, or shared, they are considered more reliable for person recognition than traditional token or knowledge-based methods. So, the electronic voting system must be improved based on the current technologies such as IOT, fingerprint sensor, Thingspeak cloud server, GSM module etc. This project presents a complete description about these.

3 Design

3.1 Design Method

Components utilized: 1. Arduino UNO, 2. R305 fingerprint Module, 3. Jumper Wires, 4. GSM module, 5. Airtel SIM, 6. Buzzer, 7. Vero board, 8. Push Button, 9. 7805 voltage Regulator, 10. Capacitor , 11. LCD display, 12. 12 V battery, 13. I2C_LCD

3.2 Circuit Diagram



3.3 Full Source Code of Firmware

```
#include <Adafruit_Fingerprint.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <EEPROM.h>

LiquidCrystal_I2C lcd(0x27, 20, 4);
// set the LCD address to 0x27 for
a 16 chars and 2 line display

#include <SoftwareSerial.h>
SoftwareSerial gprsSerial(10, 9);

#include <String.h>

const  int buttonPin1 = 7;
const  int buttonPin2 = 6;
const  int buttonPin3 = 5;
const  int buttonPin4 = 4;

int buttonState1 = 0;
```

```
        lcd.setCursor(0, 0);
        lcd.print("Vote taken");

        //delay(2000);
        //lcd.clear();
        break;
      } // 3 no vote done

      else if (buttonState4 == LOW)
      {
        vote4 = vote4 + 1;
        EEPROM.write(14, vote4);
        EEPROM.write(id, 1);


        result();
        delay(100);
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Vote taken");
```

```
int buttonState2 = 0;
int buttonState3 = 0;
int buttonState4 = 0;// Give
pushbutton a value
int id = 0;
int vote1;
int vote2;
int vote3;
int vote4;
int tot;
int value;
int j=1;
float x;

SoftwareSerial mySerial(2, 3);

Adafruit_Fingerprint finger =
Adafruit_Fingerprint(&mySerial);

void setup()
{
  vote1 = EEPROM.read(11);
  vote2 = EEPROM.read(12);
  vote3 = EEPROM.read(13);
  vote4 = EEPROM.read(14);

  pinMode(buttonPin1, INPUT); //
Set pushbutton pin as input
  pinMode(buttonPin2, INPUT);
  pinMode(buttonPin3, INPUT);
  pinMode(buttonPin4, INPUT);

  lcd.init();
  lcd.backlight();
  lcd.setCursor(3, 0);

  gprsSerial.begin(9600);
  delay(1000);

  //Serial.begin(9600);
  while (!Serial);  // For
Yun/Leo/Micro/Zero/...
  delay(100);
  Serial.println("\n\nAdafruit
finger detect test");

  // set the data rate for the
sensor serial port
  finger.begin(57600);
  delay(5);
  if (finger.verifyPassword()) {
    Serial.println("Found
fingerprint sensor!");
  } else {
    Serial.println("Did not find
fingerprint sensor ☹");
    while (1) {
      delay(1);
    }
  }

  Serial.println(F("Reading sensor
parameters"));
  finger.getParameters();
  Serial.print(F("Status: 0x"));
Serial.println(finger.status_reg,
HEX);
  Serial.print(F("Sys ID: 0x"));
Serial.println(finger.system_id,
HEX);
  Serial.print(F("Capacity: "));
Serial.println(finger.capacity);
  Serial.print(F("Security level:
"));
Serial.println(finger.security_leve
l);
  Serial.print(F("Device address:
"));
Serial.println(finger.device_addr,
HEX);
  Serial.print(F("Packet len: "));
Serial.println(finger.packet_len);
  Serial.print(F("Baud rate: "));
Serial.println(finger.baud_rate);

  finger.getTemplateCount();
```

```
      //delay(2000);
      //lcd.clear();
      break;
    } //4 no vote deyoya sesh

  } // vote deyoyar else()


  } // while loop sesh //
  tot =vote1+vote2+vote3+vote4 ;
  x = tot/j;
  if ( (x==5) & (tot !=0) & tot%5 ==0 ) // gsm
  {
    j=j+1;
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("DONT VOTE");

    //Serial.println("start of the trrasnmition");
    //Serial.println("  ");
    if (gprsSerial.available())
      Serial.write(gprsSerial.read());

    gprsSerial.println("AT");
    delay(1000);

    gprsSerial.println("AT+CPIN?");
    delay(1000);

    gprsSerial.println("AT+CREG?");
    delay(1000);

    gprsSerial.println("AT+CGATT?");
    delay(1000);

    gprsSerial.println("AT+CIPSHUT");
    delay(1000);

    gprsSerial.println("AT+CIPSTATUS");
    delay(2000);

    gprsSerial.println("AT+CIPMUX=0");
    delay(2000);

    ShowSerialData();

    gprsSerial.println("AT+CSTT=\"airtelgprs.com\"");//start task and
setting the APN,
    delay(1000);

    ShowSerialData();

    gprsSerial.println("AT+CIICR");//bring up wireless connection
    delay(3000);

    ShowSerialData();

    gprsSerial.println("AT+CIFSR");//get local IP adress
    delay(2000);

    ShowSerialData();

    gprsSerial.println("AT+CIPSPRT=0");
    delay(3000);

    ShowSerialData();


gprsSerial.println("AT+CIPSTART=\"TCP\",\"api.thingspeak.com\",\"80\"");//
start up the connection
    delay(6000);

    ShowSerialData();

    gprsSerial.println("AT+CIPSEND");//begin send data to remote server
    delay(4000);
    ShowSerialData();

    String str = "GET
https://api.thingspeak.com/update?api_key=FVQNSPY3SC86CP8S&field1=" +
String(vote1) + "&field2=" + String(vote2) + "&field3=" + String(vote3) +
"&field4=" + String(vote4);
    Serial.println(str);
```

```
  if (finger.templateCount == 0) {
    Serial.print("Sensor doesn't
contain any fingerprint data.
Please run the 'enroll' example.");
  }
  else {
    Serial.println("Waiting for
valid finger...");
    Serial.print("Sensor contains
");
Serial.print(finger.templateCount);
Serial.println(" templates");
  }
}

void loop()                     //
run over and over again
{
  lcd.setCursor(0, 1);
  lcd.print("Insert FP");
  //delay(100);
  //lcd.clear();
  //delay(3000);
  //lcd.clear();

  id = getFingerprintID();
  Serial.println("...");



  delay(50);            //don't
need to run this at full speed.
  digitalWrite(buttonPin1, HIGH);
  digitalWrite(buttonPin2, HIGH);
  digitalWrite(buttonPin3, HIGH);
  digitalWrite(buttonPin4, HIGH);

  while (id > 0) {
    buttonState1 =
digitalRead(buttonPin1); // Read
input from pin 2
    buttonState2 =
digitalRead(buttonPin2);
    buttonState3 =
digitalRead(buttonPin3);
    buttonState4 =
digitalRead(buttonPin4);

    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("FP matched");
    lcd.setCursor(0, 1);
    lcd.print("Cast one vote");
    //delay(2000);
    //lcd.clear();
    value = EEPROM.read(id);

    if (value == 1)
    {
      //Serial.println("you can not
vote");
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("YOU can not
VOTE");
      /*

        */
      //delay(2000);
      //lcd.clear();
      break;
    }
else {
      if (buttonState1 == LOW)
      {

        vote1 = vote1 + 1;
        EEPROM.write(11, vote1);

        EEPROM.write(id, 1);
        result();
        delay(100);
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Vote taken");
      gprsSerial.println(str);//begin send data to remote server

      delay(4000);
      ShowSerialData();

      gprsSerial.println((char)26);//sending
      delay(5000);//waitting for reply, important! the time is base on the
condition of internet
      gprsSerial.println();

      ShowSerialData();

      gprsSerial.println("AT+CIPSHUT");//close the connection
      delay(100);
      ShowSerialData();


    }// gsm er if sesh

} //void loop sesh //

uint8_t getFingerprintID() {
  uint8_t p = finger.getImage();
  switch (p) {
    case FINGERPRINT_OK:
      Serial.println("Image taken");
      break;
    case FINGERPRINT_NOFINGER:
      // Serial.println("No finger detected");
      return 0;
    case FINGERPRINT_PACKETRECIEVEERR:
      Serial.println("Communication error");
      return 0;
    case FINGERPRINT_IMAGEFAIL:
      Serial.println("Imaging error");
      return 0;
    default:
      Serial.println("Unknown error");
      return 0;
  }

  // OK success!

p = finger.image2Tz();
  switch (p) {
    case FINGERPRINT_OK:
      Serial.println("Image converted");
      break;
    case FINGERPRINT_IMAGEMESS:
      Serial.println("Image too messy");
      return p;
    case FINGERPRINT_PACKETRECIEVEERR:
      Serial.println("Communication error");
      return p;
    case FINGERPRINT_FEATUREFAIL:
      Serial.println("Could not find fingerprint features");
      return p;
    case FINGERPRINT_INVALIDIMAGE:
      Serial.println("Could not find fingerprint features");
      return p;
    default:
      Serial.println("Unknown error");
      return p;
  }

  // OK converted!
  p = finger.fingerSearch();
  if (p == FINGERPRINT_OK) {
    Serial.println("Found a print match!");
  } else if (p == FINGERPRINT_PACKETRECIEVEERR) {
    Serial.println("Communication error");
    return 0;
  } else if (p == FINGERPRINT_NOTFOUND) {
    Serial.println("Did not find a match");
    return 0;
  } else {
    Serial.println("Unknown error");
    return 0;
  }

  // found a match!
  Serial.print("Found ID #"); Serial.print(finger.fingerID);
  Serial.print(" with confidence of "); Serial.println(finger.confidence);

  return finger.fingerID;
}
```

```
  //delay(2000);
  //lcd.clear();
  break;
} //1 no vote deyoya sesh

else if (buttonState2 == LOW)
{
  vote2 = vote2 + 1;
  EEPROM.write(12, vote2);
  EEPROM.write(id, 1);


  result();
  delay(100);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Vote taken");


  //delay(2000);
  //lcd.clear();
  break;
}// 2 no vote deoya sesh

else if (buttonState3 == LOW)
{
  vote3 = vote3 + 1;
  EEPROM.write(13, vote3);
  EEPROM.write(id, 1);


  result();
  delay(100);
  lcd.clear();
```

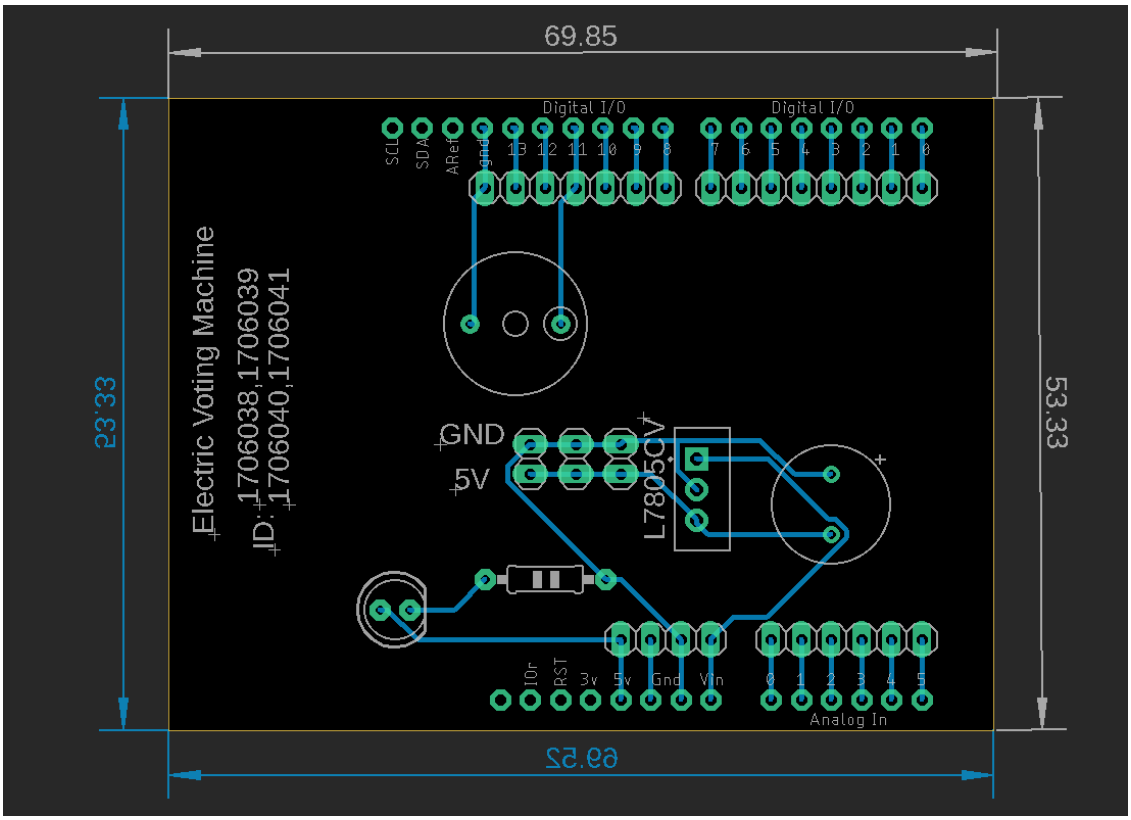
```
// returns -1 if failed, otherwise returns ID #
int getFingerprintIDez() {
  uint8_t p = finger.getImage();
  if (p != FINGERPRINT_OK)  return -1;

  p = finger.image2Tz();
  if (p != FINGERPRINT_OK)  return -1;

  p = finger.fingerFastSearch();
  if (p != FINGERPRINT_OK)  return -1;

  // found a match!
  Serial.print("Found ID #"); Serial.print(finger.fingerID);
  Serial.print(" with confidence of "); Serial.println(finger.confidence);
  return finger.fingerID;
}

void result()
{
  Serial.print("vote_1 ");
  Serial.print(vote1);
  Serial.print("  vote_2 ");
  Serial.println(vote2);
  Serial.print("  vote_3 ");
  Serial.println(vote3);
  Serial.print("  vote_4 ");
  Serial.println(vote4);

}
void ShowSerialData()
{
  while (gprsSerial.available() != 0)
    Serial.write(gprsSerial.read());
  delay(5000);

}
```

Table: Source Code for the main program

4 Implementation

4.1 Description

TOP VIEW of PCB DESIGN:



4.2 Results

Firstly, fingerprints of the voters were registered with particular IDs. Upto 125 voters can be enrolled. Later on we tested , whether the fingerprint matched or not. If a fingerprint is not enrolled the LCD display showed “ not enrolled” . If a fingerprint is enrolled then it shows “fingerprint matched” and the option for voting is activated. The voter can cast a vote to one of the four candidates. As soon as a vote is taken, the procedure repeats from “insert fingerprint” inviting to match fingerprint. If a voter has already voted then after fingerprint match LCD display will show “ you can not vote” and Buzzer will be activated for 2 seconds. Thus multiple vote from a single person is prevented. After every 5 votes the votes of all the candidates are forwarded to IOT server via GSM module from Arduino. It takes around 80 seconds to pass the information , during this period the LCD display shows “ DON’T VOTE”. Also if the Arduino is shut down and restarted it can start from where it ended and recall it’s previous data.

4.3 GitHub Link https://github.com/tajwaralmamun/EVM.git

4.4 YouTube Link https://youtu.be/UGr2rLx1gZA

5 Design Analysis and Evaluation

5.1 Novelty

Transparency with anonymous voting system is ensured. No one will be able to trace which voter voted which candidate. However, the voters id is used internally to allow him to vote. Since biometric system is used , only the enrolled voter can cast a vote as a result transparency is maintained. Not only that, a voter can not cast multiple votes, which adds furthermore protection to the system.

Since IOT is used, the data are stored in the online database too which is a strong backup. Even if the local device is somehow inactive ,everything will be available from server. This is the prime reason of using server to ensure a strong backup.

5.2 Project Management and Cost Analysis

5.2.1 Bill of Materials

Component	Quantity	Amount	Per Unit cost
ESP 8266	1	150	150
FTDI 232	1	170	170
LM317	2	30	15
1 uF – 10 uF	10	20	2
JACK – SOCKET	4	20	5
M + F Header	4	30	7.5
Small Push Button	5	10	2
Male-male, male – female	2	100	50
12 V 2 A adapter	1	80	80
UNO R3	1	925	925
16 X 2 LCD	1	150	150
R305	1	1700	1700
GSM	2	1600	800
LM317	2	30	15
Soldering tool	1	100	100
I2C1	1	75	75
Big Pushbutton	8	40	5
Buzzer	2	30	15
Vero board	1	100	100
Switch	1	30	30
12 V Battery	1	1500	1500
Total		6890	

5.2.2 Timeline of Project Implementation

18 July 2022 – 29 August, 2022.

5.3 Practical Considerations of the Design to Address Public Health and Safety, Environment, Cultural, and Societal Needs

5.3.1 Considerations to public health and safety

Battery, Arduino and other active elements of the circuit can be detrimental to public health. So, they had to be kept inside a closed interface so that they don't come into direct contact of the voters. Only the fingerprint module, LCD display, pushbutton are visible and only the fingerprint module & pushbutton should come into contact with the voters so that their health and associated safety is ensured. Also, if the battery / UNO board are to be replaced due to malfunction or expiration that should be done by opening the side of the interface.

Moreover, a minimum required voltage should be supplied to the circuit so that it's temperature is within safe limit zone. Higher voltage supply may increase the temperature and cause damage to the circuit, so with proper measurements these voltage and etc parameters should be set.

In addition, the interface should be insulating so that there is no probability that the voter will be subjected to any kind of accident.

5.3.2 Considerations to environment

A closed and insulating interface should be used , the internal damage due to any unexpected accident will be restricted to the interface only. The outside environment will not be affected.

The body of the interface should be strong and rigid. This would ensure any external pressure will not damage the body and the body would be able to withstand damages due to overload / short circuit and etc unexpected occurences.

5.3.3 Considerations to cultural and societal needs

Transparency and ease of the process are two key factors to encourage voting. Voting is the responsibility of every citizen. So, we had to engineer a voting machine that can encourage the voters to vote spontaneously. So the voting machine had to be designed in a way so that it is simple and easy with applications. Moreover, the privacy of the process had to be ensured so that voters feel safe.
Any mismanagement in the process will demotivate the voters to vote, so the process had to be clean and digital along with proper calculation. If all of these criteria could be met by the voting machine it would fill the cultural and societal needs.

5.4 Assessment of the Impact of the Project on Societal, Health, Safety, Legal and Cultural Issues

5.4.1 Assessment of Societal & Cultural Issues

As our electronic Voting machine used biometric verification there was no way to infiltrate an outsider to cast vote. Furthermore , a voter can cast only one vote , so vote laundering is prevented. Calculation of the vote is done by the programming , so no miscalculation is possible. Also, privacy is ensured as no one can know which voter voted which candidate. As a result , the citizens will believe in a clean transparent voting system if this machine is used. They will be encouraged heavily to cast vote . Thus this machine can contribute regarding societal issues.

5.4.2 Assessment of Health and Safety Issues

To prevent the contact between voter and active elements of the circuit a box was used to cover these elements. From voter's point of view only Module, push button and LCD display are visible. So,

his/her health-related safety is ensured.
The box has a body of insulator. So, there is no way of occurrence of any accident due to electrical phenomena.
The voltage level was kept to minimum so that the circuit doesn't have any overflow of current or it doesn't have excess temperature. For example with 12 V supply , the Arduino module was heating up. But when the supply was changed to 7.4 V , the functionality remained the same but the excess heat was absent.

5.4.3 Assessment of Legal Issues

Two kinds of legal issues can be addressed related to this project. One is while constructing the machine, the other is the process through which we get proper results or not.
As illustrated during the results that the voting procedure will ensure the clearness about proper results.
Regarding the construction of the machine, the software algorithm and hardware design concept was of our own. While coding , we have used codes from online which are allowed to use. And as our algorithm demanded we made further modifications to get the desired result which corresponds to our hardware design. Used free sources are given in references, other than that everything was completed with our own concept and realization.

5.4.4 Assessment of Environmental Issues

As an isolating surface is present around the circuit of the machine, the internal damage impact would be confined. Thus no harmful element can emit to damage the environment.

However, the body is strong or rigid enough to tolerate massive external pressure. With further supply of funding the body could be replaced with even more appropriate element that is strong and the same time insulating. This will ensure furthermore safety regarding environmental issues.

5.5Evaluation of the Sustainability and Impact of the Designed Solution in the Societal and Environmental Contexts

5.5.1 Evaluation of Sustainability

Our voting machine has a supply from external Battery. The battery needs to be charged. However , with time the battery may die out. In that case the , battery has to be exchanged with a new one. The same applies for Arduino, GSM etc components. They can be replaced with a working one. Thus the overall system is the same just some modifications will be required to maintain the functionality time to time.
However as mentioned before the body used is relatively weak. It is not immune to water / wet components. So, internal circuit may come into contact of water in case there is a considerable amount of water injected to the body. Thus the sustainability from external phenomena can be improved with better material. Other than that , it should provide the expected sustainability.

5.5.2 Evaluation of Impact of Design in Societal Context

The project was used only in front of few audiences. The practicality of the expected societal contributions can be evaluated properly after observing scenario in large scale. However, due to the design a lot of audiences were enthusiastic in trying out the voting machine. So, the purpose of motivating to vote is partially successful even though it is in small scale. Moreover, when the results were accurate people felt assured about impartial voting. However, the delay introduced by GSM is time consuming, so it is one of the demotivating factors that need to be sorted out. Replacement of a faster device to connect to IOT server will be one of the future ideas to insert positive impact from societal point of view.

5.5.3 Evaluation of Impact of Design in Environmental Context

From our observation , the design was friendly to environment. Nothing happened associated with the machine that caused any concern for environment. However , the environment situation has a slight impact on the machine. As GSM module requires connection feasibility. Under bad weather , it doesn't get proper connection, which relates to further delay to the procedure. The module antenna has to be aligned in the direction where it gets signals properly. So, there is definitely room for further improvisations.
But the machine is absolutely environment friendly.

6 Reflection on Individual and Teamwork

6.1 Individual Contribution of Each Member

1706038 -the LCD display, Fingerprint Module (Arduino Coding).

1706039 - Hardware portion of Vote counting Push Button, LCD setup.

1706040 – GSM module setup, Rest of the Hardware setup along with PCB designing.

1706041 – Vote count, GSM module, Buzzer, and combining all the subsections (Arduino Coding).

6.2 Mode of Teamwork

Online meeting during Eid vacation via Microsoft teams and zoom.

Mostly, offline meeting in Sher-e-Bangla Hall, BUET.

6.3 Diversity Statement of Team

All of us were involved with the project regularly in all the sessions. Distribution and discussion sessions were active throughout the whole project implementation.

ID 1706038, 1706041 mostly did the software portion.

ID 1706039, 1706040 mostly did the hardware portion.

6.4 Logbook of Project Implementation

Date	Milestone achieved	Individual Role	Team Role	Comments
18 July, 2022	Buying Arduino, Fingerprint module etc.	Bought by 1706040	Acknowledged	Bought from online platform.

19 July, 2022	Fingerprint module crosscheck			
25 July, 2022	Working on LCD display and ESP8266			
4 August, 2022	Working on vote count			
5 August, 2022	Combining voting system and fingerprint module			
12 August, 2022	Working with GSM module and Thingspeak			
19 August, 2022	Combining GSM module with rest of the system			
20 August, 2022	PCB designing implementation			
22 August, 2022	Added whole circuit to PCB			
26 August, 2022	Introducing Buzzer into the system			
29 August, 2022	Improvisation of GSM delay, shaping and decoration of the project	1706038, 1706041 – GSM delay and shaping the software portion 1706039, 1706040 – Shaping the hardware portion		Quite a hectic process to decorate and shape

7 References

https://circuitdigest.com/microcontroller-projects/iot-based-biometric-attendance-system-using-arduino-and-thingsboard
https://randomnerdtutorials.com/fingerprint-sensor-module-with-arduino/
https://randomnerdtutorials.com/guide-for-oled-display-with-arduino/
https://how2electronics.com/smart-electronic-voting-machine-using-arduino/