

FINGERPRINT BASED ELECTRONIC VOTING MACHINE

A Project Report Phase - II

Submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering Degree in Electronics and Communication Engineering

by

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRONICS

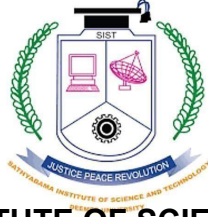
SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119

April-2023



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of SEYED AMEER SALMAN(39130410) AND TAMIL VASANTHAN S(39130463) who carried out the project entitled "FINGERPRINT BASED ELECTRONIC VOTING MACHINE "under my supervision from November 2022 to April 2023.

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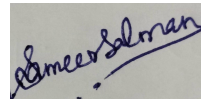
We SEYED AMEER SALMAN and TAMIL VASANTHAN.S hereby declare that the Project Report entitled “FINGERPRINT BASED ELECTRONIC VOTING MACHINE” done by us under the guidance of Dr.I.Rexiline Sheeba,M.E.,Ph.D. is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE: 20.04.23

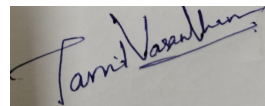
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We wish to express my thanks to all Teaching and Nonteaching staff members of the Department of Electronics and Communication Engineering who were helpful in many ways for the completion of the project

ABSTRACT

In this project, an embedded fingerprint recognition system for authentication for voting systems has been proposed. The system is implemented on an embedded platform and equipped with a novel finger-vein recognition algorithm. The proposed system consists of two modules: image recognition module, human machine communication module. The Embedded main board including the Microcontroller chip, memory (flash), and communication port is used to execute the finger-vein recognition algorithm and communicate with the peripheral device. The human machine communication module (LED or LCD) is used to display recognition results and receive inputs from users. Our proposed system is an intelligent security system. Here we developed a secure voting system for elections. If an authenticated person voted it sends a GSM message to the mobile, otherwise it activates a buzzer and also SMS sent to the particular person.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

Election is the act of the party casting votes to elect an individual for some type of position. Elections may involve a public or private vote depending on the position. Most positions in the local, state, and federal governments are voting on in some type of election. In paper-based elections, voters cast their votes by simply depositing their ballots in sealed boxes distributed across the electoral circuits around a given country. When the election period ends, all these boxes are opened, and votes are counted manually in presence of the certified officials. In this process, there can be errors in counting of votes or in some cases voters find ways to vote more than once. Sometimes votes are even manipulated to distort the results of an election in favor of certain candidates. In order to avoid these shortcomings, the government of India came up with a direct-recording electronic (DRE) voting system which are usually an electronic voting machine (EVM). These devices have been praised for their simple design, ease of use and reliability. However, it has been found that EVMs are not tamper proof and are easily hacked. Moreover, these attacks, hardware as well as software, go without any detection but are quite simple to implement. This made us to bring forth a system that is secure, transparent, reliable as well as easy to use for the citizens. Biometric e-voting systems are not a phenomenon anymore they are being actively used in countries like Ghana and Ireland and are spreading in many other developing nations. In this project, we propose an idea to avoid fraudulence in a mechanism to make e-voting in India a reality. It improves the security performance and avoids forgery votes because naturally one human fingerprint is different from another human

CHAPTER -2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

A literature review is a type of academic writing that provides an overview of existing knowledge in a particular field of research. A good literature review summarizes, analyses, evaluates and synthesizes the relevant literature within a particular field of research. It illuminates how knowledge has evolved within the field highlighting what has already been done, what is generally accepted, what is emerging and what is the current state of thinking on the topic. Additionally, literature reviews identify the gaps in the current knowledge - that is, uninvestigated or under-researched areas.

Rahil Rezwan et.al(2017)demonstrates Biometrically Secured Electronic Voting Machine Voting is one of the fundamental rights of every citizen of a democratic country. By utilizing the right of the voting, people elect their most suitable leader who will lead them. In this modern era where technology is being used in every aspect of life, election is a place to apply the best technology. In this project, we have developed a system which will be suitable for elections in countries like Bangladesh. The usual system for voting in Bangladesh is ballot paper-based voting system, where voting is sometimes unfair. In this proposed system we have used Arduino and Fingerprint Scanner that can identify each voter, count votes and can prevent fake votes. The proposed system is a more digital, technology-based and secured system.

SomaBhattacharya,et.al(2019) demonstrates Wireless Voting Machine Traditional Voting systems used ballot-paper based voting systems. This system was accompanied by some problems. To curtail some of these problems, two new techniques were used which are biometric fingerprint reorganization and retina scanning. In this paper, the techniques are illustrated in detail and these techniques when implemented in the wireless voting machine as safety measures has proven to be a boon. Thus, the wireless voting system has proved to be an advantage in the new age of voting systems.

Santhosh Kumar Shaw,et.al(2018) demonstrates Arduino Based Voting Machine Lecture India being the largest democracy faces a lot of issues during elections. Lot of controversies are reported about the voting system, voting machines, authentication of voting, corruption during elections etc... In our paper we have described a secured system that can eliminate such controversies involving elections in our country. In our present work we have developed a prototype and successfully tested an Arduino UNO based Aadhar facilitated electronic voting machine possessing a Two-Tier fingerprint security.

Sudarshan B,et.al (2019)demonstrates Concepts Of Blockchain Lecture Electronic Voting Machines (EVMs) are replacing paper ballots because of the errors involved in the manual counting process and the large time period required to count the votes. Even though these digital recording electronic systems are advancements, they are prone to tampering and electoral frauds. The suspected vulnerabilities in EVMs are the possibilities of tampering with the EVM's memory chip or switching it with a fake one, their simplicity, which enables them.

Balaji, Speech of Shri V S Sampath,et.al(2014) demonstrates Defence Estates Day Lecture Biometric Fingerprint devices are used in the Electronic Voting machine for voter verification. We have designed a fingerprint-based voting machine where there is no need for the user to carry his ID which contains his required details. The person at the polling booth needs only to place his Finger on the device, thus allowing the acquisition of an on-spot fingerprint from the voter which serves as an identification. This Fingerprint reader reads the details from the tag. This data is passed onto the controlling unit for the verification. The controller fetches the data from the reader and compares this data with the already existing data stored during the registration of the voters. If the data matches with the pre-stored information of the registered fingerprint, the person is allowed to cast his vote. If not, a warning message is displayed on LCD and the person is barred from polling his vote. The vote casting mechanism is carried out manually using the push buttons. LCD is used to display the related messages, warnings and ensuing results.

R.Haenni, E. Dubois,et.al(2008) demonstrates" Bern University of Applied Sciences, Governments around the world are increasingly considering the replacement of traditional paper-based voting schemes with electronic voting systems. A particular form of such devoting systems is those which allow voters to cast their ballots over the internet, so-called remote e-voting (or i-voting) systems.¹ In the last few years, several legally binding remote e-voting pilots have been conducted in various countries [10; 35], but most of them were restricted to communal or regional elections. The Swiss pilots in the cantons of Geneva, Neuchâtel, and Zurich are considered to be among the most advanced projects worldwide [9]. Despite the pioneering role of the Swiss e-voting projects, the first nationwide parliamentary elections took place in Estonia February 2007 [38]

G.V.L.N.Rao.Democracy at Risk demonstrates Transparency & Accountability In many democracies of the world the issue of electronic voting machines has become a matter of wide-spread public discussion. In India we have been conducting our elections through this device for the last two Lok Sabha elections and also in various Assembly elections held recently. But as yet there has been little debate on how useful these machines have proved. So when the author of this book G.V.L. Narasimha Rao approached me and requested me to write its Foreword, I not only accepted his plea, but complimented him for his efforts to compile all the facts he could on the subject and initiate a debate. The title of the book is certainly provocative.

K. Agarwal, D. T. Shahani, and P. V. Andresen. et.al (2006)demonstrates an upgraded electronic voting machine (EVM). Elections in India are conducted almost exclusively using electronic voting machines developed over the past two decades by a pair of government owned companies. These devices, known in India as EVMs, have been praised for their simple design, ease of use, and reliability, but recently they have also been criticized following widespread reports of election irregularities. Despite this criticism, many details of the machines' design have never been publicly disclosed, and they have not been subjected to a rigorous, independent security evaluation. In this paper, we present a security analysis of a real Indian EVM obtained from an anonymous source. We describe the machine's design and operation in detail, and we evaluate its security in light of relevant election procedures. We conclude that in spite of

the machines' simplicity and minimal software-trusted computing base, they are vulnerable to serious attacks that can alter election results and violate the secrecy of the ballot. We demonstrate two attacks, implemented using custom hardware, which could be carried out by dishonest election insiders or other criminals with only brief physical access to the machines. This case study carries important lessons for Indian elections and for electronic voting security more generally.

A.W. Appel, M. Ginsburg, H. Hurst, B. W. Kernighan, et al (2009) demonstrates Electronic Voting Technology As a result of a public-interest lawsuit, by Court order we were able to study, for one month, the hardware and source code of the Sequoia AVC Advantage direct-recording electronic voting machine, which is used throughout New Jersey (and Louisiana), and the Court has permitted us to publicly describe almost everything that we were able to learn. In short, these machines are vulnerable to a wide variety of attacks on the voting process. It would not be in the slightest difficult for a moderately determined group or individual to mount a vote-stealing attack that would be successful and undetectable.

R. G. Johnston, et al (2006) demonstrates Some comments on choosing seals and on past label seals. In 2008 and 2009 the plaintiffs in the New Jersey voting-machine lawsuit, *Gustier v. Corzine*, asked me to study the use of tamper-indicating security seals proposed by the New Jersey Division of Elections to secure their voting machines. In this paper I am making some of my assessments available to the public. I found that the proposed seals and security measures are insufficient to guarantee election integrity. The skills, time, and resources to spoof these seals and security measures are not a major barrier to an adversary, and are, in fact, widely available. The design of the AVC Advantage voting machines themselves is not conducive to good security, especially the lack of security on the voter's end of the machine. There are vulnerabilities and other problems with the seals chosen by New Jersey.

CHAPTER 3

PROPOSED SYSTEM

Private information is traditionally provided by using passwords or Personal Identification Numbers (PINs), which are easy to implement but is vulnerable to the risk of exposure and being forgotten. Biometrics, which uses*- human physiological or behavioral features for personal identification, has attracted more and more attention and is becoming one of the most popular and promising alternatives to the traditional password or PIN based authentication techniques. There is a long list of available biometric patterns, and many such systems have been developed and implemented, including those for the face, iris, fingerprint, palmprint, hand shape, voice, signature, and gait. Notwithstanding this great and increasing variety of biometrics patterns, no biometric has yet been developed that is perfectly reliable or secure. For example, fingerprints and palm prints are usually frayed; voice, signatures, hand shapes and iris images are easily forged. The disadvantages of biometric systems are False positives, cost, privacy issues etc. A voting system includes the practices and associated documentation used to identify system components and versions of such components; to test the system during its development and maintenance; to maintain records of system errors or defects; to determine specific changes made after initial certification; and to make available any materials to the voter (such as notices, instructions, forms, or paper ballots). Traditionally, a voting machine has been defined by the mechanism the system uses to cast votes and further categorized by the location where the system tabulates the votes.

3.2 PROPOSED METHODOLOGY

The fingerprint is a promising biometric pattern for personal identification in terms of its security and convenience. The vein is hidden inside the body and is mostly invisible to human eyes, so it is difficult to forge or steal. The non-invasive and contactless capture of finger-veins ensures both convenience and hygiene for the user and is thus more acceptable. The fingerprint pattern can only be taken from a live body. Therefore, it is a natural and convincing proof that the subject whose finger-vein is successfully captured is alive.

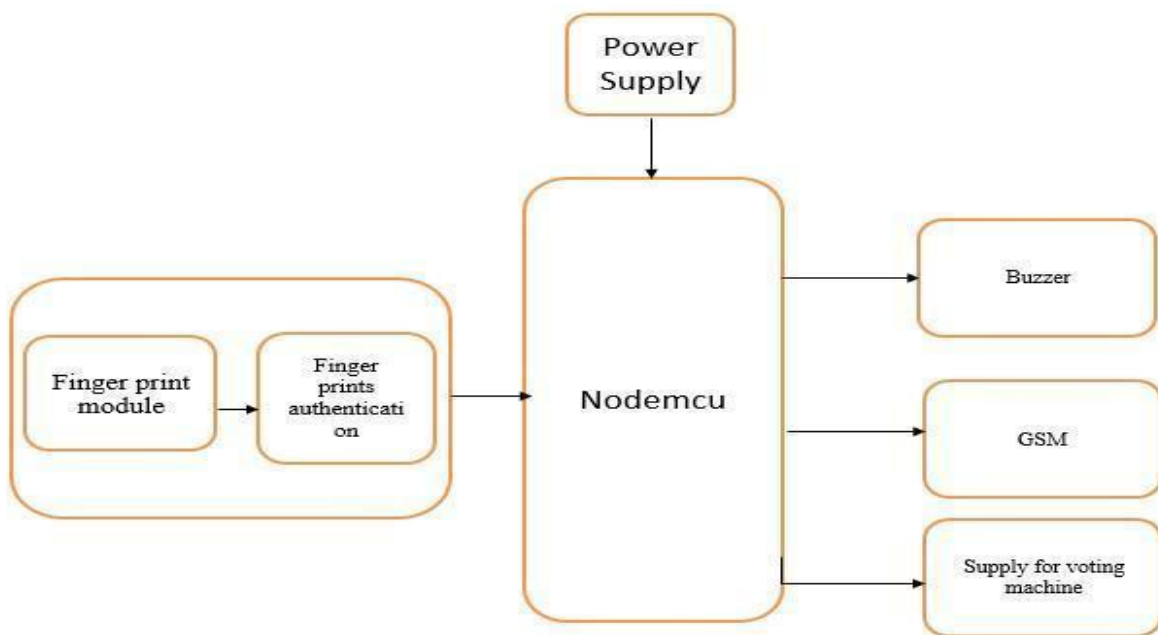


Fig: 3.1 Block Diagram Proposed Method

Voting machines have different levels of usability, security, efficiency and accuracy. Certain Systems may be more or less accessible to all voters, or not accessible to those voters with certain types of disabilities. They can also have an effect on the public's ability to oversee elections. Traditionally, a voting machine has been defined by the mechanism the system uses to cast votes and further categorized by the location where the system tabulates the votes.

3.3 NODE MCU

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressive Systems, and hardware which is based on the ESP-12 module. The Nodemcu ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Ten silica Extensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

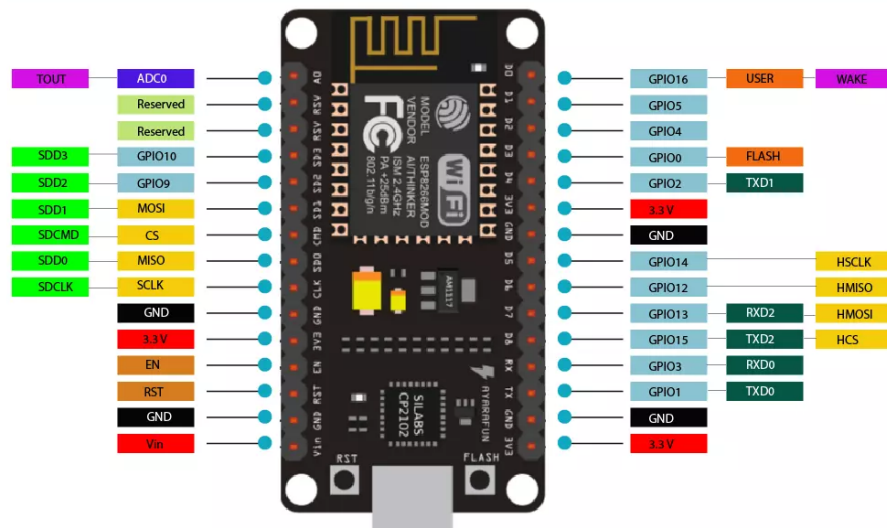


Fig: 3.2 Node MCU

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term NodeMCU by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications. NodeMCU started on 13 Oct 2014, when Hong committed the first file of

nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

In summer 2015 the creators abandoned the firmware project and a group of independent contributors took over. By summer 2016 the NodeMCU included more than 40 different modules. Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.

3.4 ESP8266 ARDUINO CORE

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 p]-

\WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE". This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs. NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.

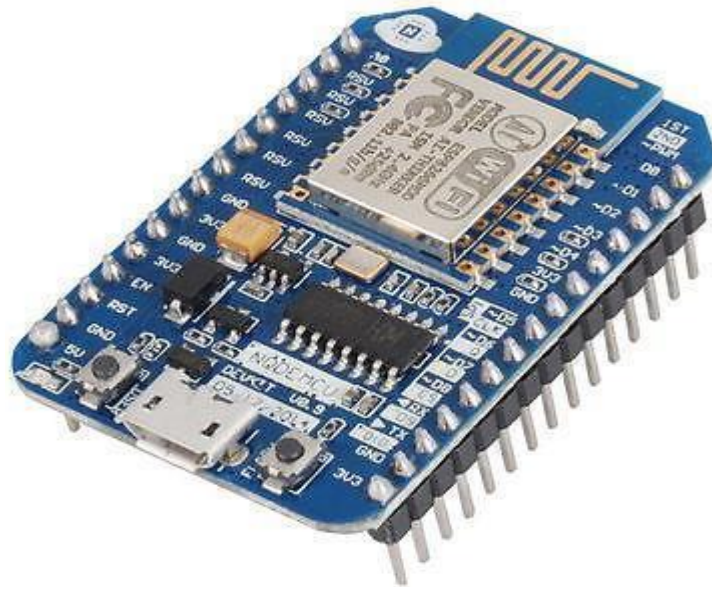


Fig: 3.2 NodeMCU Development Board/kit v0.9 (Version1)

Since NodeMCU is an open source platform, their hardware design is open for edit/modify/build. NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module. There is Version2 (V2) available for NodeMCU Dev Kit i.e. NodeMCU Development Board v1.0 (Version2), which usually comes in black colored PCB.

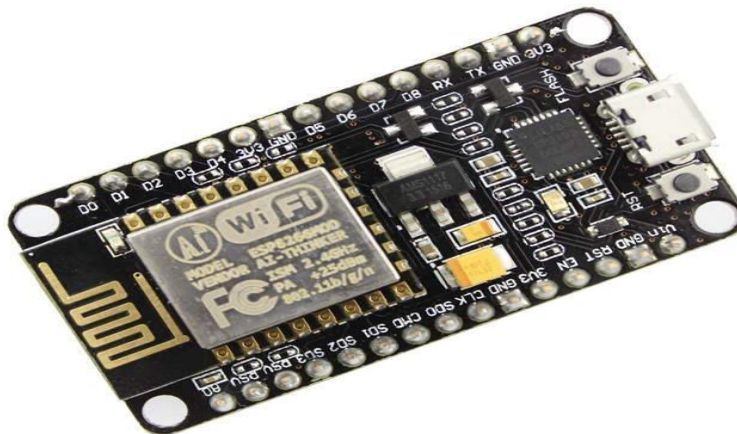


Fig: 3.3 NodeMCU Development Board/kit v1.0 (Version2)

NodeMCU Dev Kit has Arduino like Analog (i.e. A0) and Digital (D0-D8) pins on its board. It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC

chips, GPS modules, touch screen displays, SD cards etc. NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocol. To get start with using NodeMCU for IoT applications first we need to know about how to write/download NodeMCU firmware in NodeMCU Development Boards. And before that where this NodeMCU firmware will get as per our requirement. There is online NodeMCU custom builds available using which we can easily get our custom NodeMCU firmware as per our requirement. To know more about how to build custom NodeMCU firmware online and download it refer Getting started with NodeMCU

After setting up ESP8266 with Node-MCU firmware, let's see the IDE (Integrated Development Environment) required for development of NodeMCU. Lua scripts are generally used to code the NodeMCU. Lua is an open source, lightweight, embeddable scripting language built on top of C programming language. Here is another way of developing NodeMCU with a well-known IDE i.e. Arduino IDE. We can also develop applications on NodeMCU using the Arduino development environment. This makes it easier for Arduino developers than learning a new language and IDE for NodeMCU. Well, there is a programming language difference we can say while developing applications for NodeMCU using ESPlorer IDE and Arduino IDE. We need to code in C\C++ programming language if we are using Arduino IDE for developing NodeMCU applications and Lua language if we are using ESPlorer IDE.

Basically, NodeMCU is Lua Interpreter, so it can understand Lua script easily. When we write Lua scripts for NodeMCU and send/upload it to NodeMCU, then they will get executed sequentially. It will not build a binary firmware file of code for NodeMCU to write. It will send Lua script as it is to NodeMCU to get executed. In the Arduino IDE when we write and compile code, the ESP8266 toolchain in the background creates a binary firmware file of code we wrote. And when we upload it to NodeMCU then it will flash all NodeMCU firmware with newly generated binary firmware code. In fact, it writes the complete firmware. That's the reason why NodeMCU does not accept further Lua scripts/code after it is getting flashed by Arduino IDE. After getting flashed by Arduino sketch/code it will be no more Lua interpreter and we got errors if we try to upload Lua scripts. To start again with Lua script, we need to flash it with NodeMCU firmware. Since Arduino IDE compiles and uploads complete firmware, it takes more time than ESPlorer IDE. I2C interface.

3.5 BUZZER



Fig: 3.4 Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-' symbol or short terminal and it is connected to the GND terminal. Buzzer Pin Configuration.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6 Volts whereas the negative terminal is represented with the '-' symbol or short terminal and it is connected to the GND terminal. The history of an electromechanical buzzer and piezoelectric is discussed below. This buzzer was launched in the year 1831 by an American Scientist namely Joseph Henry but this was used in doorbells until they were eliminated in 1930 in support of musical bells, which had a smooth tone. Piezoelectric buzzers were

invented by Japanese manufacturers of Japanese & fixed into a broad range of devices during the period of 1970s – 1980s. So, this development primarily came due to cooperative efforts through the manufacturing companies of Japan. In the year 1951, they recognized the Application Research Committee of Barium Titanate that allows the corporations to be cooperative competitively & bring about numerous piezoelectric creations.

3.3.1 Specifications of Buzzer

The specifications of the buzzer include the following.

- Color is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA

3.3.2 Types of Buzzer

A buzzer is available in different types which include the following.

- Piezoelectric
- Electromagnetic
- Mechanical
- Electromechanical
- Magnetic

3.3.2.1 Piezoelectric

As the name suggests, the piezoelectric type uses the piezoelectric ceramic's piezoelectric effect & pulse current to make the metal plate vibrate & generate sound. This kind of buzzer is made with a resonance box, multi resonator, piezoelectric plate, housing, impedance matcher, etc. Some of the buzzers are also designed with LEDs. The multi resonator of this mainly includes ICs and transistors. Once the supply is given to this resonator, it will oscillate and generates an audio signal with 1.5 to 2.kHz. The impedance matcher will force the piezoelectric plate to produce sound.

3.3.2.2 Electromagnetic

This type of buzzer is made with a magnet, solenoid coil, oscillator, housing, vibration diaphragm, and magnet. Once the power supply is given, the oscillator which produces the audio signal current will supply throughout the solenoid coil to generate a magnetic field. Sometimes, the vibration diaphragm will vibrate & generates sound under the magnet & solenoid coil interaction. The frequency range of this ranges from 2 kHz to 4kHz.

3.3.2.3 Mechanical

These types of buzzers are subtypes of electromagnetic, so the components used in this type are also similar. But the main difference is that the vibrating buzzer is placed on the outside instead of the inside.

3.3.2.4 Electromechanical

The designing of these types of buzzers can be done with a bare metal disc & an electromagnet. The working principle of this is similar to magnetic and electromagnetic. It generates sound throughout the disc movement & magnetism.

3.3.2.5 Magnetic

Like a piezo type, magnetic is also used to generate a sound but they are different due to core functionality. The magnetic type is more fixed as compared to the piezo type because they work through a magnetic field. Magnetic buzzers utilize an electric charge instead of depending on piezo materials to generate a magnetic field, after that it permits another element of the buzzer to vibrate & generate sound.

The applications of magnetic buzzers are similar to the piezo type in household devices, alarms such as watches, clocks & keyboards.

3.3.3 Working Principle

The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors. Once a

potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

3.3.4 Mounting Configurations

The mounting configurations of buzzers include the following,

- Panel Mount
- Wire Leads
- Screw Terminals
- Through Hole
- Spring Contact
- Surface Mount

A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on a breadboard or PCB. So in most applications, this component is widely used.

There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep. Beep. Beep. This sound is because of the internal oscillating circuit within it.

This buzzer uses a DC power supply that ranges from 4V – 9V. To operate this, a 9V battery is used but it is suggested to utilize a regulated +5V/+6V DC supply. Generally, it is connected through a switching circuit to switch ON/OFF the buzzer at the necessary time interval.

3.3.5 Buzzer Circuit Diagram

The circuit diagram of the water level indicator using the buzzer is shown below. This circuit is used to sense or detect the water level within the tank or washing machine or pool, etc. This circuit is very simple to design using few components such as a transistor, buzzer, 300K variable resistor, and power supply or 9V battery.

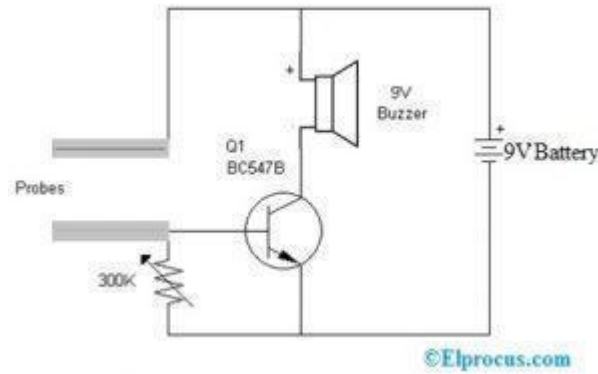


Fig: 3.5 Water Level Circuit using Buzzer

Once the two probes of the circuit are placed in the tank, it detects the level of water. Once the water level exceeds the fixed level, then it generates a beep sound through a buzzer connected to the circuit. This circuit uses a BC547B NPN transistor however we can also use any general-purpose transistor instead of using 2N3904/2N2222.

This water level sensor circuit working is very simple and the transistor used within the circuit works as a switch. Once the two probes notice the water level within the tank, then the transistor turns ON & the voltage begins flowing throughout the transistor to trigger the buzzer

3.4 FINGERPRINT MODULE



Fig: 3.6 Fingerprint Module

There are different types of fingerprint modules available in the market like R305, R307. For a better understanding of this sensor, here we are going to discuss an overview of the R305 fingerprint sensor module.

The R305 is one kind of fingerprint sensor module used in biometrics for security in fingerprint detection as well as verification. These devices are mainly used in safes where there is a high-powered DSP chip used in the rendering of image, feature-finding, searching and calculation by connecting it to any microcontroller with the help of TTL serial, & send data packets to get photos, notice prints, search and hash. The enrollment of new fingers can be stored directly within the flash memory of on board.

3.4.1 R305-fingerprint-sensor-module

The R305 is one kind of fingerprint sensor module used in biometrics for security in fingerprint detection as well as verification. These devices are mainly used in safes where there is a high-powered DSP chip used in the rendering of image, feature-finding, searching and calculation by connecting it to any microcontroller with the help of TTL serial, & send data packets to get photos, notice prints, search and hash. The enrollment of new fingers can be stored directly within the flash memory of on board.

3.4.2 Features of Fingerprint Sensor

The features of this sensor include the following.

- It includes image collection as well as chip algorithm
- The fingerprint reader can perform lesser growth and can be fixed into a range of end products
- Power use is low, excellent performance, small in size, and less cost
- Optical technology which is used is professional, and exact module developed techniques
- The capabilities of image processing are good, and can effectively capture pictures up to 500 dpi resolution

3.4.3 Fingerprint Sensor Working Principle

The working principle of the fingerprint sensor mainly depends on the processing. The fingerprint processing mainly includes two elements namely

enrollment and matching. In fingerprint enrolling, every user requires to place the finger twice.

So that the system will check the finger images to process as well as to generate a pattern of the finger and it will be stored. When matching, a user places the finger using an optical sensor then the system will produce a pattern of the finger & compares it with the finger library templates.

For 1:1 fingerprint matching, the system will evaluate the exit finger with a precise pattern which is selected within the module. Similarly, for 1: N matching, the scanning system will look for the complete finger records for the finger matching. In both situations, the scanning system will go back to the corresponding result, success otherwise crash.

3.4.4 Specifications

The specifications of this sensor include the following.

- The fingerprint sensor is an optical type
- The interface is USB1.1/ TTL logical level (UART)
- The speed of scanning is 0.5 sec
- The speed of verification is 0.3 sec
- The capacity storage is 1000
- The security level is 5
- The baud rate of RS232 is 4800BPS ~115200 BPS variable
- Current is typical 50 mA, and peak 80mA
- The corresponding technique is 1: N
- Fixed indicators-15KV bright green backlight
- The life of the sensor is 100 million times
- The dimension is 44.1 X 20 X 23.5mm

- The size of the character file is 256 bytes
- The template size is 512 bytes
- The FRR (False Rejection Rate) is <1.0%
- The FAR (False Acceptance Rate) is 0.001%
- Voltage is 4.2 to 6.0 VDC
- Operating surroundings temperature is -20° C to 40° C

3.5 GSM MODEM

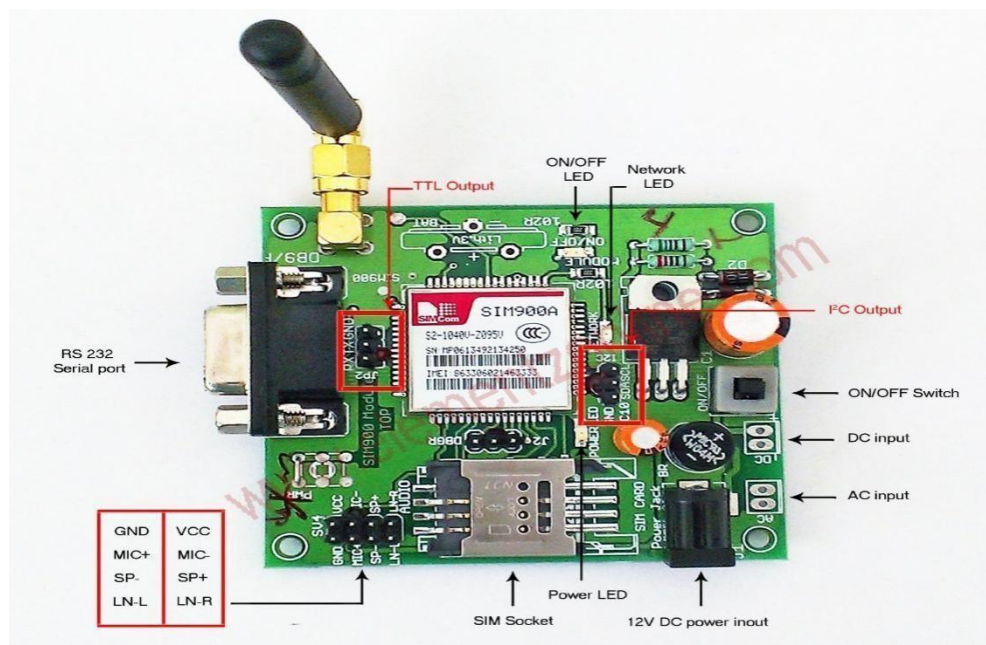


Fig: 3.7 GSM Modem

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHz. GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible

but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low -- only about six to ten SMS messages per minute.

3.6 LCD

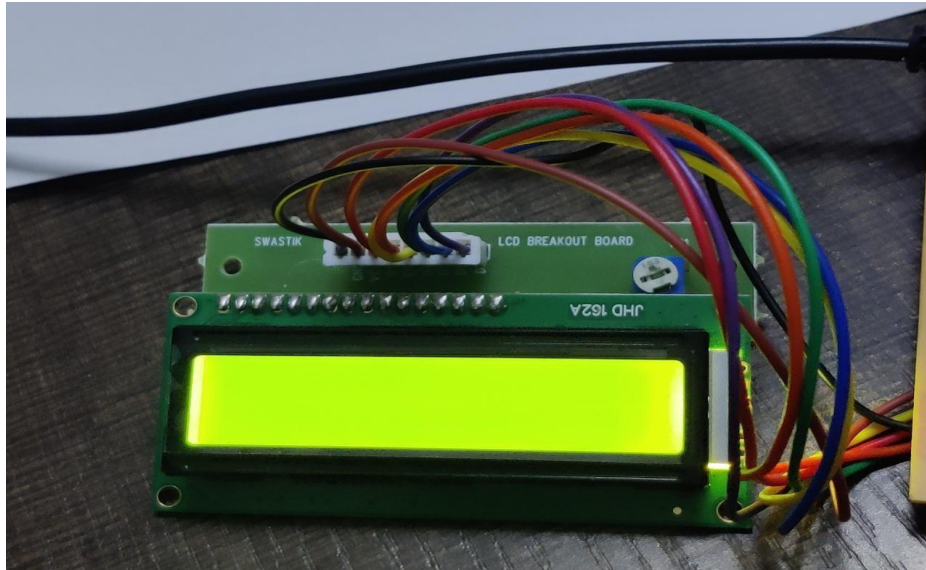


Fig: 3.8 LCD

Liquid Crystal Display which is commonly known as LCD is an Alphanumeric Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly Display device which can be used for displaying various messages unlike seven segment display which can display only numbers and some of the alphabets. The only disadvantage of LCD over seven segments is that seven segments has a robust display and can be visualized from a longer distance as compared to LCD. Here I have used a 16 x 2 Alphanumeric Display which means on this display I can display two lines with a maximum of 16 characters in one line.

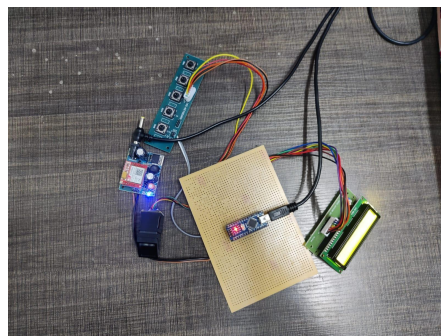


Fig: 3.9 Hardware Design

\

CHAPTER 4

RESULT AND ANALYSIS

4.1 ADVANTAGES

- It is economical
- Less manpower required
- Time conscious, as less time required for voting & counting
- Avoids invalid voting
- Saves transportation cost due to its compact size
- Convenient on the part of voter

4.2 APPLICATIONS

This could be used for voting purposes at any required place.

4.3 SOFTWARE USED

For controlling the controller unit, which is an arduino UNOR3 with ATMEGA 32 microcontroller, software from an arduino developer is used. The arduino board can be programmed with this software. UNO was selected from Tools>Boarding menu and ATMEGA 32 was selected for microcontroller. In case of controlling the fingerprint scanner a library file was used create and developed by Josh Hawley [7].ing The header file from this library was used to interface the scanner with arduino and for controlling it. The language used in the header file is C++.

4.4 RESULT

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

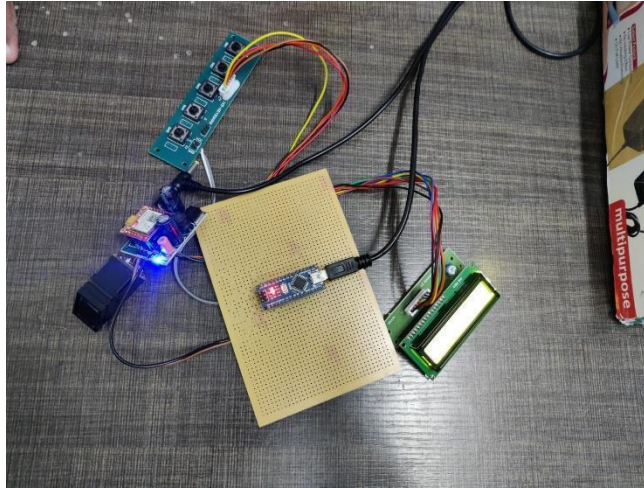


Fig: 4.1 Hardware system

shows the full hardware setup after completing the setup. The setting consisting of the fingerprint sensor module, which will take the fingerprinting 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 3 push buttons for giving votes to different and other one is for result. When the system is turned ON, Figure 4 shows when the machine is turned on. The machine welcomes with a greeting message and the machine is now ready.

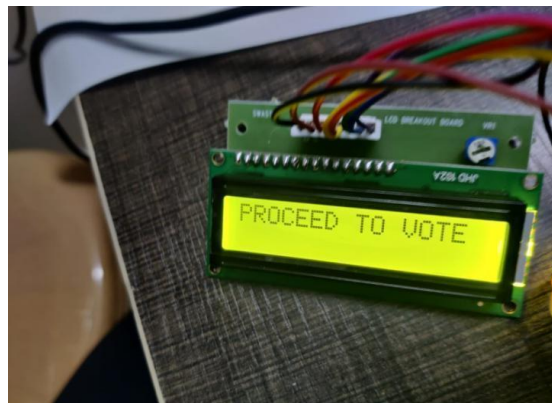


Fig 4.2 when system is turned on

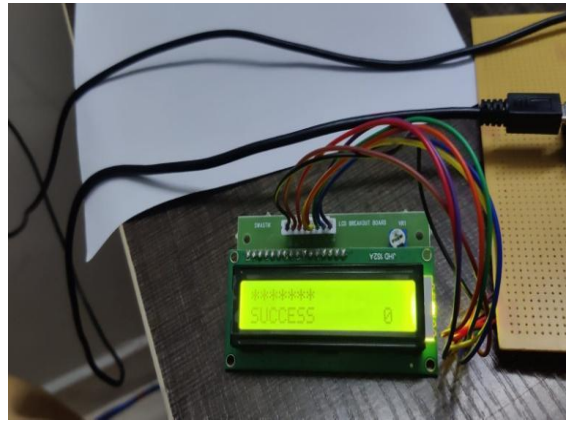


Fig. 4.3: Voted Successfully

shows when an authorized voter, which means that, if a person's fingerprint matches with the database and if the specific voter did not cast a vote previously, the machine will show welcome message to the voter and tell him to cast the vote. When voter casts the vote, the machine will ask for the confirmation, at this point, the voter has the freedom to change the previous vote if he wants or they can proceed with the previous vote. After a successful vote casting, the machine will show a confirmation message in the screen. If a voter, who previously casted vote, again tries to cast vote. The machine will deny and will say that the person has already casted vote.

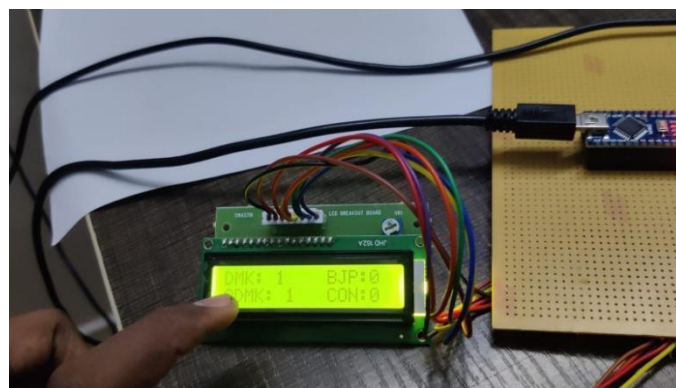


Fig: 4.4 Result

Finally, when the result button is pressed, the machine will display on LCD screen, how many vote goes for which team. It is capable of showing result like and it can also calculate who the winner is. It can also say that if the result is a draw or not. In case, no one attended the voting, it will show that no one voted.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION

To make the voting system of Bangladesh faster and more secure, an attempt has been taken so that the voting system can be acceptable to all kind of citizen of the nation. The security was the main concern of the whole project. More security has been added compared to usual electronic voting machine by adding the fingerprint feature so that there cannot be any kind of cheating. By using this system, the national voting system will be more secure, faster, easy to use and more economical. The system also consumes very low power and the device is easy to carry. The total cost of one machine would be less than BDT 5500. In one word, the system will make voting system more reliable and more secure. It is better than traditional ballot-paper system. In a country like Bangladesh where government is trying to bring technologies in every case to make the country more developed, voting system is a very good place to apply new technology like this, by which the common people will elect their right representative in smarter and secured way.

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APPENDIX

SOFTWARE CODE USED

```
int vote=0;
```

```
int dmK=0;
```

```
int admk=0;
```

```
int bjp=0;
```

```
int congress=0;
```

```
int person1=0;
```

```
int person2=0;
```

```
int per=0;
```

```
int p1=2;
```

```
int p2=1;
```

```
int p3=2;
```

```
int p4=1;
```

```
int v1=0;
```

```
int v2=0;
```

```
int v3=0;
```

```
int v4=0;
```

```

int id = 0;

int val1 = 1;

int val2 = 1;

int val3 = 1;

int val4 = 1;

int val5 = 1;

int cnt=0;

int cnt1=0;

void setup()

{

  Serial.begin(9600);

  finger.begin(57600);

  pinMode(14, INPUT);//s1

  pinMode(15, INPUT);//S2

  pinMode(16, INPUT);//s3

  pinMode(17, INPUT);//s4

  pinMode(18, INPUT);//s3

  LCD.begin(16,2); //Tell Arduino to start your 16 column 2 row LCD

  LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0

  LCD.print("VOTING SYSTEM"); //Print Message on First Row

  delay(1000);

  LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0

  LCD.print("*****      "); //Print Message on First Row

  if (finger.verifyPassword())

```

```

    {
        Serial.println("Found fingerprint sensor!");
    }

}

void loop()                // run over and over again
{
    val1= digitalRead(14);
    val2= digitalRead(15);
    val3= digitalRead(16);
    val4= digitalRead(17);
    val5= digitalRead(18);

    if(val1==1 && vote==1)
    {
        dmk=dmk+1;
        vote=0;

        LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
        LCD.print("DMK"); //Print Message on First Row
        delay(1000);

        LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
        LCD.print("      "); //Print Message on First Row
    }
}

```

```

if(per==1)
{
    SendMessage1();
}

```

```

if(per==2)
{
    SendMessage2();
}
}

```

```

if(val2==1 && vote==1)
{
    admk=admk+1;
    vote=0;
    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print("ADMK"); //Print Message on First Row
    delay(1000);
    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print("      "); //Print Message on First Row
}

```

```

if(per==1)
{
    SendMessage1();
}

```

```
}
```

```
if(per==2)
```

```
{
```

```
    SendMessage2();
```

```
}
```

```
}
```

```
if(val3==1 && vote==1)
```

```
{
```

```
    bjp=bjp+1;
```

```
    vote=0;
```

```
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("BJP"); //Print Message on First Row
```

```
delay(1000);
```

```
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("        "); //Print Message on First Row
```

```
if(per==1)
```

```
{
```

```
    SendMessage1();
```

```
}
```

```
if(per==2)
```

```
{
```

```
    SendMessage2();
```

```
}
```

```
}
```

```
if(val4==1 && vote==1)
```

```
{
```

```
    congress=congress+1;
```

```
    vote=0;
```

```
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("CONGRESS"); //Print Message on First Row
```

```
delay(1000);
```

```
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("      "); //Print Message on First Row
```

```
delay(1000);
```

```
if(per==1)
```

```
{
```

```
    SendMessage1();
```

```
}
```

```
if(per==2)
{
    SendMessage2();
}
}
```

```
val1= digitalRead(14);
val2= digitalRead(15);
val3= digitalRead(16);
val4= digitalRead(17);
val5= digitalRead(18);
```

```
if(val1==1 && vote==0)
{
    id=id+1;

    LCD.setCursor(14,1); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print(id); //Print Message on First Row
    Serial.println(id);
    delay(1000);
}
```

```

if(val2==1 && vote==0)

{

id=id-1;

if(id<0)

{

id=0;

}

LCD.setCursor(14,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print(id); //Print Message on First Row

Serial.println(id);

delay(1000);

}

```

```

if(val3==1 && vote==0)

{

Serial.println(".");

Serial.print("Enrolling ID");

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("PLACE"); //Print Message on First Row

while (! getFingerprintEnroll(id) );

LCD.clear();

}

```

```

if(val4==1 && vote==0)

```

```

{
door();
}
}

void door()
{
if(getFingerprintIDez())>=0)
{
Serial.print(finger.fingerID);
if(finger.fingerID==0 && person1==0)
{
Serial.print("zero");

LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
LCD.print("PROCEED TO VOTE "); //Print Message on First Row
//LCD.setCursor(14,0);//Set LCD cursor to upper left corner,column 0, row 0
// LCD.print(finger.fingerID); //Print Message on First Row

delay(2000);

LCD.clear();

vote=1;

per=1;

person1=1;

}
else

```

```

if(finger.fingerID==0 && person1==1)
{
    Serial.print("zero");

    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print("ALREADY VOTED"); //Print Message on First Row
    delay(2000);
    LCD.clear();
}

```

```

if(finger.fingerID==1 && person2==0)
{
    Serial.print("one");

    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print("PROCEED TO VOTE"); //Print Message on First Row
    //LCD.setCursor(14,0); //Set LCD cursor to upper left corner, column 0, row 0
    // LCD.print(finger.fingerID); //Print Message on First Row
    delay(2000);
    LCD.clear();

    vote=1;

    per=2;

    person2=1;
}

else

if(finger.fingerID==1 && person2==1)

```

```

{
  Serial.print("one");

  LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print("ALREADY VOTED"); //Print Message on First Row
  delay(2000);
  LCD.clear();
}

```

```

if(finger.fingerID==2)
{
  LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print("DMK:"); //Print Message on First Row
  LCD.setCursor(5,0); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print(dmk); //Print Message on First Row

```

```

  LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print("ADMK:"); //Print Message on First Row
  LCD.setCursor(6,1); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print(admk); //Print Message on First Row

```

```

  LCD.setCursor(10,0); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print("BJP:"); //Print Message on First Row
  LCD.setCursor(14,0); //Set LCD cursor to upper left corner, column 0, row 0
  LCD.print(bjp); //Print Message on First Row

```

```

LCD.setCursor(10,1);//Set LCD cursor to upper left corner, column 0, row 0
LCD.print("CON:"); //Print Message on First Row

LCD.setCursor(14,1);//Set LCD cursor to upper left corner, column 0, row 0
LCD.print(congress); //Print Message on First Row

//LCD.setCursor(14,0);//Set LCD cursor to upper left corner,column 0, row 0
// LCD.print(finger.fingerID); //Print Message on First Row

delay(5000);

LCD.clear();

}

}

else
{
LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
LCD.print("UNAUTHORIZED"); //Print Message on First Row
delay(1000);

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
LCD.print("          "); //Print Message on First Row
LCD.clear();

v1=0;

v2=0;

v3=0;

```

```

v4=0;

cnt1=0;

}

}

uint8_t getFingerprintEnroll(int id)
{
    int p = -1;

    Serial.println("Waiting for valid finger to enroll");

    while (p != FINGERPRINT_OK) {

        p = finger.getImage();

        switch (p) {

            case FINGERPRINT_OK:

                Serial.println("Image taken");

                break;

            case FINGERPRINT_NOFINGER:

                Serial.println(".");

                break;

            case FINGERPRINT_PACKETRECEIVEERR:

                Serial.println("Communication error");

                break;

            case FINGERPRINT_IMAGEFAIL:

                Serial.println("Imaging error");

                break;

```

```

default:

    Serial.println("Unknown error");

    break;

}

}

// OK success!


p = finger.image2Tz(1);
switch (p) {

    case FINGERPRINT_OK:

        Serial.println("Image converted");

        break;

    case FINGERPRINT_IMAGEMESS:

        Serial.println("Image too messy");

        return p;

    case FINGERPRINT_PACKETRECEIVEERR:

        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;

    }

```

```

Serial.println("Remove finger");

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("REMOVE"); //Print Message on First Row

delay(1000);

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("    "); //Print Message on First Row

```

```

p = 0;

while (p != FINGERPRINT_NOFINGER) {

    p = finger.getImage();

}

```

```

p = -1;

Serial.println("Place same finger again");

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("PLACE"); //Print Message on First Row

delay(1000);

```

```
LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("    "); //Print Message on First Row
```

```
while (p != FINGERPRINT_OK) {  
    p = finger.getImage();  
    switch (p) {  
        case FINGERPRINT_OK:  
            Serial.println("Image taken");  
            break;  
        case FINGERPRINT_NOFINGER:  
            Serial.print(".");  
            break;  
        case FINGERPRINT_PACKETRECEIVEERR:  
            Serial.println("Communication error");  
            break;  
        case FINGERPRINT_IMAGEFAIL:  
            Serial.println("Imaging error");  
            break;  
        default:  
            Serial.println("Unknown error");  
            break;  
    }  
}
```

```
// OK success!
```

```
p = finger.image2Tz(2);
```

```
switch (p) {
```

```
    case FINGERPRINT_OK:
```

```
        Serial.println("Image converted");
```

```
        break;
```

```
    case FINGERPRINT_IMAGEMESS:
```

```
        Serial.println("Image too messy");
```

```
        return p;
```

```
    case FINGERPRINT_PACKETRECEIVEERR:
```

```
        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.createModel();

if (p == FINGERPRINT_OK) {
    Serial.println("Prints matched!");
} else if (p == FINGERPRINT_PACKETRECEIVEERR) {
    Serial.println("Communication error");
    return p;
} else if (p == FINGERPRINT_ENROLLMISMATCH) {
    Serial.println("Fingerprints did not match");
    return p;
} else {
    Serial.println("Unknown error");
    return p;
}

Serial.print("ID "); Serial.println(id);

p = finger.storeModel(id);

if (p == FINGERPRINT_OK) {
    Serial.println("Stored!");

    LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print("SUCCESS"); //Print Message on First Row

    delay(1000);

```

```
LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
```

```
LCD.print("    "); //Print Message on First Row
```

```
} else if (p == FINGERPRINT_PACKETRECEIVEERR) {
```

```
    Serial.println("Communication error");
```

```
    return p;
```

```
} else if (p == FINGERPRINT_BADLOCATION) {
```

```
    Serial.println("Could not store in that location");
```

```
    return p;
```

```
} else if (p == FINGERPRINT_FLASHERR) {
```

```
    Serial.println("Error writing to flash");
```

```
    return p;
```

```
} else {
```

```
    Serial.println("Unknown error");
```

```
    return p;
```

```
}
```

```
}
```

```
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 p;

case FINGERPRINT_PACKETRECEIVEERR:

    Serial.println("Communication error");

    return p;

case FINGERPRINT_IMAGEFAIL:

    Serial.println("Imaging error");

    return p;

    default:

        Serial.println("Unknown error");

        return p;

}

```

```

// 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.fingerFastSearch();

if (p == FINGERPRINT_OK)

{

    Serial.println("Found a print match!");

} else if (p == FINGERPRINT_PACKETRECIEVEERR) {

```

```

        Serial.println("Communication error");

        return p;

    } else if (p == FINGERPRINT_NOTFOUND) {

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

        Serial.println("Did not find a match");

        return p;

    } else {

        Serial.println("Unknown error");

        return p;

    }

}

// found a match!

// Serial.print("Found ID #"); Serial.print(finger.fingerID);

// Serial.print(" with confidence of "); Serial.println(finger.confidence);

}

// 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 SendMessage1()

{

    Serial.println("AT+CMGF=1");

    delay(800);

    Serial.println("AT+CMGS=\"+919989814751\\r\"");

    // Serial.println("AT+CMGS=\"+917373077228\\r\"");


    delay(800);

    Serial.println("THANKS FOR VOTING!");

    delay(500);

    Serial.println((char)26);

    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0

    LCD.print("*****"); //Print Message on First Row

```

```
}
```

```
void SendMessage2()
```

```
{
```

```
    Serial.println("AT+CMGF=1");
```

```
    delay(800);
```

```
    Serial.println("AT+CMGS=\"+916383420293\\r\"");
```

```
    // Serial.println("AT+CMGS=\"+917373077228\\r\"");
```

```
    delay(800);
```

```
    Serial.println("THANKS FOR VOTING!");
```

```
    delay(500);
```

```
    Serial.println((char)26);
```

```
    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
    LCD.print("*****"); //Print Message on First Row
```

```
}
```