FINGERPRINT BASED BIOMETRIC ATTENDANCE SYSTEM USING ARDUINO

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ELECTRONICS DESIGN WORKSHOP

ECE – 1

SUBMITTED TO :- *PROF. DV GADRE*

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<u>INTRODUC TION</u>

In this project, we are going to design a Fingerprint Sensor using Arduino. Simply we will be **interfacing fingerprint sensor with Arduino**, **LCD Display** & **RTC Module** to design the desired project. In this project, we used the fingerprint Module and Arduino to take and keep attendance data and records.

Biometric Attendance systems are commonly used systems to mark the presence in offices and schools. This project has a wide application in school, college, business organization, offices where marking of attendance is required accurately with

time. By using the fingerprint sensor, the system will become more secure for the users.

BILLS OF MATERIALS

SNO.	COMPONENTS NAME	DESCRIPTION	QUANTITY
1.	Arduino board	Arduino UNO R3 Development Board	1
2.	Fingerprint Sensor	R305 Fingerprint Sensor Module	1
3.	RTC Module	DS3231/DS1307 Real Time Clock Module	1
4.	LCD Display	16 X 2 LCD Display	1
5.	Push Buttons	Push-To-ON Reset Tact Switch	4
6.	Buzzer	5V Active Buzzer	1

7.	LED	5mm any colour	1
8.	Connecting wires	Jumper Wires	20
9.	Memory SD Card Module		1

<u>DESCRIPTION OF MATERIALS</u>

7. **<u>ARDUINO BOARD</u>** :- **Arduino Uno** is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to -DC adapter or battery to get started.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The

Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.
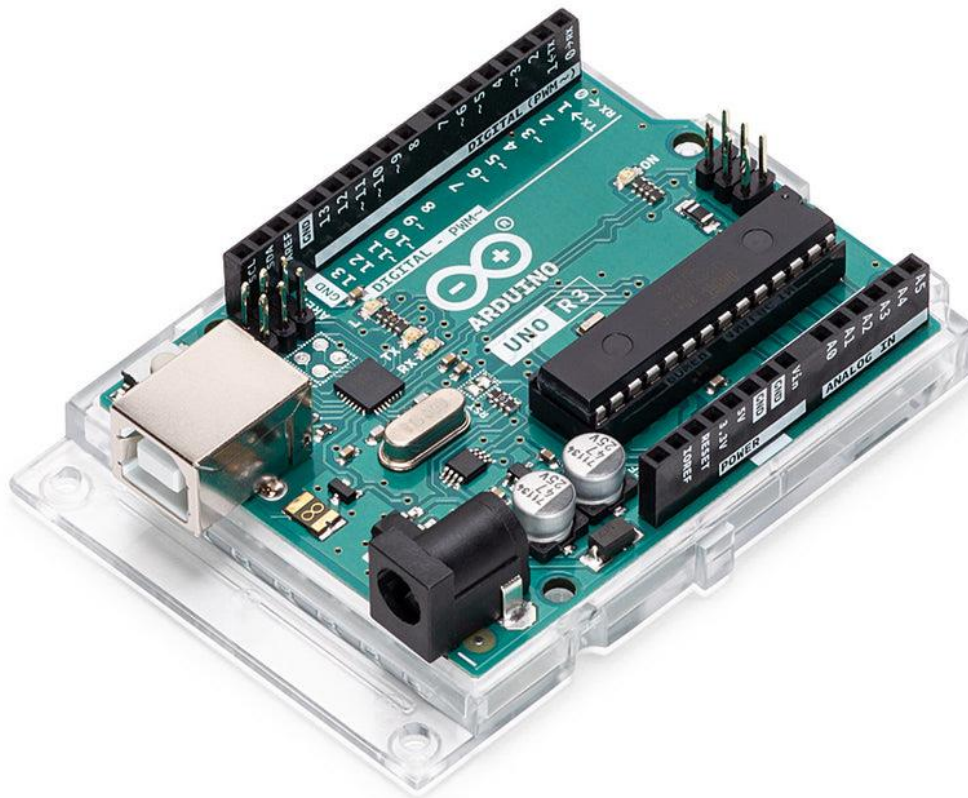
2. FINGERPRINT SENSOR :- This is a fingerprint sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through

MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The Fingerprint module can be directly interfaced with any microcontroller as well as Arduino Board. This optical biometric fingerprint reader with great features and can be embedded into a variety of end products like access control system, attendance system, safety deposit box, car door locking system.

Specifications

1. Fingerprint sensor type: Optical
2. Sensor Life: 100 million times
3. Static indicators: 15KVBacklight: bright green
4. Interface: USB1.1/UART (TTL logical level)
5. RS232 communication baud rate: 4800BPS~115200BPS changeable
6. Dimension: 55*32*21.5mm
7. Image Capture Surface 15—18(mm)
8. Verification Speed: 0.3 sec
9. Scanning Speed: 0.5 sec
10. Character file size: 256 bytes

11. Template size: 512 bytes
12. Storage capacity: 250
13. Security level: 5 (1,2,3,4,5(highest))
14. False Acceptance Rate (FAR) :0.0001%
15. False Rejection Rate (FRR): 0.1%
16. Resolution 500 DPI
17. Voltage :3.6-6.0 VDC
18. Working current: Typical 90 Ma, Peak 150Ma
19. Matching Method: 1: N
20. Operating Environment Temperature: -20 to 45° C

3. RTC MODULE :- **DS3231 RTC** is a Precise Real-Time Clock Module with 32Kbit EEPROM and a built-in 10-bit temperature sensor having a resolution of 0.25C. The DS3231 RTC module Precise Real-Time Clock Module is a low-cost, extremely accurate I^2C real-time clock (RTC) with an integrated temperature-compensated crystal oscillator (TCXO) and crystal. The device incorporates a battery input and maintains accurate timekeeping when the main power to the device is interrupted.

4. LCD DISPLAY :- The term <u>LCD stands for liquid crystal display</u>. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment <u>light-emitting diodes</u> and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and

there are no limitations for displaying custom characters, special and even animations, etc.

Features of LCD16x2

The features of this LCD mainly include the following.

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1Ma with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

5. PUSH BUTTONS :- A push button switch controls an action in a machine or other type of process. They are common features within the home and workplace, and are also referred to as pushbutton switches or push switches.

The buttons are typically made from plastic or metal and the push button may either be flat or customised to

ergonomic specifications. There is a wide variety of button switch models, which are powered either by momentary or latching action.

Features :-

1. Through-hole design.
2. Shaft Shape: Round
3. High operating force (3.0N or 3.6N) suited to automotive equipment requirements
4. The long life of 300,000 cycles realized despite the high operating force
5. Middle stroke (1.05mm)
6. Used in the fields of electronic products, household appliances and more.
7. This light touch switch is waterproof, prevent oil, anti-pollution, anti-static interference.
8. High precision mechanism design offers acute operation and long service life.
9. Compact and lightweight, easy to carry and dismantling.
10. Good electrical conductivity.

8. BUZZER :- The Buzzer Active 5V Module is an active piezo buzzer module useful for creating sound in a project. There are two types of buzzers, Active buzzers such as this one and passive buzzers.

Active buzzers have the drive circuitry built into them, so a simple active HIGH logic level signal will activate the buzzer. Though simple to use, the downside of the active buzzer is that the tone of the buzzer is fixed

at a particular frequency and the loudness is more or less fixed. These are mainly useful for signaling or an alarm.

Passive buzzers are more similar in function to a small speaker and need to be driven by a waveform with enough drive current capability to create the desired sound. The advantage of a passive buzzer is that the tone and loudness of the buzzer can be controlled by the frequency and drive power of the waveform that is used to drive it but it is more difficult to use.

The buzzer will draw about 25Ma from the S pin. If driving it using a MCU output pin, it can be driven directly from the pin, though it is recommended to not draw more than 20Ma for extended periods of time. If a lower volume is desired, a small value resistor can be put in series.

It is moderately loud at about 85Db with a 2.3 kHz frequency, so it is best suited for use as an attention getting alarm or beeper. Here is a sound clip where it is being toggled on/off every second.
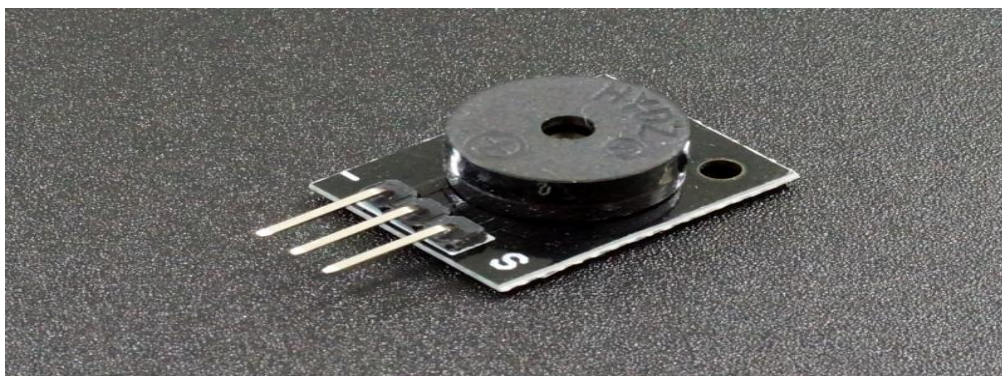

9. LED :- A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. LEDs allow the current to flow in the forward direction and blocks the current in the reverse direction. Light-

emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.

BLOCK DIAGRAM
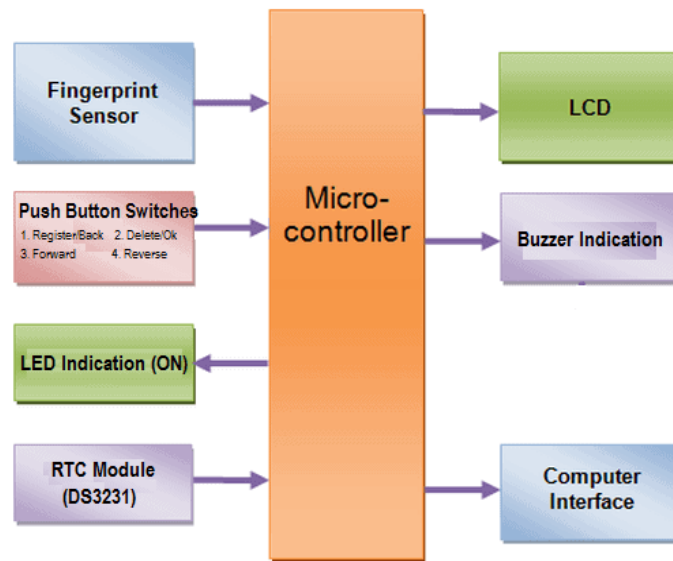
In this Fingerprint Sensor Based Biometric Attendance System using Arduino, we used a Fingerprint Sensor module to authenticate a true person or employee by taking their finger input in the system. Here we are using 4 push buttons to register new fingerprint or delete stored fingerprint or match stored fingerprint. The 4 push buttons are used as an input unit for these tasks. Similarly, RTC Module DS3231 is used for registering scanning/entering/existing time of the user.

The LCD displays the time record and every function happening via push button. Buzzer indicates different functions and happening whenever an interrupt is detected. The LED is used for power indication.

CIRCUIT DIAGRAM
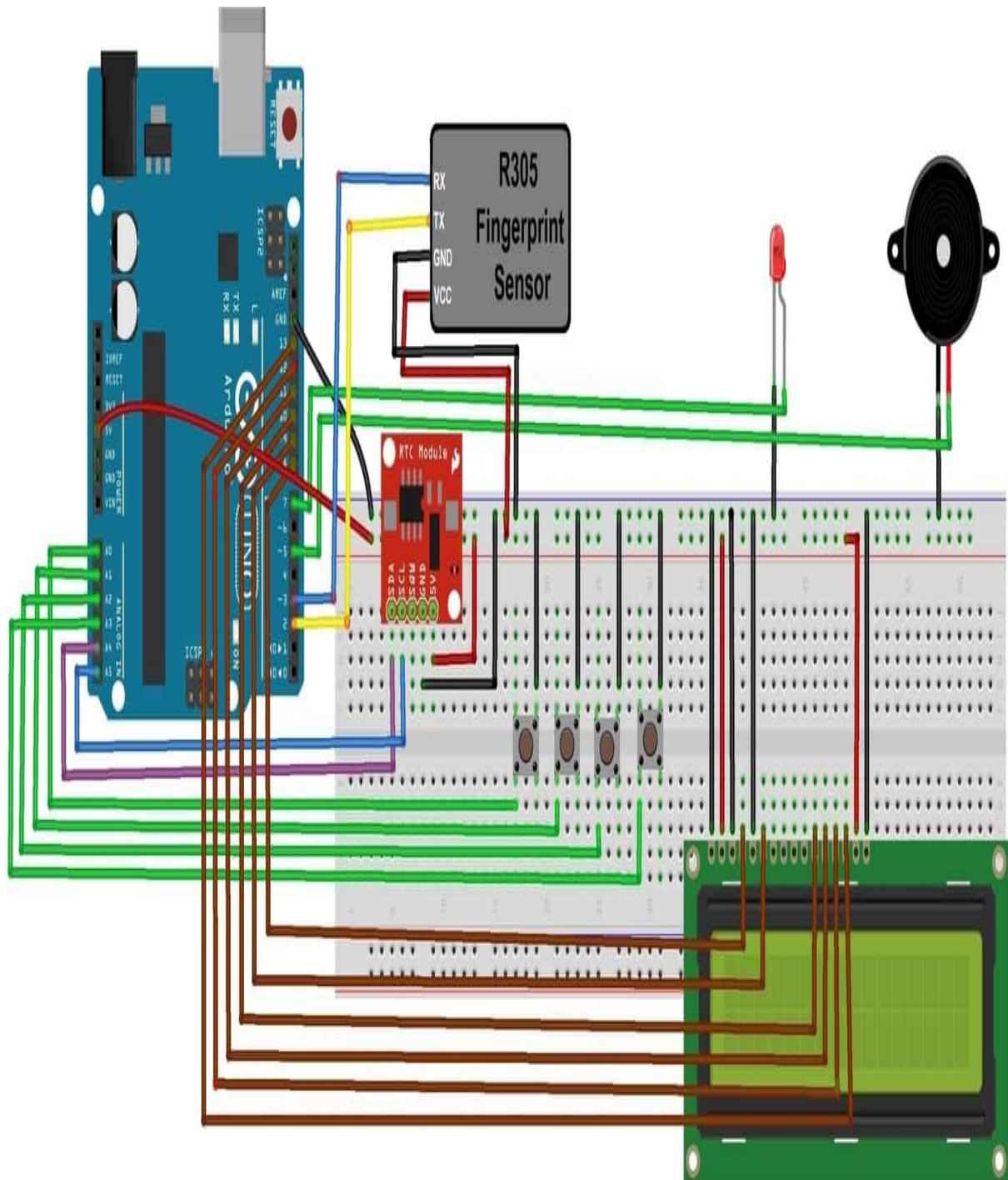
WORKING OF THE PROJECT

The working of the Fingerprint Sensor Based Biometric Attendance System. In this project, we have used a DS3231 RTC Module for time & date display. We used 1 LED for power indication, 1 buzzer for different function indication. We have interfaced 16*2 LCD which displays everything whenever the finger is placed or removed, or registering attendance or downloading data.

We have used 4 push buttons which are used to control the entire system. The functions of each button are:

1. Register/Back Button – Used for enrolling new fingerprint as well as reversing the back process or going back

2. Delete/OK Button – This Button is used for deleting the earlier stored fingerprint system as well as granting access as an OK selection.

3. Forward Button – Used for moving forward while selecting the memory location for storing or deleting fingerprints.

4. Reverse Button – Used for moving backward while selecting memory location for storing or deleting fingerprints.

Enrolling New Fingerprint

To enroll New Fingerprint Click on the Enroll button. Then select the memory location where you want to store your fingerprint using the UP/DOWN button. Then click on OK. Put your finger and remove your finger as the LCD instructs. Put your finger again. So finally your fingerprint gets stored.

Deleting Stored Fingerprint

To delete the fingerprint which is already clicked on DEL Button. Then select the memory location where your fingerprint was stored earlier using the UP/DOWN button. Then click on OK. So finally your fingerprint is deleted.

Downloading Data

Simply click on Register/Back Button and reset the button together. At this movement, the serial monitor should be opened.