



BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING FOR WOMEN,PUNE 43

DEPARTMENT: ENGINEERING SCIENCES AND ALLIED ENGINEERING



PROJECT BASED LEARNING



**BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING FOR
WOMEN,PUNE 43**

DEPARTMENT: ENGINEERING SCIENCES AND ALLIED ENGINEERING

PROJECT BASED LEARNING (110013)

Project Title : Fingerprint Door Lock System

Academic Year 2020-2021

Semester-II

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Roll No. :- 102

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CERTIFICATE OF ORIGINALITY

Year : date ____

This is to certify, that the project (Title of the paper) submitted by me is an outcome of my own work. I have duly acknowledged all the sources from which the ideas and extracts have been taken. The project has not been copied from anywhere and all data has been collected by me.

Name of Student_

Class / Sem /

Exam no. :-

Signature of student

Signature of Guide



BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING FOR WOMEN

PUNE-SATARA RD., PUNE – 411043

Department of Engineering Sciences and Allied Engineering

Academic Year 2020-21 (Semester II)

Subject:	Project based learning (Course2019) Subject Code: 110013	Examination Scheme:	
Course Code: Class:	First Year Engineering		
Practical:	04 Hrs/Week	PR :	50 Marks

Course Objectives:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

After successful completion of this course the student will be able to

110013. 1	CO1: Project based learning will increase their capacity and learning through shared cognition..
110013. 2	CO2: Students able to draw on lessons from several disciplines and apply them in practical way.
110013. 3	CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning

Course Attainment methods:

1. Evaluation and Continuous Assessment
2. **Progress report**

Prof. D.P.Chopade

Subject Teacher

H.O.D

Engg. Sciences and Allied Engg.

Principal



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Student Signature & Name

Ms. Anushruti Adhikari

Course Teacher Signature

Prof.D.P.Chopade

I. ABSTRACT:

This concept which is of Fingerprint door locker is related to the security issues in the day today life, the physical key can be made as duplicate in very cheap cost and the key can lost somewhere or the key can steal, to overcome these issues we can use biometric security gadgets and try improvise the security much more because it can never be stolen it cannot be lost and the stealing chance of duplication are very low to break the security. From the old times the security is the big issue for the company's houses and other places and every person is worried about the security now a days. The traditional door locks can be bypasses by the duplicate keys, but the best solution for this situation is biometric locks which include Fingerprints, Iris and Handprint scanners. So, in this project we are going to try to get upper level of security.

Human detection and recognition field is very significant and has undergone rapid changes with time. An important and very reliable human identification method is fingerprint identification. Fingerprint of every person is unique. So, this helps in identifying a person or in improving security of a system. Finger print of a person is read by a special type of sensor. Finger print sensor can be interfaced with a microcontroller.

This is an arduino based fingerprint doorlock prototype. In this Model, when we place our finger on the sensor, the program takes an image of it and tallies it with the enrolled fingerprints. If the finger is recognized then the door automatically opens for a specific time and after that it close on its own.

The fingerprint door lock has a very self-explanatory name, it is a system that allows authorized people access as a result of recognizing their fingerprints, as they are a great method of identification for humans. Human fingerprints have a lot of details and are incredibly unique. In addition, it is difficult to try and copy another set of fingerprints, even to fake them and alter them.

II. OBJECTIVE:

- Primary objective of fingerprint scanners is to produce best possible fingerprint patterns for conversion into digital templates.
- For security reasons.
- Easy unlocking of door.
- Time saving mechanism/system.
- For keeping track of the data.
- The biometric fingerprint sensor is ideal to create a system capable of protecting what you require through the analysis of your fingerprint.

III. INTRODUCTION:

○ What are fingerprint door locks?

Biometrics refers to the automatic identification of a living person based on physiological or behavioral characteristics for authentication purpose. Among the existing biometric technologies are the face recognition, fingerprint recognition, finger-geometry, hand geometry, iris recognition, vein recognition, voice recognition and signature recognition, Biometric method requires the physical presence of the person to be identified. This emphasizes its preference over the traditional method of identifying what you have such as, the use of password, a smartcard etc.

Also, it potentially prevents unauthorized admittance to access control systems or fraudulent use of ATMs, Time Attendance Systems, cellular phones, smart cards, desktop PCs, Workstations, vehicles and computer networks. Biometric recognition systems offer greater security and convenience than traditional methods of personal recognition.

Fingerprint recognition represents the oldest method of biometric identification which is dated back to 2200 BC. The use of fingerprints as a personal code has a long tradition and was already used. This system focuses on the use of fingerprints for door opening and closing. The fingerprint recognition software enables fingerprints of valid users of the house to be enrolled in a database.

Before any user can enter the house, his/her fingerprint image is matched against the fingerprints in the database while users with no match in the database are prevented from entering. A microcontroller stores the data equivalent of fingerprint of the master user. Comparison between this enrolled fingerprint and the fingerprint of the person who is about to enter the house is done by the micro controller. If both the fingerprints are identical control circuitry of the microcontroller send appropriate signals to the motor relays operating the door of the house. If the fingerprints are not identical microcontroller sends signals to alarm circuitry to warn about an unauthorized use.

■ Advantages of fingerprint door Lock system :

- Security
- Highly accurate
- No risk of misplacing
- Cost effective
- User – friendly
- Difficulty in overriding
- Most economical technique
- It is unique and can never be the same for two persons.
- It is easy to use.

■ Disadvantages of fingerprint Door lock system :

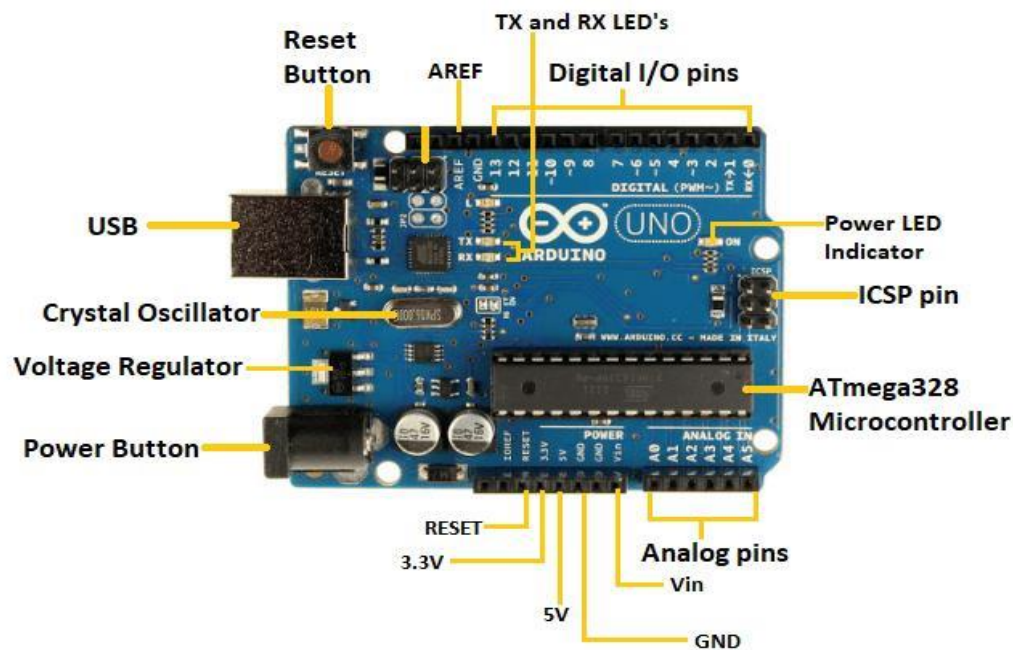
- Hard to install
- Difficult to change
- Power failure
- False positives are common
- Enroll everyone
- Expensive
- If function error occurs the fingerprint will not be scanned.

IV. Components required:

❖ ARDUINO Uno

The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.



✓ Technical specifications

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- UART: 1
- I2C: 1
- SPI: 1
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g
- ICSP Header: Yes
- Power Sources: DC Power Jack & USB Port

✓ General pin function

- LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.
- VIN: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 – 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- 3V3: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND: Ground pins.

- IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.
- Reset: Typically used to add a reset button to shields that block the one on the board.

✓ Special pin functions

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control (using `pinMode()`, `digitalWrite()`, and `digitalRead()` functions). They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e., 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the range using the AREF pin and the `analogReference()` function.

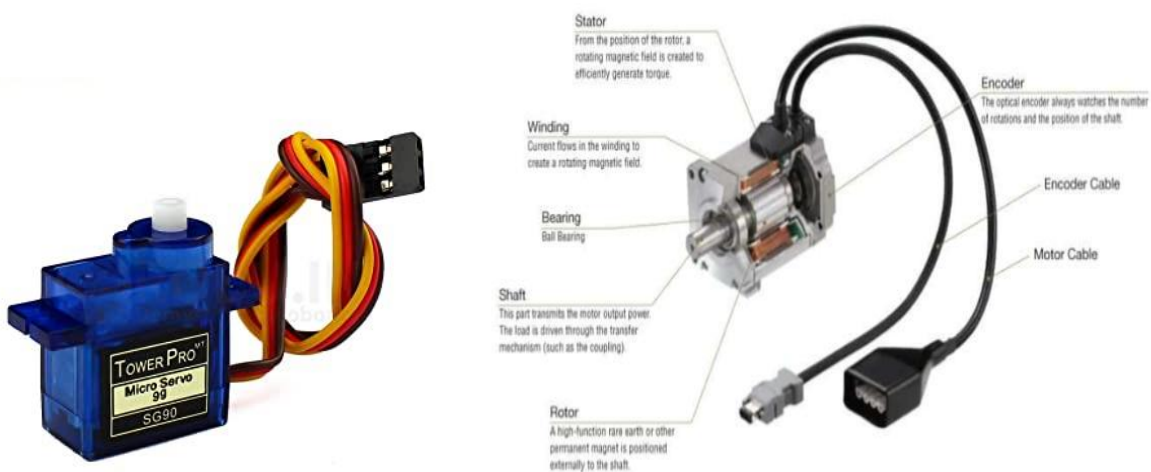
In addition, some pins have specialized functions:

- Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.
- External interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM (pulse-width modulation): pins 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the `analogWrite()` function.
- SPI (Serial Peripheral Interface): pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.
- TWI (two-wire interface) / I²C: pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.
- AREF (analog reference): Reference voltage for the analog inputs.

❖ Servo motor (modified)

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism. If motor is powered by a DC power supply, then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor. For this tutorial, we will be discussing only about the DC servo motor working. Apart from these major classifications, there are many other types of servo motors based on the type of gear arrangement and operating characteristics. A servo motor usually comes with a gear arrangement that allows us to get a very high torque servo motor in small and lightweight packages. Due to these features, they are being used in many applications like toy car, RC helicopters and planes, Robotics, etc.

Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.



✓ Servo Motor Working Mechanism

It consists of three parts:

1. Controlled device
2. Output sensor
3. Feedback system

It is a closed-loop system where it uses a positive feedback system to control motion and the final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

Here reference input signal is compared to the reference output signal and the third signal is produced by the feedback system. And this third signal acts as an input signal to the control the device. This signal is present as long as the feedback signal is generated or there is a difference between the reference input signal and reference output signal. So, the main task of servomechanism is to maintain the output of a system at the desired value at presence of noises.

✓ Servo Motor Working Principle

A servo consists of a Motor (DC or AC), a potentiometer, gear assembly, and a controlling circuit. First of all, we use gear assembly to reduce RPM and to increase torque of the motor. Say at initial position of servo motor shaft, the position of the potentiometer knob is such that there is no electrical signal generated at the output port of the potentiometer.

Now an electrical signal is given to another input terminal of the error detector amplifier. Now the difference between these two signals, one comes from the potentiometer and another comes from other sources, will be processed in a feedback mechanism and output will be provided in terms of error signal. This error signal acts as the input for motor and motor starts rotating. Now motor shaft is connected with the potentiometer and as the motor rotates so the potentiometer and it will generate a signal. So as the potentiometer's angular position changes, its output feedback signal changes. After sometime the position of potentiometer reaches at a position that the output of potentiometer is same as external signal provided. At this condition, there will be no output signal from the amplifier to the motor input as there is no difference between external applied signal and the signal generated at potentiometer, and in this situation motor stops rotating.

❖ Fingerprint scanner

R307 Fingerprint Module consists of optical fingerprint sensor, high-speed DSP processor, high-performance fingerprint alignment algorithm, high-capacity FLASH chips and other hardware and software composition, stable performance, simple structure, with fingerprint entry, image processing, fingerprint matching, search and template storage and other functions.

R307 is a finger print sensor module with TTL UART interface. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can directly interface with 3v3 Microcontroller. A level converter (like MAX232) is required for interfacing with PC.

✓ Features: -

- Supply voltage: DC 4.2 ~ 6.0V
- Supply current: Working current: 50mA (typical) Peak current: 80mA
- Fingerprint image input time: <0.3 seconds
- Window area: 14x18 mm
- Matching method: Comparison method (1: 1)
- Search method (1: N)
- Characteristic file: 256 bytes
- Template file: 512 bytes
- Storage capacity: 1000 pieces
- Security Level: Five (from low to high: 1,2,3,4,5)
- Fake rate (FAR): <0.001%
- Refusal rate (FRR): <1.0%
- Search time: <1.0 seconds (1: 1000 hours, mean value)
- Host interface: UART \ USB1.1
- Communication baud rate (UART): (9600xN) bps Where N = 1 ~ 12 (default N = 6, ie 57600bps)
- Working environment: Temperature: -20 °C - +40 °C Relative humidity: 40% RH-85% RH (no condensation)
- Storage environment: Temperature: -40 °C - +85 °C Relative humidity: <85% H (no condensation)



Front view of Fingerprint Scanner



Back view of fingerprint Scanner

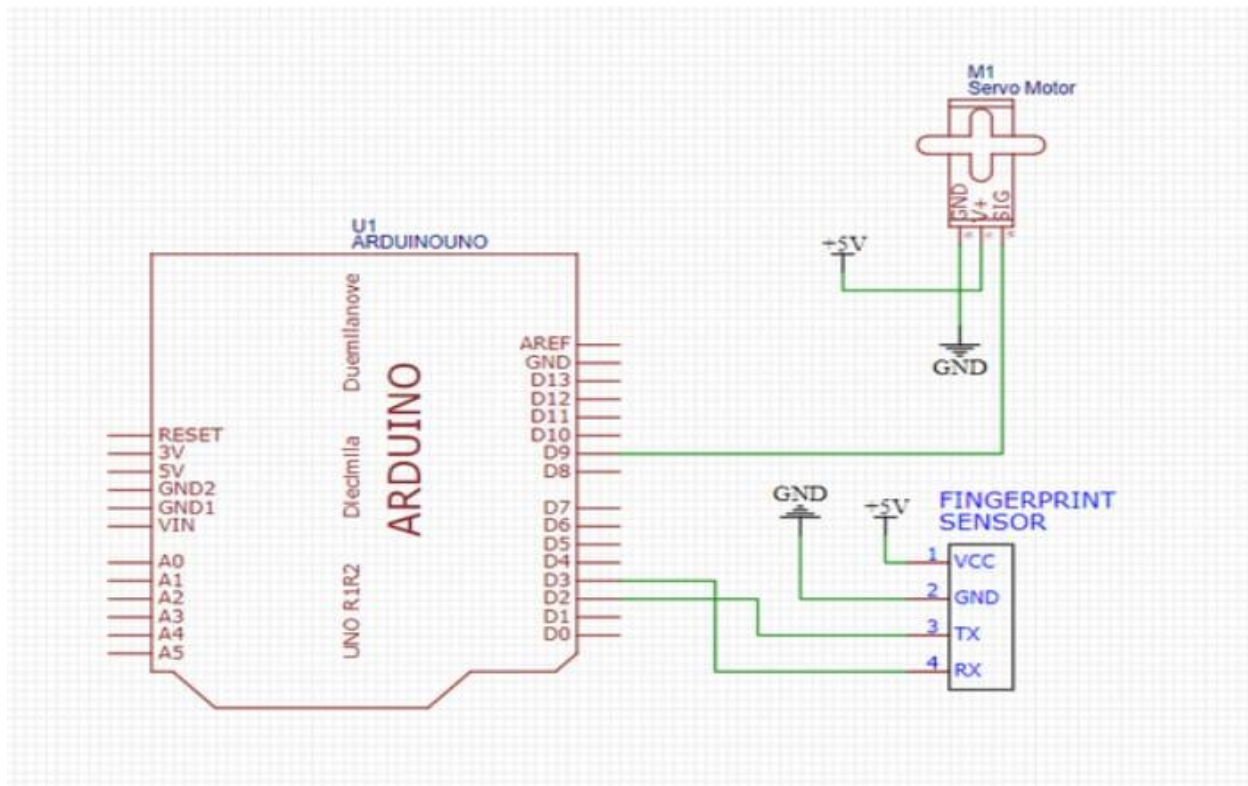
- ❖ 9-volt battery
- ❖ Some wires
- ❖ Wooden piece
- ❖ Latch

V. WORKING:

○ How do fingerprint door locks work?

Basically, fingerprint locks operate by scanning and converting our Fingerprint data into a numerical template. Once you place your finger onto the scanner for the first time, the conversion into numerical data takes place, and the fingerprint template is saved. This process is then repeated every time you want to grant someone Access.

The next time someone places his/her finger on the sensor, it matches the Data obtained through the finger with the pre-saved values. If a match is found, access is granted and the door opens. On the other Hand, if its someone else trying to get through, access not allowed and the Door remains locked.



VI. APPLICATION:

- Used in Banks and Offices to secure the vaults door or simply for residential houses door lock system.
- Fingerprint security system can be used in ATM, fingerprint operated Vehicle.
- Can be used for voter ID registration.
- Industrial Application: - “Fingerprint door lock system project” can be used by employees, staff or workers in various industries like Auto mobile industries, Manufacturing industries and Software development companies.
- Home or Domestic Application: - This project can be used to automate the door locking process at ours home, so the user needs not to carry door lock keys along with him/her. He/she can just use his/her finger print to open the door.
- Bank Lockers/Security Safes: - Many of the bank use key based or password-based locks for their lockers and safes. We can implement this fingerprint door lock system there.

VII. FUTURE USE:

- ✓ This project provides security.
- ✓ Used commonly available component.
- ✓ Circuit diagram is simple and easy.
- ✓ Easy to use and setup.

- ✓ Power consumption is less.
- ✓ Storage of up to 200 fingerprints.
- ✓ Generally, it is used in ATM, fingerprint car and home door lock etc. for security.

Advancements in biometric identification management technology are moving so fast, in future we will make advancement and multi functions like sms alert if authorized person try to lock the door. Image recognizing process system and password system based. Also, eyes retina for password which helps authorized persons for authentication for entrance so biometric technology makes individual convenient in real life.

VIII. Conclusion:

we have tried to solve the security matters in door locks by bringing the conceptions of biometric fingerprint with the door lock. For that purpose, we are using fingerprint as a rare key to implement device so as to lock or unlock a door lock. This project is going to implemented in multiple applications and this concept is still in use in the banks but those systems are specially built for those organizations to secure the whole organization and the assured will be very high and other companies and houses.

IX. Reference:

- “(PDF) Password Based Door Lock System Using
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