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Smart Door Lock using IoT

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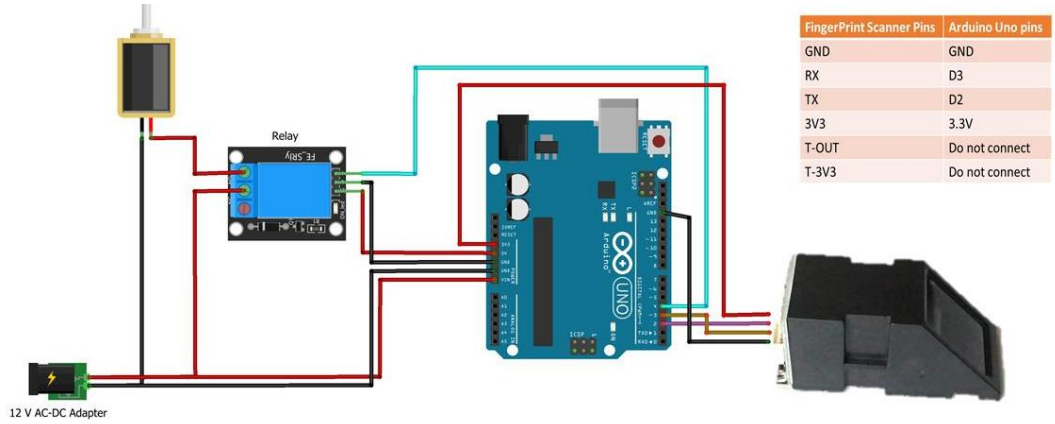
Abstract: *Along with products like Google Home and Alexa from Amazon, a smart lock is a new line of home security and the next step in building the smart homes of the future. In a nutshell, it's an electronic lock that you can remotely lock or unlock with your fingerprint or smartphone. By using a biometric system to secure your home, smart locks eliminate the need for physical keys, which are easily misplaced or forgotten. The goal of this project is to create a smart door lock with an Arduino and ESP32 module. It will also incorporate a fingerprint sensor to unlock the door lock and a camera that is integrated with the ESP32 to operate the door lock wirelessly. Power for the door lock will come from 12 Volt DC supply. The door lock is wirelessly controlled by Blynk application. This is smart and cost-effective approach to make a smart door lock system.*

Keywords: IOT, smart door lock, ESP32, Arduino, Home security

I. INTRODUCTION

Smart locks are IoT-enabled keyless entry devices that allow users remote access to door locks through theirsmartphone. Smart locks leverage IoT-enabled sensors to operate keyless entry devices that allow users to access doors remotely, through a smartphone or other internet-connected device. Smart locks provide users the ability to unlock their door without a key, from anywhere. Smart locks must be powered, many also allow a physical key to serve as a backup in case of a service or internet outage. Smart locks offer additional functionality through compatibility with other IoT devices, smart assistants, or smart home management systems.

According to our project, the solenoid lock system can be unlocked wirelessly via the Blynk app or biometrically. The ESP32 must be linked to a wi-fi network in order to operate the wireless system. The solenoid lock opens when the user presses the unlock button in the Blynk app because the ESP32 sends a signal to the lock. The fingerprint sensor can also be used to open the lock. The solenoid lock opens and the relay is activated when the user inserts their finger into the sensor and the database matches their fingerprint.



FingerPrint Scanner Pins	Arduino Uno pins
GND	GND
RX	D3
TX	D2
3V3	3.3V
T-OUT	Do not connect
T-3V3	Do not connect

Arduino Uno Developed by Arduino.cc, it is an open-source microcontroller board that was first made available in 2010 and is based on the Microchip ATmega328P microprocessor. A variety of expansion boards (shields) and other circuits can be interfaced with the board's sets of digital and analogue input/output (I/O) pins. The board can be programmed using the Arduino IDE and features 14 digital I/O pins, six of which may output PWM, and 6 analogue

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I/O pins.Although it supports voltages ranging from 7 to 20 volts, it can be powered by an external 9-volt battery or by the USB cable. It is comparable to the Leonardo and Arduino Nano. The Arduino website offers the hardware reference design for free under a Creative Commons Attribution Share-Alike 2.5 license. For certain hardware versions, layout and production files are also accessible.

ESP32 with cam ESP32 equipped with a camera A line of inexpensive, low-power system-on-a-chip microcontrollers with built-in Wi-Fi and dual-mode Bluetooth is called ESP32. With integrated antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, and power-management modules, the ESP32 series uses either a Tensilica Xtensa LX6 microprocessor in dual-core and single-core variants, an Xtensa LX7 dual-core microprocessor, or a single-core RISCV microprocessor. TSMC uses their 40 nm technology to build the ESP32, which was designed and built by the Chinese company Espressif Systems, based in Shanghai. It is the ESP8266 microcontroller's replacement.

II. FINGERPRINT SENSOR (R307)

The R307 Fingerprint Module comprises an optical fingerprint sensor, a high-speed DSP processor, a high-performance fingerprint alignment algorithm, high-capacity FLASH chips, and other hardware and software components. It exhibits stable performance and a straightforward structure, offering functions such as fingerprint entry, image processing, fingerprint matching, searching, and template storage.

III. SOLENOID LOCK

A latch for electrical locking and unlocking is indicated by a solenoid lock. It can be utilised selectively depending on the situation and is available for both locking and keeping in the power-on mode type and unlocking in the power-on mode type. Unlocking is only possible using the power-on unlocking type when the solenoid is powered on.

Blynk Application Blynk is a full suite of software required to prototype, deploy, and remotely manage connected electronic devices at any scale: from personal IoT projects to millions of commercial connected products. With Blynk anyone can connect their hardware to the cloud and build a no-code iOS, Android, and web applications to analyse real-time and historical data coming from devices, control them remotely from anywhere in the world, receive important notifications, and much more

Relay is an electro-mechanical device which acts as a switch. DC electrical current is used to energize the relay coil which opens or closes the contact switches. Internal circuit of a single channel 5V relay consists of normally open contacts, normally closed contacts and a coil.

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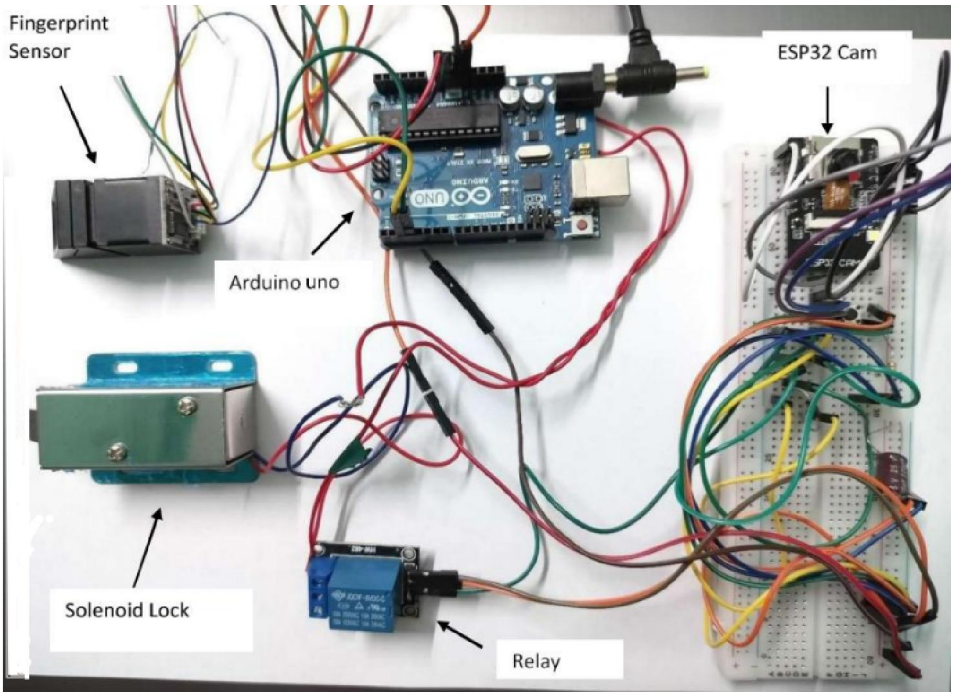

Fig. 1. A prototype of the proposed system

Step by step operation of the prototype

1. Connect the 12 V supply and via adapter. Switch on theArduino by connecting the pin of adapter to board.
2. Now we will load the fingerprints on the fingerprint sensor and load it to the fingerprint enrolment code on the laptop.
3. We are now connecting the circuit and here the black wire of fingerprint sensor (5V VCC Pin) is connected to VIN pin on the Arduino. Now connect the brown wire of fingerprint sensor to the ground pin of Arduino, white wire to pin 2 and yellow wire to digital pin 3 of Arduino, respectively. Now we will connect the relay whose VCC is connected to the 5V. The ground pin of relay will be connected to the ground pin of Arduino, And the signal pin will be connected to the 12 no pin of Arduino. Now the fingerprint is loaded on the fingerprint sensor via the program.
4. The solenoid red wire will be connected to the common pin on the Arduino. After the whole circuit is completed, we place the smart lock on the door and now we will give our fingerprint on the sensor which will get checked with the previously enrolled fingerprints and if it matches any of it, the door is unlocked.
5. We also have a camera module (ESP32) with our circuit to detect anyone through the camera. The camera module is operated by the Blynk application where we can capture the picture or video of the person currently standing outside the door.

IV. CONCLUSION

1. Smart locks are compatible with other smart devices, which can provide implementation of a smart home
2. Users can ensure the safety of their residences, even when not present there physically.
3. Authorization access can be given or revoked to visitors and service providers for particular time or permanently.
4. Notification of door unlocking is sent for user to verify its them.

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V. FUTURE SCOPE

Artificial intelligence and RFID technology can also be added to this project to identify the user and unlock the door without using their hands.There are fascinating potential applications of AI in door security and locks in the future, such as being able to determine the frequency of door entry, the time of day, and the typical user behaviour. This kind of technology can significantly contribute to the intelligent, hassle-free security of your house or place of business.

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