DOOR LOCK SYSTEM USING ESP32 CAM

ECB4243 DESIGN PROJECT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report **"DOOR LOCK SYSTEM USING ESP32 CAM "** is the bonafied work of **O. REDDY RAGHAVENDRA (20121002), B. DHARAN (20121024),** who carried out the project work under my supervision during the academic year **2021-2022.**

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ABSTRACT

The Project reported here in and titled as “Design & Implementation of an IoT Networked Contactless Doorway Security System for Remote Monitoring and Control using ESP32- CAM and a Cloud Server”. People want security in everyplace possible when they are into their homes or away from their homes. An anti-theft system is a device or method used to prevent or deter the unauthorized intrusion or trespassing activity in its coverage area. The implemented system was developed in combination of hardware and software. It's a unique security system made with low cost wireless camera and sensors which ensured remote monitoring and control of doorways. The system empowered the user to monitor the doorway by capturing images using a high performance wireless camera i.e. ESP32-CAM connecting other devices and sensors in an IoT network. A major challenge was to develop this dynamic system with zero error, Realtime response and smooth performance, viable, smart and feasible.

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1 .INTRODUCTION

The research work carried out here provided an insight into the development of IoT systems. The research area of the Internet of Things in recent years has experienced growth and development in an interdisciplinary manner. IoT is the inter-networking of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The traditional fields of embedded system, wireless sensor networks, control system, automation systems are together interconnected to form the IoT. That means the internet of things builds over the revolutionary success of mobile and internet network.

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2.BLOCK DIAGRAM AND DESCRIPTION

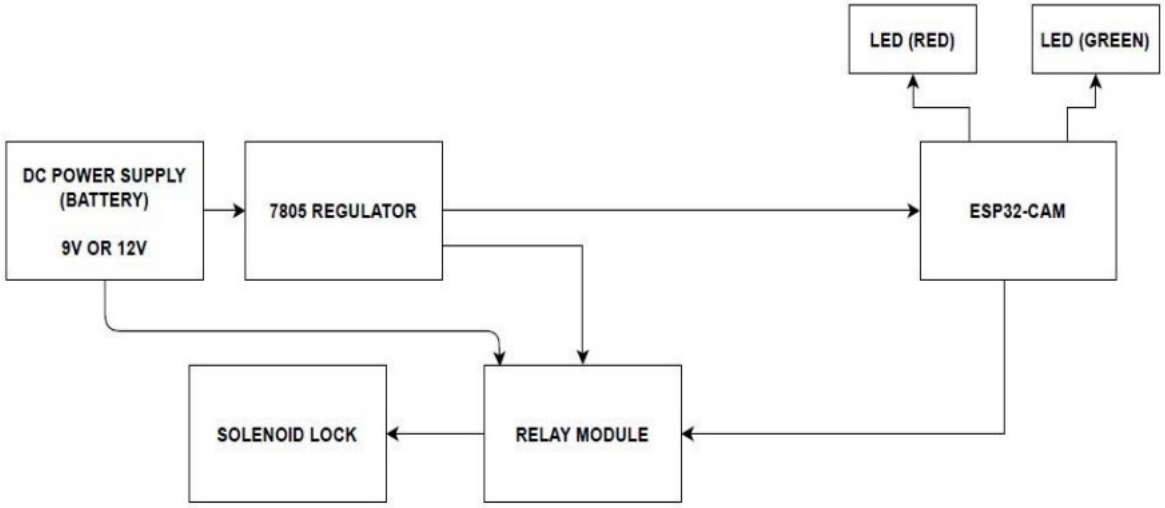


FIG.1 BLOCK DIAGRAM OF DOOR LOCK SYSTEM

2.BLOCK DIAGRAM DESCRIPTION

The above figure shows the complete circuit diagram of face detection include the few components like solenoid lock,12v power supply, 7805 regulator, ESP-32 CAM, relay module and LEDs. Initially the solenoid lock is powered with the 12v power supply through the relay module and all other components are powered with the 5v and 3.3v power supply. With the help of power regulator, we converting the 12v to 5v supply. Here the ESP32-CAM was powered with the 5v supply but we have the option in that we can either choose 5v or 3.3v in the module. Here green LEDs and red LEDs are connected with the ESP32-CAM that used to detect wright and wrong faces of the person.

OBJECTIVE

The aim of this work was to achieve a versatile, viable, low power doorway security solution with real-time response. The system developed should be integrated with IoT network and cloud computing. The objective was to

develop a dynamic wireless doorway security system which empowers the user to acquire visitor's photo identity and take an informed decision for giving that person access into his/ her premises. Also, the data collected by the cloud server could be retrieved if required for some investigation purpose. The developed system should be user friendly and feasible.

4.CIRCUIT DIAGRAM

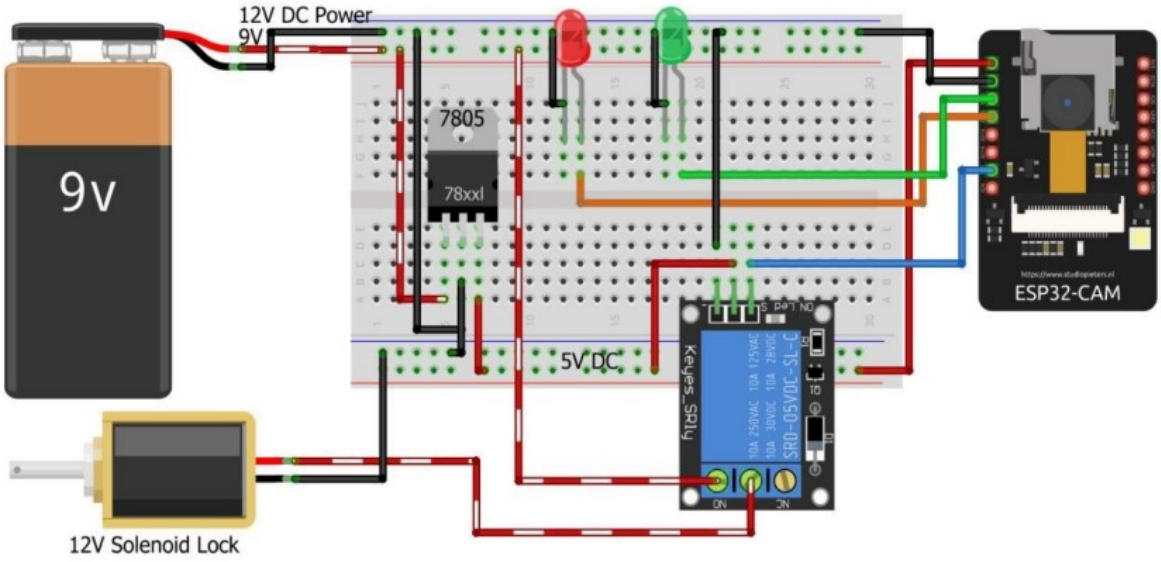


FIG 2. CIRCUIT DIAGRAM

5.COMPONENTS REQUIRED

COMPONENTS	SPECIFICATION	QUANTITY
LED'S	RED &GREEN	2
BUZZER	-	1
UART TTL MODULE	-	1
ESP32 CAMERA	Atmel	1
RELAY MODULE	Two Channel	1
CAPACITOR	100uF	1
RESISTOR	10k ohms	1
BATTERY	9volts	1
BREAD BOARD	-	1
JUMPER WIRES	-	FEW
VOLTAGE REGULATOR	7805	1

6. ESP 32 CAMERA

The ESP32-CAM is a full-featured microcontroller that also has an integrated video camera and microSD card socket. It‟s inexpensive and easy to use, and is perfect for IoT devices requiring a camera with advanced functions like image tracking and recognition. The sample software distributed by Espressif includes a sketch that allows you to build a web-based camera with a sophisticated control panel. After you get the hang of programming the device, you'll find that it is very easy to use. The ESP32-CAM module has fewer I/O pins than the previous ESP-32 module we looked at. Many of the GPIO pins are used internally for the camera and the microSD card port. Another thing missing from the ESP32-CAM module is a USB port. In order to program this device, you'll need to make use of an FTDI adapter. One thing to note about this module is that it has components on both sides of the printed circuit board. The "top" of the board has the connector for the camera module, as well as the microSD (sometimes called "TF") card socket.

Figure 1: ESP32-CAM

You'll also note a square white LED on the top of the module, this can act as a "flash" for illuminating the subject you are trying to view with the camera. The underside of the circuit board has the ESP32-S module.

It also has a connector for an external antenna, as well as an internal antenna that is etched onto the circuit board. I'll explain how to use the external antenna shortly. Another key component located underneath the board is the reset switch.

ESP32-CAM Specifications The ESP32-CAM is based upon the ESP32-S module, so it shares the same specifications. It has the following features:

- 802.11b/g/n Wi-Fi
- Bluetooth 4.2 with BLE
- UART, SPI, I2C and PWM interfaces
- Clock speed up to 160 MHz
- Computing power up to 600 DMIPS
- 520 KB SRAM plus 4 MB PSRAM
- Supports Wi-Fi Image Upload
- Multiple Sleep modes
- Firmware Over the Air (FOTA) upgrades possible
- 9 GPIO ports
- Built-in Flash LED

7. RELAY MODULE

The Single Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, PIC and etc.
Product Features:

The relays terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay.

FIG.2 RELAY MODULE

8.SOLENOID LOCK

The solenoid lock denotes a latch for electrical locking and unlocking. It is available in unlocking in the power-on mode type, and locking and keeping in the power-on mode type, which can be used selectively for situations. The power-on unlocking type enables unlocking only while the solenoid is powered on. A door with this type is locked and not opened in case of power failure or wire disconnection, ensuring excellent safety. This type is used mainly for places requiring crime prevention. The power-on locking type can lock a door while the solenoid is powered on. If the power is disconnected, the door is unlocked. This type unlocks the door in case of wire disconnection due to a fire or accident, and it is used for emergency exits through which firefighting activity or evacuation should preferentially be made rather than safety for crime prevent

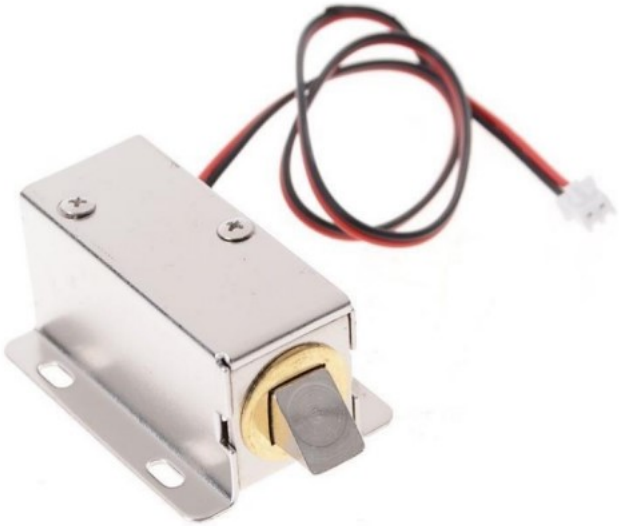


Figure 3: Solenoid Lock:

The keeping type performs two operations, locking and unlocking by applying a positive or negative pulse voltage to the solenoid, and keeps the no-power state in each position. This type features energy saving because it is unnecessary to always power the solenoid on. For the continuous rating and the intermittent rating, the continuous rating is designed to be able to feed a rated voltage power continuously for hours without exceeding a specified temperature rise limit, and the intermittent rating is designed to be able to feed a specified voltage only for a specified time duration without exceeding a specified temperature rise limit.

9. VOLTAGE REGULATOR

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So, our 7805 will provide a +5V output voltage. The output current of this IC can go up to 1.5A. But the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current.

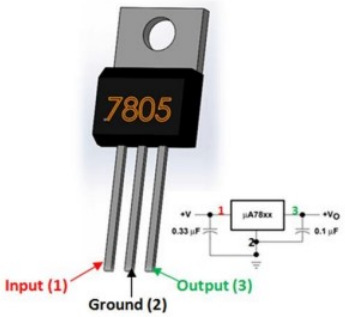


Figure 4: Voltage Regulator

For example, the input voltage is 12V and you are consuming 1A, then (12-5) * 1 = 7W. This 7 Watts will be dissipated as heat.

10.CAPACITOR

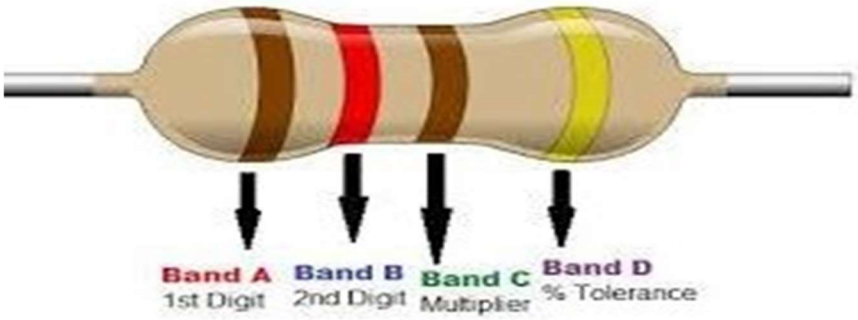
A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance.

11. RESISTOR

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.



12.Battery

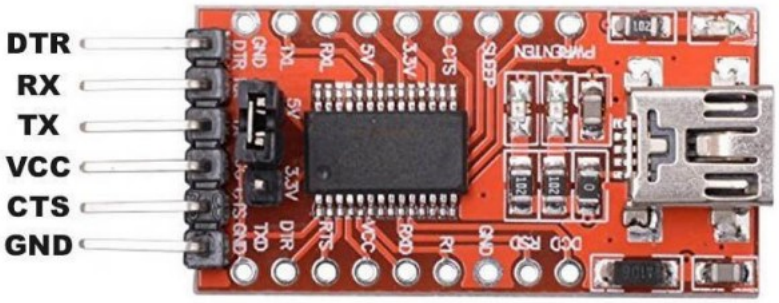
A battery is an energy source consisting of one or more electrochemical cells and terminals on both ends called an anode (-) and a cathode (+). Electrochemical cells transform
chemical energy into electrical energy. Inside the battery is an electrolyte, often consisting of soluble salts or acids, it serves as a

conductive medium, allowing the electric charge to travel through the battery.

When a battery is disconnected, the charge at the positive and negative ends is equal, meaning there is no electric current. When connected to an outside resistance or device, the battery experiences an imbalance in charge that pushes electrons through the device's conductive material to the positive end of the battery. But while the electrons—or the negative charge—are what moves through the circuit, the electric current is measured following the positive charge's direction, which flows from the positive to the negative end inside the battery, and vice versa outside it. Depending on its voltage and load, a single battery can power anything from a car's motor or a computer to a cellphone or a light bulb.

13.UART TTL MODULE

Original FT232R chips are one of the newer chips manufactured by FTDI (Future Technology Devices International). Apart from being an USB to serial UART, it has an integrated EEPROM and optional clock generator output. The chip also incorporates FTDIChip-ID functionality (giving each chip a unique identifier for security) and USB termination resistors. Cloned boards (with a cloned chip) will likely exclude the unique ID functionality and does not include an EEPROM, meaning that signals cannot be inverted. The internal clock (6MHz, 12MHz, 24MHz and 48MHz) can be brought out of the device and used to drive a microcontroller or external logic.



The module has a mini-B USB port which is used to connect to an USB port of an interfaced device (e.g. a PC). On the other side, the FTDI USB to TTL serial converter module has breakout pins (Tx, Rx, Vc and GND) that is connected to a microcontroller's corresponding pins. Communication takes place using TTL (transistor-transistor logic). It has a 3.3/5V DC jumper and will supply 500 mA through its Vc pin.

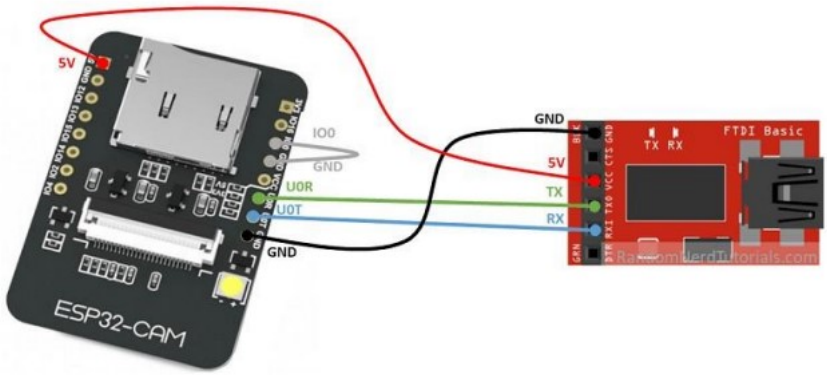
WORKING PRINCIPLE

PHASE-I: SETTING UP WITH ESP-CAM 32

Using the ESP32-CAM is similar to using the ESP32 modules we looked at previously, with one major difference. The ESP32-CAM board has no USB port, so you can‟t just connect it up to your computer and start loading programs. Instead you will need to add an external FTDI adapter. This is the same adapter you would use programming an Arduino Pro Mini, so if you‟ve worked with the Pro Mini then you probably already have one of these

Hooking up the FTDI Adapter

Here is the hook up diagram for connecting the FTDI adapter to the ESP32-CAM module: It is important to note that the FTDI adapter must be set for a 3.3-volt VCC output, not 5- volts, as we are powering the ESP32-CAM using the 3.3-volt power pin. You could also keep the FTDI adapter at 5-volts and use the 5-volt power pin instead. I have found the 3.3-volt set up to be more reliable, which is why I am recommending it.



You‟ll also need to note that there is a connection between the GPIO 0 pin and Ground. This connection is only required while you are programming the ESP32CAM. Once you have finished programming the module you can power it down and remove this connection. As you‟ll require access to the Reset push button you may want to use female-tofemale Dupont jumpers, instead of a solderless breadboard, when working with the ESP32-CAM

14.LED’S

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.

15.BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

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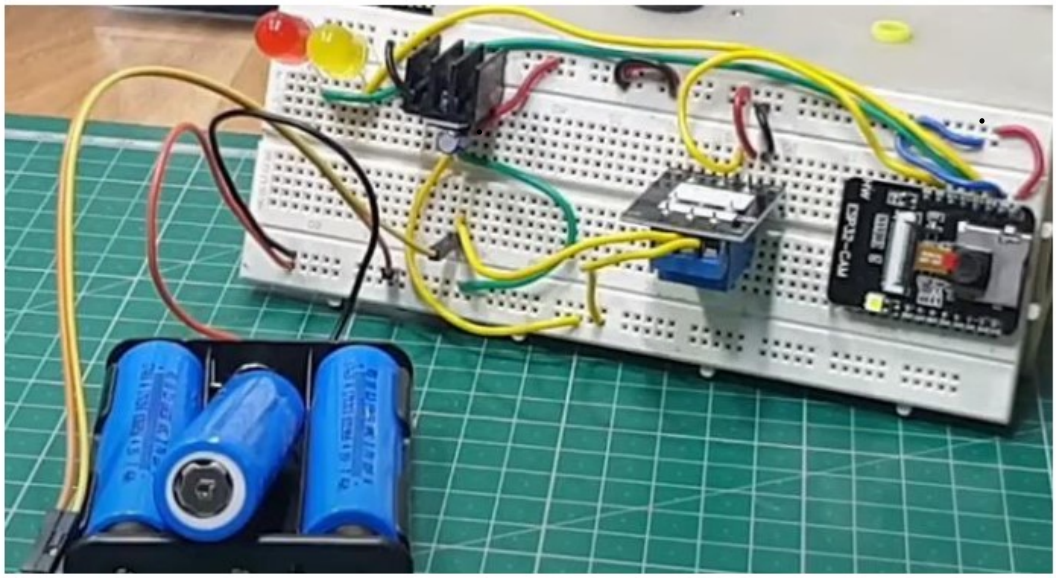
16. BREAD BOARD

Breadboards enables you to connect electronic components in thousands of ways to produce working circuits without soldering or damaging your circuit board — and you don't need additional tools

OVERALL CIRCUIT DIAGRAM



17.MERITS

- We can able to monitor using our camera
- It allows only the authorized persons in to it
- Power consumption is very less

18.DEMERITS

- Less secure.
- The lock base cannot bear more stress

19.CONCLUSION

By the end of successful completion of this work it was concluded that through IoT we can connect multiple input/ output devices, multiple sensors and actuators in a network so that they can talk to each other, data acquired from these things can be used to keep a log or monitor or control the other things without human intervention and much more. Thus, IoT is like global networks which give the communication between things to things, human to things and human to human. IoT is the development of existing internet facility to manage everything which exists in the world or exists in the future. As per this work, surveillance is the procedure of close deliberate perception or supervision kept up over an individual, gathering, and so forth particularly one in care or under doubt. For the above-mentioned purposes, I developed here a system which was equipped with sensor, camera, processor, relays, buzzer, LED indicators and actuators as per the application requirements. The system worked well in the local environment and responded well as per the expectations.

20.REFERENCES

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