

IoT based Door Access Control System using ESP32cam

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ABSTRACT:

The home security system has become very important for each house. Previously, most doors are open by victimization ancient ways, resembling keys, security cards, Arcanum or pattern. However, incidents such as a key loss has crystal rectifier to a lot of worrying cases such as theft and identity fraud. This has become a major issue. during this paper we've got given a wise Wi-Fi Door Lock mistreatment the ESP32 CAM associate degreed wire app. during this easy operating model, once someone is detected by a PIR motion sensing element an ESP32CAM captures the face then telegram sends the notifications on phone, so the owner offers unlock/lock commands within the telegram. It mechanically responds to it command. Mainly, this project is for security purpose reception and industries. Anyone these days cares about security, whether or not it's information security or the protection of their own home. Digital door locks have mature quite prevailing in recent years as technology has advanced and therefore the use of IOT has increased. A digital lock doesn't need a physical key to operate, instead counting on Radio-Frequency Identification (RFID), fingerprint, Face ID, pins, passwords, and alternative strategies to try to do so.

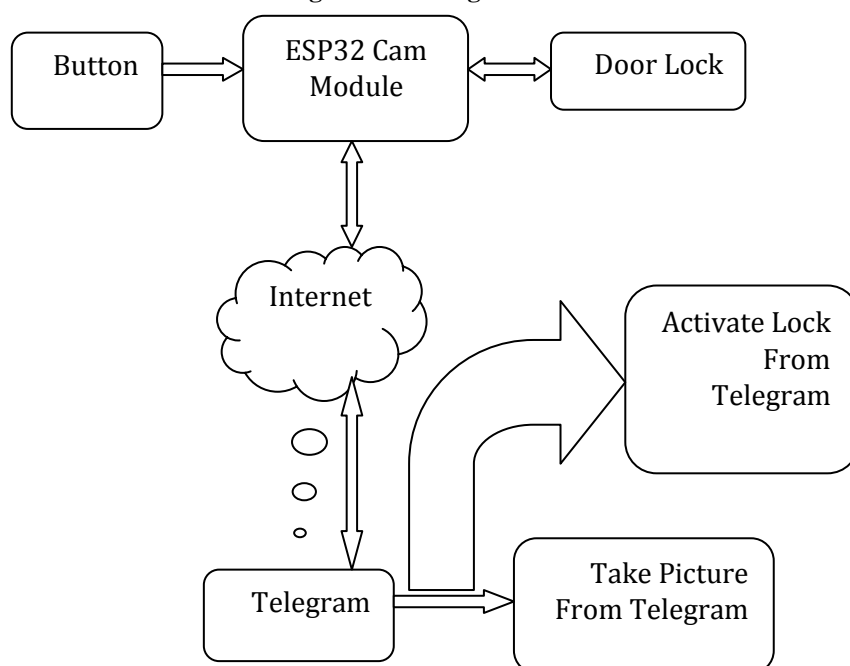
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I. INTRODUCTION

Door plays a vital role in home security. To secure the house, occupants of the house can continuously have the door Locked. However, generally the house occupants forgot to lock the door because of hurry once going the house, or they will doubt whether or not they have secured the door or not. We propose a Project referred to as Door Security System that is predicated on mechanical man victimization Internet of Things (IOT) technology to watch the standing of the Door, dominant the Door and increase security in an exceedingly house. A door is one amongst the defense options to keep up physical security of the house.

Fig. 1 Block Diagram



If the door of the house is often opened simply, an outlaw can easily enter and steal the contents of the house. At first, a door solely incorporated a physical key to lock or unlock the door however then, with the advancement of technology, an additional trendy door has been innovated, specifically the digital door which will lock or unlock doors while not requiring any physical Key. In this paper, we've given a wise Wi-Fi Door Lock mistreatment the ESP32 CAM and therefore the wire App. during this straightforward operating model, once an individual hits the doorbell, the owner receives a notification on his/her phone with a photograph of that person. The owner also can unlock the door from a transportable when checking the photo. The aim of the project is dominant the Door and increase Security in an exceedingly House. Face recognition are utilized in Smartphone in past few years. It's a cool technology wherever we are able to unlock mobile phones or to access any application that needs high security. With ESP-32 CAM, we can attempt develop an easy project that uses your face as ID. Since ESP32 board already comes with Camera internet Server example code that caters for video stream .So this can be a simple however terribly helpful home automation project exploitation esp-32 camera module.

II. Hardware implementation

A. ESP32-CAM

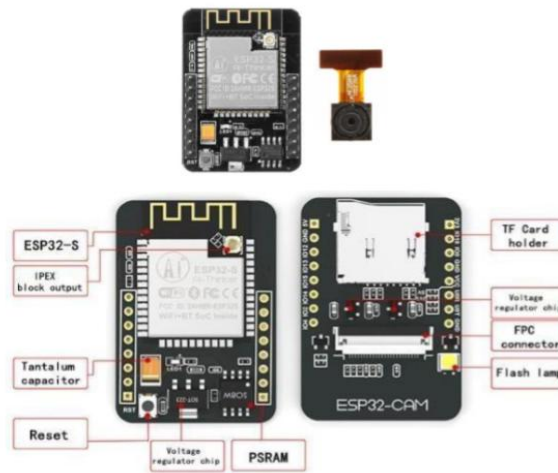


Fig 2: ESP32 CAM

The ESP32-CAM could be a small size, low power consumption camera module supported ESP32. It comes with an OV2640 camera and provides aboard TF card slot. The ESP32-CAM will be wide employed in intelligent IoT applications like wireless video monitoring, Wi-Fi image upload, QR identification, and then on. The ESP32 CAM Wi-Fi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition encompasses a terribly competitive small-size camera module which will operate severally as a minimum system with a footprint of solely forty x twenty seven mm; a deep sleep current of up to 6mA and is widely used in numerous IoT applications.

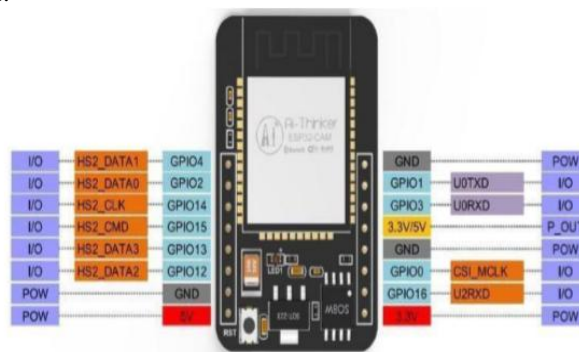


Fig 3: pin diagram of ESP32 Microcontroller

It is appropriate for home sensible devices, industrial wireless control, wireless monitoring, and alternative IoT

applications. This module adopts a DIP package and may be directly inserted into the backplane to appreciate fast production of products, providing customers with high-reliability association mode that is convenient for application in varied IoT hardware terminals. Second sight integrates Wi-Fi, ancient Bluetooth, and BLE Beacon, with a pair of superior 32-bit LX6 CPUs, 7-stage pipeline architecture. it's the most frequency adjustment vary of 80MHz to 240MHz, on-chip sensor, Hall sensor, temperature sensor, and so on

B. SOLENOID LOCK



Fig 4: Solenoid Lock

A coil lock works on the electronic-mechanical lockup mechanism. This kind of lock includes a slug with a slanted cut and a decent mounting bracket. Once the ability is applied, DC creates a magnetic flux that moves the slug within and keeps the door within the unsecured position. The slug can retain its position till the power is removed. Once the power is disconnected, the slug moves outside and locks the door. It doesn't use any power in an exceedingly locked state. To drive the magnet lock, you'd want an influence supply that may offer 12V @ 500mA. Magnet Door Lock Mechanism represents a system supported solenoid lock with latch for electrical protection and unlocking. A solenoid door lock could be a primary door locking appliance that latches or unbars using a magnetic attraction solenoid. It's offered in unlocking within the power-on mode kind and locking and keeping in the power-on mode type, which may be used by selection for situations.

C. PIR MOTION SENSOR

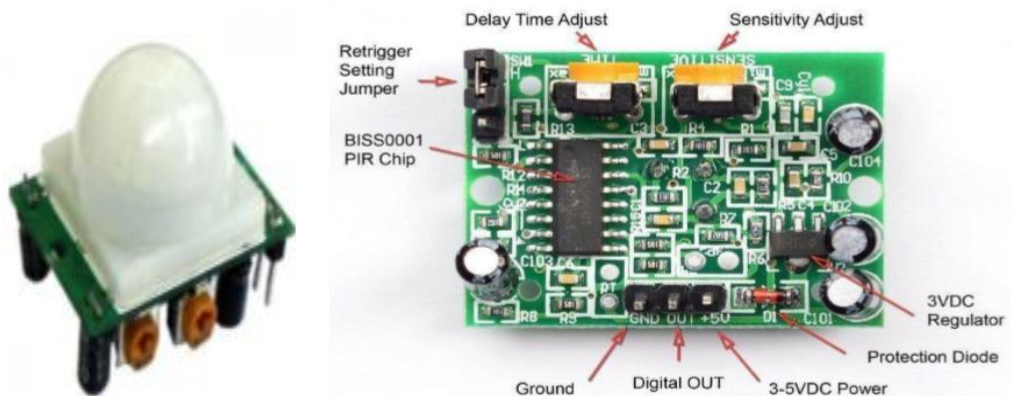


Fig 5: PIR sensor

Passive infrared (PIR) detectors use a combine of electrical phenomenon sensors to notice energy within the close environment. These two sensors sit beside every other, associated once the signal differential between the 2 sensors changes (if someone enters the room, for example), the sensor will engage. That will mean it triggers an alarm, notifies authorities, or even activates a floodlight. IR radiation focuses on every of the 2 electrical phenomenon sensing elements employing a series of lenses made because the sensor's housing. These lenses widen the device's sensing area. Whereas the lens setup and sensor physical science are subtle technology, these

units are simple to use in an exceedingly sensible application. You simply want power and ground for the sensor to provide a discreet output that's robust enough for a microcontroller to use. Typical changes embrace adding potentiometers for sensitivity and tweaking however long a PIR stays engaged once it's triggered. A passive infrared sensing element (PIR sensor) is AN electronic sensor that measures infrared (IR) lightweight diverging from objects in its field of view. They're most frequently employed in PIR based motion detectors. PIR sensors are normally used in security alarms and automatic lighting applications. PIR sensors are used in thermal sensing applications, resembling security and motion detection. They're commonly used in security alarms, motion detection alarms, and automatic lighting applications.

D. CARBON MONOXIDE GAS SENSOR (MQ-7)

MQ-7 could be a CO (CO) sensing element, appropriate for sensing CO concentrations (PPM) within the air. The MQ-7 sensor will live CO concentrations starting from twenty to 2000ppm. This sensor includes a high sensitivity and quick response time. The sensor' output is an analog resistance. The drive circuit is extremely easy , simply a voltage divider; all you would like to try to do is power the heater coil with 5V DC or AC , add a load resistance, and connect the output to an ADC or a simple OPAMP comparator. MQ7 may be a carbon monoxide gas (CO) device, appropriate for sensing carbon monoxide gas concentrations (PPM) within the air. MQ7 Gas sensor will live CO concentrations starting from twenty to 2000 ppm. This sensor features a high sensitivity and quick response time. The sensor' output is an analog resistance. This sensor comes during a package kind of like MQ3 alcohol sensor. MQ7 gas sensor has high sensitivity to Carbon Monoxide. The sensor may well be wont to sight different gases contains CO; it's with low price and suitable for various application. They're utilized in gas detection instrumentation for carbon monoxide (CO) in family and business or car.



FIG 6: MQ7 GAS SENSOR

III. Circuit Design And Implementation

The idea of Wi-Fi door lock exploitation ESP32 CAM has recently become a crucial subject in home appliances. Security could be a high priority for everybody nowadays, whether or not it' information security or personal security. Digital door locks have full-grown quite current in recent years as technology has advanced and also the use of IoT has increased. A digital lock doesn't need a physical key to operate; instead depends on RFID, fingerprint, Face ID, pins, passwords, and different ways to try to do so. Using these numerous technologies, researchers have antecedently designed variety of digital door lock applications. We tend to use the ESP32 CAM to make a Wi-Fi Door Lock system during this project. The AI-Thinker ESP32 CAM module could be a low-priced development board with a micro-SD card port and a little OV2640 camera. It contains an inbuilt Wi-Fi and Bluetooth chip, further as 2 superior 32-bit LX6 CPUs and 7-stage pipeline architecture. Existing models explained ESP32 CAM full and incontestable a way to use it to create a Wi-Fi Video Doorbell. Using the ESP32 CAM and Telegram, we tend to produce a Face Recognition-based Door Lock System with a Relay module and coil Lock.

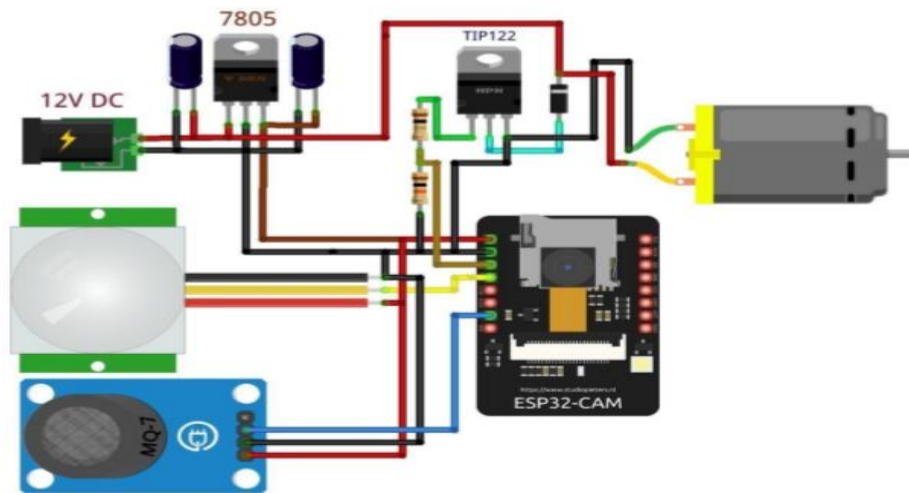


Fig 7: Schematic Diagram of Circuit

From the pilot research, an entire image specification is made and considered. The protection issues and also the common design of IoT systems are taken into consideration whereas creating style decisions. an appropriate microcontroller to serve the SDL' practicality, wireless devices sending never-ending radio radiation which will be detected by sensible devices (e.g., Smartphone's) via a connective protocol (e.g., Bluetooth), a cloud to assist in secure and stable communication, and an API to handle the SDL' functionality were among the preferences. Wi-Fi Door Lock with ESP32 CAM uses net of Things (IoT) technology to watch the standing of the door, management it, associate degreed improve home security. Wire is a communication protocol that is used to increase the security of a home. Wire is a communication protocol that connects a Smartphone to a door lock system. The epitome is designed victimization an unvarying method that matches the style specifications throughout the development and implementation phase. We are able to produce and check in continuation sequences by breaking down the planning into very little bits. New options are often developed and evaluated in every iteration till we've got a completely practical system that meets the thesis' goals.

IV. Results

The picture below is to represent the results of this work. During this IOT primarily based operating model, we've created a sensible WLAN door lock victimization ESP32-CAM and also the wire App.

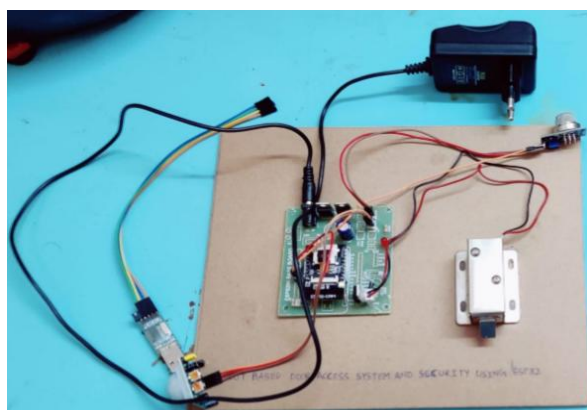


Fig 8: Circuit connections of IOT based door access control system using ESP32CAM

During this model, once somebody presses the doorbell, the house owner can get a notification on the mobile with a photograph of the visitor. When checking the photo, owner will unlock the door from an each mobile phone.



Fig 10: PIR Motion Sensor

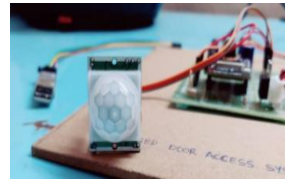


Fig 9: MQ7 Gas Sensor

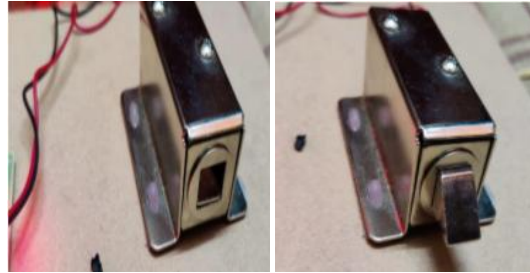


Fig 11: Unlocking and locking mechanism of Solenoid lock

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ESP32 Telegram
1 #include <Arduino.h>
2 #include <WiFi.h>
3 #include <WiFiClientSecure.h>
4 #include <soc/rtc.h>
5 #include <soc/rtc_cntl_reg.h>
6 #include <esp_camera.h>
7 #include <UniversalTelegramBot.h>
8 #include <ArduinoJson.h>
9 #include <SPIFFS.h>
10 #include <ESP32_MailClient.h>
11 #include <FS.h>
12 #include <SPIFFS.h>
13
14 const char* ssid = "Mirtal Fiber"; //WiFi SSID
15 const char* password = "Fiber@1509"; //WiFi Password;
16
17 #define CHAT_ID = "931099801"

```

Sketch uses 112974 bytes (35%) of program storage space. Maximum is 3145728 bytes.
Global variables use 45216 bytes (13%) of dynamic memory, leaving 282464 bytes for local variables. Maximum is 327680 bytes.

Fig 12: Code compilation in Arduino IDE



Fig 14: Notifications on Telegram app



Fig 13: Commands on Telegram app

V. Conclusion

We with success designed associate degree IoT-based Wi-Fi door lock security system mistreatment the ESP32Cam to observe the standing of the door and boost the house security. The communication protocol wire is employed between the sensible phone and therefore the door lock system. During this circumstance, thanks to the present COVID scenario, the smart lockup door system is sort of necessary and applying this Wi-Fi-based door lock system while not using our hands is essential. A real time speaking assistant is deployed to form the system a lot of user-friendly Associate in nursing efficient. Extremely secure protocols resembling TLS can be deployed to make sure there's no security breach. exploitation raspberry pi this project can be changed by an Infrared camera interfacing it can be utilized in sensible police investigation watching security system that any style of security is using Living body detection or spying.

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