

IoT BASED FACE RECOGNITION BASED DOOR LOCK CONTROLLING SYSTEM

¹Dr.A.Maheswara Reddy, ²V.Nandini, ³G.Madhav Krishna, ⁴P.Kavya Sri, ⁵J.Prem Chandh, ⁶V.Jyothika

¹ Professor, Department of Electronics and Communication Engineering, Visvodaya Engineering College, Kavali, Andhra Pradesh, India.

^{2,3,4,5,6} Student, Department of Electronics and Communication Engineering, Visvodaya Engineering College, Kavali, Andhra Pradesh, India.

ABSTRACT

Security is at most concern for anyone nowadays, whether it's data security or security of their own home. With the advancement of technology and the increasing use of IoT, digital door locks have become very common these days. Digital lock doesn't require any physical key but it uses RFID, fingerprint, Face ID, pin, passwords, etc. to control the door lock. In past, we have developed many digital door locks applications using these various technologies. In this project we will build a Face reorganization system using ESP32-CAM. The AI-Thinker ESP32-CAM module is a low-cost development board with a very small size OV2640 camera and a micro-SD card slot. It has an ESP32 S chip with built-in Wi-Fi and Bluetooth connectivity, with 2 high-performance 32-bit LX6 CPUs, 7-stage pipeline architecture. We will use the ESP32-CAM to build a Face Recognition based Door Lock System using a servo motor for locking and unlocking the door. Not only that it can be monitored by the mobile and can grant the permission to access the door. It also enabled with notification when someone is detected by the system and alerts to the owner.

Keywords: Blynk, Door lock, ESP32-CAM, Face recognition, IoT, Security, Mobile.

INTRODUCTION

In these modern times, home security is the need for the development of society as a whole which in turn will help make our cities smart, so the concept of facial recognition to gain access of the house is an idea which is used to make our place of living more secure. A facial recognition system is a system which captures facial images and verifies the identity of a person using a digital camera. The human face assumes an essential part in our social association, passing on individuals' character. Utilizing the human face as a key to security, biometric confront acknowledgment innovation has gotten tremendous consideration in the previous quite a while because of its potential for a wide assortment of utilizations.

Human beings are recognized by their distinctive facial characteristics. In the face recognition approach, a given face is compared with the faces stored in the database in order to identify the person. The aim is to search out a face in the database, which has the highest similarity with the given face. In the field of bio science, face recognition technology is one among the fastest growing fields. The need of face recognition in security systems is attributed to the rise of commercial interest and therefore the development of feasible technologies to support the development of face recognition. Major areas of commercial interest comprise of bio science, law enforcement and surveillance, human computer interaction, multimedia management (for example, automatic tagging of a particular individual within a collection of digital photographs) smart cards, passport check, Criminal investigations, access control management.

A facial acknowledgment framework is a framework which gets facial pictures and confirms the character of a man using a propelled camera. It is an application fit for distinguishing or checking a man from a computerized picture. One approach to do this is by looking at those facial components from the picture and a face database. As stood out from other diverse biometrics frameworks utilizing unique mark/palm print and iris, confront acknowledgment has unmistakable favorable circumstances due to its non-contact handle. Face pictures can be caught from a separation without touching the individual being recognized, and the ID does not require participating with the individual. It is normally utilized as a part of security frameworks and can be contrasted with different biometrics. It has additionally turned out to be main stream as a commercial recognizable proof and advertising instrument.

We want to provide high level security to home by using IoT technology. IoT is new technology which has made an enormous impact on the modern world. The IoT can be defined as the system of interconnected mechanical, electrical and computing devices and other objects like animals, humans which are given a unique identifier and this system has an ability to transfer data over a wide network of such interrelated systems without requiring human-to-human or human-to-computer interaction. In short, the IoT has an ability to make things self-instructed.

Hence it can make significant impact on modern security technologies. Home security has become a solemn issue in the society. Anyone can be harassed in its own house. Older security systems can't tackle some situations like hacking, break down in the system. Unwanted persons like thieves, murderers and some known criminals will try to intrude in the home any time they want. Also, we know that the gadgets now a days are not that secured and hence can be easily hacked. Even intruders have found their way to take over these gadgets.

To develop this, we will use an ESP-32 micro-controller board for system development, it consists of inbuilt camera module for face recognition, and a relay to control door lock and solenoid as door lock. For the door unlocking system, we will place a solenoid lock at door latch. This lock will be programmed in such a way that when the user authenticates the person in front of the camera and wants to grant access, the solenoid shaft will go inside and latch door will be unlocked.

CONCEPT

Block diagram:

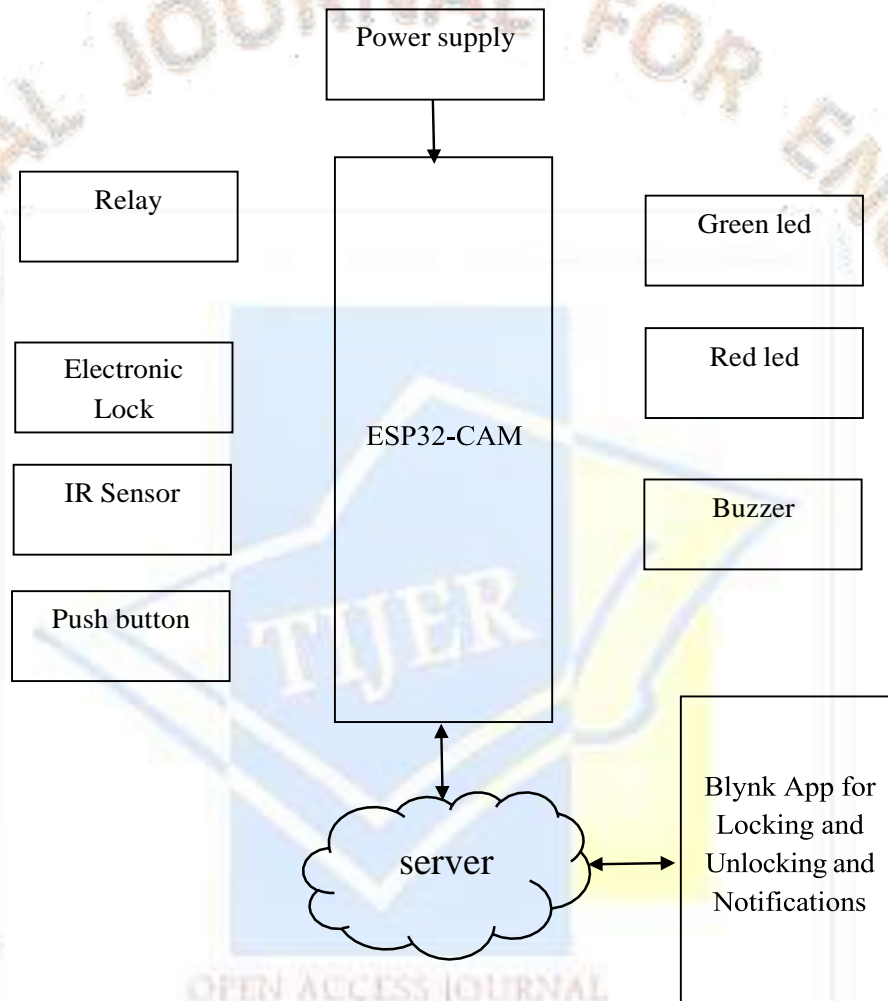


Figure 1.Block diagram

Esp32-Cam:

The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and provides onboard TF card slot .The ESP32-CAM can be widely used in intelligent IoT applications such as wireless video monitoring, Wi-Fi image upload, QR identification, and so on. This ESP32 microcontroller comes with inbuilt wi-fi, Bluetooth and camera module.

Features of ESP32:

- Onboard ESP32-S module, supports Wi-Fi and Bluetooth
- OV2640 camera with flash
- Onboard TF card slot, supports up to 4G TF card for data storage
- Supports Wi-Fi video monitoring and Wi-Fi image upload
- Supports multi sleep modes, deep sleep current as low as 6mA
- Control interface is accessible via pin header, easy to be integrated and embedded into user products.

Ir Sensor:

Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wavelengths, but smaller than microwaves, i.e., the region roughly from 0.75 μm to 1000 μm is the infrared region. Infrared waves are invisible to human eyes. The wavelength region of 0.75 μm to 3 μm is called near infrared, the region from 3 μm to 6 μm is called mid infrared and the region higher than 6 μm is called far infrared. (The demarcations are not rigid; regions are defined differently by many). infrared is light that has a wavelength longer than visible red light. The ranges of infrared include near infrared, mid infrared and far infrared, spanning wavelengths from about 710 nanometers (near infrared) to 100 micrometers (far infrared).

Relay:

A relay is an electromechanical switch, which perform ON and OFF operations without any human interaction. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. When this relay allows power supply through it solenoid acts as unlock state by that door can be opened otherwise it remains in locked state.

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. We use power-on unlocking type. 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.

Buzzer:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

Blynk:

Blynk is a mobile application which was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. All controlling and monitoring takes place through this application.

Led:

Used for indication purposes. In this we are using two led's, red and green led. Green led indicates access granted to the person and red led indicates no access to the user. When door unlocks green led will be glow.

Power Supply:

We have used chloride safe power sealed acid battery. Having 12v,7Ah. These batteries are rechargeable. This is connected to the filter to remove harmonics and in turn given to the regulator that regulated output is supplied to the components.

MTHODOLOGY

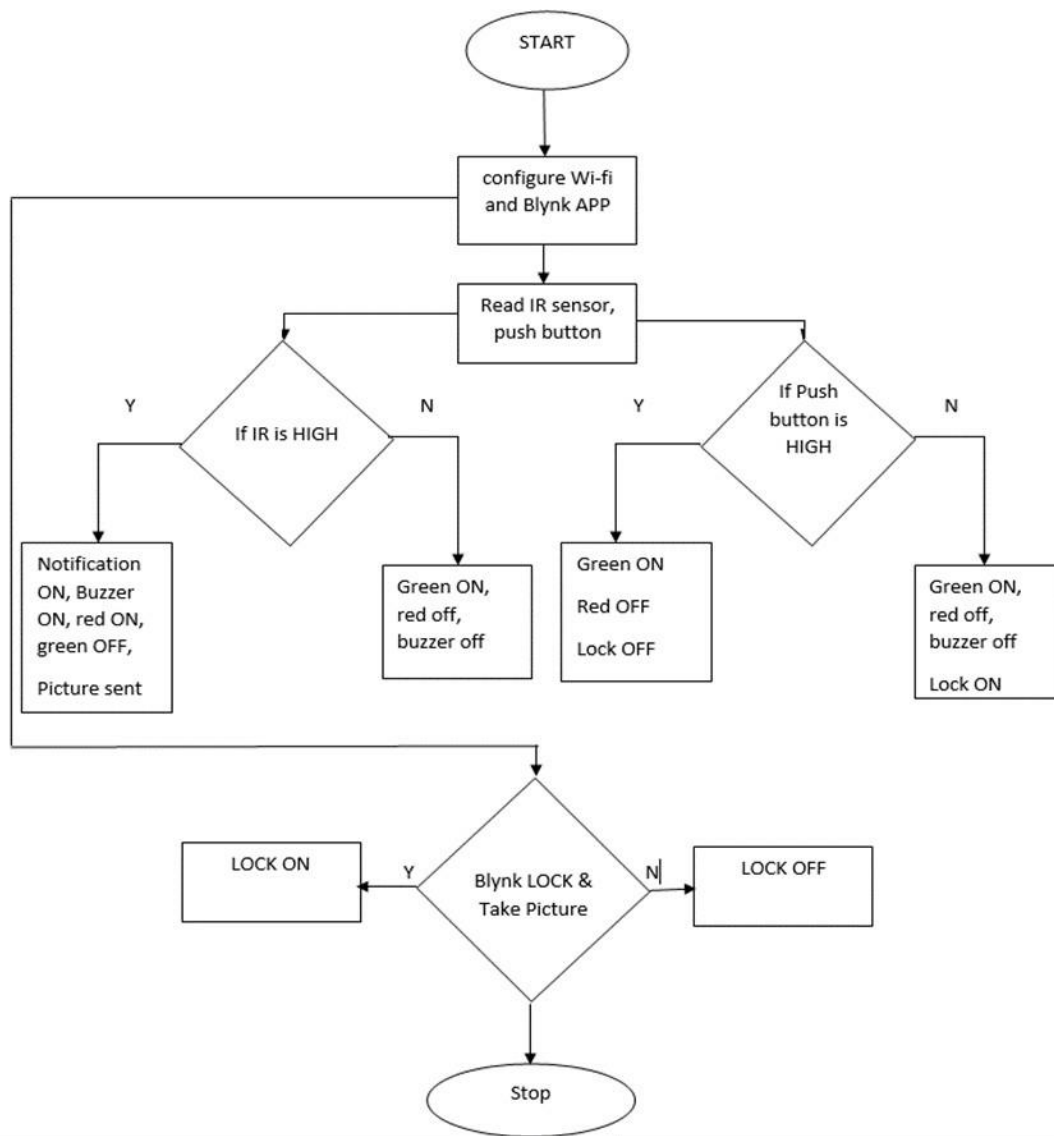


Figure 2. Flow chart Working

When we setup this arrangement to any door, camera recognizes the person who comes in front of it and updates it to the server that is connected through wi-fi module and this server is connected to mobile application which is blynk app that is installed in the users mobile. Users will get a notification to their mobile through this application.

If we click on that notification, we will get the live video streaming of surroundings (person) in front of the door in the blynk application. If user wants to grant access to the person in front of door, he can press unlock button in the application so that a command will be generated to the microcontroller then microcontroller releases signal to the relay then it allows power supply to the solenoid and it gets unlocked and green led will be glow indicating that he gained the access by that person can open the door.

If user does not want to grant access to the person in front of the door, he can press the lock button inside the application again a command will be generated to the microcontroller then it generates signal to the red led and buzzer which indicates that person does not have gained access. If user wants to save the snapshot or photo of the person in front of the door, he can press take picture option in the application by that photo of the person will get saved into the memory.

When anyone tries to gain the access by damaging the lock or handle of the door this IR Sensor will detect the motion and immediately notifies the user through mobile application then user can open it and can warn person through buzzer and alouser can save picture of the person for informing to authorities and can keep record of the person. If the persons who are inside the door want to come out there a push button is placed by pressing that microcontroller generates a signal to the relay by that door will be unlocked.

CONCLUSION

In this paper, we have proposed a security monitoring system based on IoT technology. The proposed system that can monitor and control the door remotely, receive a warning if a motion is detected near the door, granting door access to trusted people to control the door, view the door access history log and user access, get a notification that the door is still open after the limit time has passed, and turn on the alarm should the door is opened by force. The simulation results also show that when messages are published or subscribed between smartphone and door lock, they are encrypted by SSL encryption properly, so messages sent are safe from hacker. The message can't be seen or modified by other people because the hacker does not have the key to decrypt messages.

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