

Smart Door Lock with Camera Surveillance using ESP32

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Abstract

When we heard word security first thing came in our mind is door, Door is first and crucial part when we talk about physical security. To prevent our home, office meetings and other place from unauthorized person we keep our door locked all the time. But sometime owner forgot to locked the door or even not sure that it is locked or not after leaving the place.

In this paper we have presented a Smart Door Lock with Camera Surveillance using ESP32 which is based on Bluetooth and IoT. It works on two ways; we can close and open the door by app and also can check the visitor by the camera by our mobile and compute using the IP address over the same network. After checking we have option on the app to unlock the door from your mobile phone or to leave it as it is, if we don't want to allow that person to enter.

Key Words: Smart door lock System, Door lock based on IoT, ESP32 cam, Camera Surveillance System at home

I. INTRODUCTION

Today's all concerned about security, it maybe data security or the security of our residence. Smart door lock grown good in recent few years after the adoption of IoT on smart home projects. A smart door lock does not require any physical movement to open or close the door as it contains a digital door lock for this purpose. For home security, cameras play wide roles also and that's why we use ESP32-cam.

The ESP32-cam is low in budget module with micro SD port for storing media data. It also has an in board Wi-Fi module for connectivity purpose. It also contains a camera for monitoring purpose by which we can look who is on the door without going near to the door physically, we can use this for live monitoring purpose and also can store the data recorded on the memory card for later uses.

This project uses Internet of Things (IoT) and ESP module for monitoring purpose and Arduino and Bluetooth module for the door lock/unlock mechanism. It can be operation from both Android and iOS system.

1.1 RELATED WORK

We look on following work to get the idea for this project:

A). **Door Lock System based on the password:** The password based door lock system is good work for a beginner to getting started. This system used a 8051 microcontroller to operate this project, in which when a person is want to open the door he/she has to enter a password to open it, if the entered password is correct the door will be unlocked. If another individual came, it will again prompt to enter the code or password, if the password is not matched then the door will remain locked to deny the entry of the person as maybe this person is not authorized for that area.

B). **Face Recognition Smart Door Lock System:** It is an advance technology used now-a-

day. Face Recognition include self-recognition of image. The technology used is mainly image processing. Face recognition used in self-monitoring, face matching, security purpose, OpenCV. The image processing is technology in which the image is captured using camera, and then this captured image is compare with the pictures stored on the database. Database pictures consists of shade of face, eye contacts, size of nose, ear which is compare with the captured picture for the face recognition. This process takes few fractions of second to match the image and then action takes upon this match.

C). **Door Unlock System using Finger-Print:** In high tech world, security of data is must. The reliable system is needed to protect the system. The finger print system is reliable and finger print of an individual is not identical. In this door lock system, door is unlock when the finger print is matches with the saved one. The visitor presses the thumb on scanner it capture the pattern of thumb and the image will match with the saved one with minimum percentage error.

II. PROPOSED TECHNIQUE

In a smart door lock with camera surveillance, we use Arduino UNO module and Bluetooth module for door lock/unlock mechanism and for surveillance purpose ESP32-cam is best option because it has in-built camera for this. By using Arduino Bluetooth Controller app locking /unlocking can be done in many ways like voice command, gestures, in app button, text command. If someone press the doorbell we can have option to look the person on the door by opening ESP portal and can take decide to open the door or to remain it closed from the mobile using app. Camera surveillance setup is based on IoT system which works over the network and can be used only on the same network.

III. HARDWARE AND SOFTWARE REQUIREMENT

The main purpose of this project is to create and make a door lock with camera surveillance that can be operate from far distance using mobile app with camera facility to check the visitor. We used below software and hardware for making of this Smart door lock with camera surveillance system.

a. Software used

1. Arduino ide (Integrated Development Environment)

b. Hardware used

1. Arduino UNO
2. Bluetooth Module HC-05
3. Electric door lock 12V
4. Relay
5. 7805 voltage Regulator (5v)
6. BC 547B transistor
7. Capacitor (1000 micro farad)
8. Resistors (330 ohm and 1000 ohm)
9. ESP32-CAM
10. 12V DC adaptor
11. FTDI232 USB to Serial interface board (for programming esp32cam)

FTD1232 is core component to code in ESP32-cam. As ESP32-cam doesn't have any USB port so it is not possible to connect it to computer or mobile to transfer code, but it can be connected by the help of FTD1232 to make coding possible and also it provide power to it.

IV. BLOCK DIAGRAMS

This project uses a microcontroller (Arduino UNO) with Bluetooth module for the operating mechanism of the electric door lock and for surveillance purpose we use ESP32-Cam with IoT to spread the data over the network.

a. Smart Door Lock System

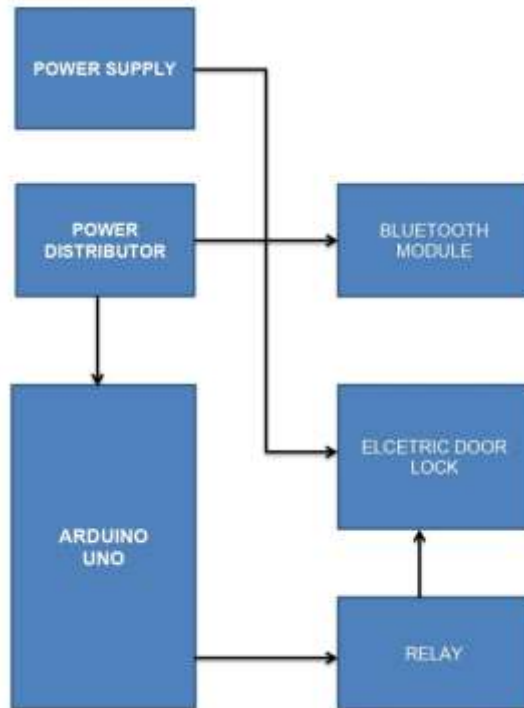


Fig.1 Block diagram of door lock system surveillance system.

b. Camera Surveillance System

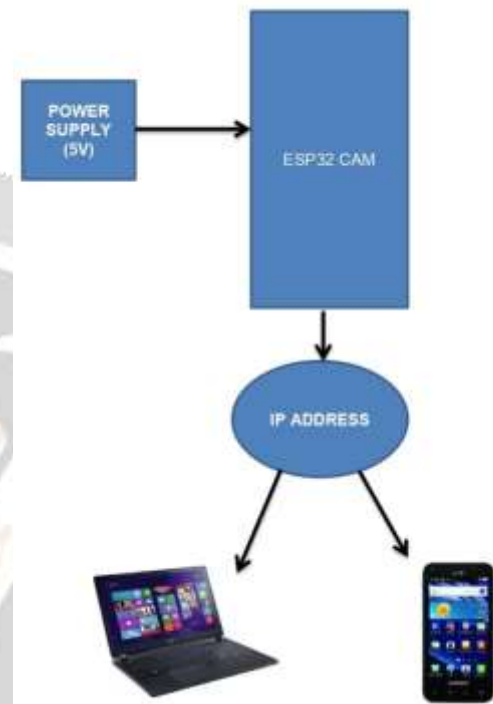
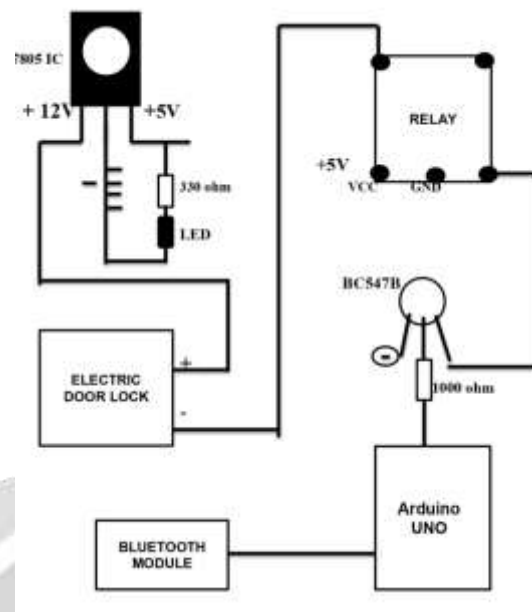


Fig.2 Block diagram of the camera surveillance system.

V. WORKING

1. 12 Voltage supply is given using power adapter, the 7085 IC regulates maintain the output voltage at constant values and provide variable voltage point. The input supply may contain voltage fluctuations which can be removed by capacitor.
2. One pin of IC supplies 12 Volt to operate an electric lock and other pin supply 5 volt output for working of other electronic devices like Arduino, Bluetooth module, relay etc.
3. The user input is transfer by Bluetooth Arduino Controller App to the Bluetooth module then according to the input the Arduino send signal to the relay which then provides switching action to the electric door lock to open or closes the door according to the input given.
4. The surveillance camera consists of ESP32 camera module and FTDI programmer module with operates with a 5V supply, can be given by a power bank.
5. The Camera output can be seen by any mobile and computer on that network by access 192.168.47.23(code specific) IP address.

V. CIRCUIT DIAGRAM



VI. Results

The given picture represents the result of this work. In this IOT and Bluetooth based project model, we have made a Smart door lock with camera surveillance using ESP32-CAM with Arduino and Bluetooth module. In this working model, when someone presses the doorbell, the owner can check the person standing in front of the door by accessing ESP portal (192.168.43.27 in our case). After verification, owner can unlock the electric door lock from an authenticated mobile phone by Bluetooth Arduino Controller App using voice, gesture, and touch methods.

We successfully created an IoT and Bluetooth based smart door lock with camera surveillance using ESP32-Cam to monitor and to control the door lock and boost the home security to one level up. The communication protocol Bluetooth Arduino Controller App is used between the smart phone and electric door lock. In this circumstance, due to current COVID situation, the smart locking door with camera plays an importance role so we can also check the visitor wore mask or not and we not need to touch the door also to open and close it.



V. FUTURE SCOPE

- a. This setup can further be developed into IOT project by using Ethernet arduino and a Wi-Fi module.
- b. It can be controlled from anywhere around the globe having feedback from the devices to further improve the energy savings.
- c. Double Security setup can be possible using this circuit.
- d. By using AI we can control door locks using face detection and for registered faces.
- e. We can attach a LED display on the door and can share message to the visitors.

Also, the android application can be used for managing more than one door, curtains, and to check temperature of visitors too in the future. For operating in an electric failure condition, a battery backup system should be used in both the circuits.

IV. REFERENCES

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