

Smart home automation and security with ESP

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Abstract : The Internet of things (IoT) combines the idea of controlling Real-world objects through remote-controlled signals using Wi-Fi. In today's world automation systems are being preferred over manual systems. IoT systems that use computers or mobile devices to control basic home functions and features automatically through the internet from anywhere around the world. Easy homes or home automation plays a vital role in the current lifestyle or modern era. This IoT project focus on building a smart home in which user can control any device in home and security using face unlock which is linked with solenoid lock using ESP32 face cam. In case of any trespass, the system will send an alert to the user using the internet and raise alarm optionally. If in case any user who is not registered before then-owner can let you in through the virtual button provided in-app.

Keywords - Automation, IoT, Internet, Wi-Fi.

I. INTRODUCTION

Wireless Surveillance and Home automation are the dual aspects of this Project. This system prototype sends alerts and live video to the owner and send message to the mobile-based application and Motion sensor etc. In addition to that, the provision for sending alert messages to the concerned security personnel in case of a critical situation is also provided. Any random movement can also be detected. Rather than activating the safety alarm, the owner can make plans by opening the door and turning on various appliances in the house that are connected to and regulated by the ESP8266. The user has control over himself too he can adjust each and everything via automation. Thus using the same set of sensors the dual problems of home security and Home Automation can be solved on a complimentary basis.

The user can access the IoT system's notifications and status from any place, even if internet connectivity isn't readily accessible. The following parts make up the remainder of the paper: In section II, a comparison of the proposed system and existing solutions is presented, highlighting the advantages of the proposed system over the existing ones. Section III illustrates how the system has been implemented, while sections IV and V go into greater detail about the working of the individual components present within the system and the overall functioning. Section V presents a flowchart concerning the working of the system. Some further modifications which can be done to increase the user-friendliness of the current prototype have been discussed in section VI. Section VII concludes the whole project.

II. ADVANTAGES

- This system is user-friendly and comes at a low cost with minimum requirements and can be accessed at ease.
- This system helps users to have live coverage of any household from anywhere in the world [needed IP address].
- This system detects the face of the person who is at the front door and sends snap-through internet hence acts as a security system.
- From this system, the user can access all peripheral devices connected to the ESP server.
- To operate this system user smartphone should be connected to active internet and Bluetooth should be ON.
- When an intruder tries to break into the home this system will send a text message through a web API-based platform.
- This home security system comes with a personalized app that needs user fingerprint authentication to control the home with no chance of leakage in security.
- This system will make the user alert that someone is at the front door and asks for user permission to open the door or not through the virtual button in the android app.
- This personalized app interface shows all the devices in the home including live coverage of the camera. With this, a lot of power can be saved and protected.
- During poor connectivity or power cut, all the peripheral devices can be operated manually.
- This system is designed for home automation and the security system is simple and inexpensive.

III. IMPLEMENTATION SETUP

A) Components required

- ESP-32 CAM
- 8-Relay Module
- 12V Solenoid Lock
- Node MCU

B) *Explanation**ESP-32 CAM:*

The ESP-32 cam is a microcontroller that also has an integrated video camera and microSD card socket. This is used for advanced functions like image tracking and recognition. This device can be programmed by using an FTDI adapter.

1)ESP-32 CAM Specifications:

- 802.11b/g/n Wi-Fi
- Bluetooth 4.2 with BLE
- UART, SPI, I2C, AND PWM interfaces
- 9 GPIO ports
- Multiple sleep modes
- Support Wi-Fi image upload



Fig 1 ESP32 CAM

2) 8-Relay Module:

8 channel relay board is a simple and convenient way to interface 8 relays for switching applications. The input voltage level support TTL as well as CMOS. It is easy to interface 8- relay with microcontrollers and analog circuits.

- Supply Voltage-3.75V to 6V
- Trigger current-5mA
- Current when relay is active-70mA(single),600 ma (all eight)
- Relay maximum contact voltage -250VAC,30VDC
- Relay maximum current – 10A



Fig 2 8-Relay Module

3) 12V Solenoid Lock:

The 12V Solenoid Lock is an electronic lock, designed for cabinet, safe, or door. The 12V solenoid lock is easy to install for an automatic door locking system.

12V Solenoid Lock Specifications:

- Operating voltage: 12VDC
- Draws 650mA at 12V, 500mA at 9Vwhen activated
- Designed for 1-10 seconds long activation time
- Wire length: 222.25mm



Fig 3 Solenoid lock

4) NODE MCU:

Node MCU is an open-source LUA Firmware and development board. The Node-MCU hardware design is open to modify, edit and build.

NODE MCU Specifications:

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input voltage: 4.5-10V
- Digital I/O Pins(DIO):16
- Analog Input Pins (ADC):1
- UARTs:1
- SPIs:1
- I2Cs:1
- Flash Memory:4MB
- SRAM: 64 KB
- Clock Speed: 80MHz
- PCB Antenna
- Onboard USB-TTL based on the CP2102 enables Plug and Play.
- The Compact module that fits neatly within your IoT project

IV. WORKING PROTOTYPE

This working prototype can be used in two different ways:

1. As a home automation system.
2. As a smart security system.

1. As home automation system:

Automation is a vastly growing field available at the fingertip of human life. This home automation system provides full control over his/her home and can access from anywhere in the world. ESP32 has an inbuilt Wi-Fi module that sends an electric pulse to

the relay module. Then relay module will trigger different sensors connected to it. From this prototype, every electronic device can be controlled in the house. If anyone wishes to turn on the fan then simply press ON and switch OFF. This system comes with a customized app with an interface showing a different device located in different locations in the house thus user can control that which is in need. For the advancement of this prototype, users can store device information with usage timing and the current status of the device.

2. As a smart security system:

This prototype is included with ESP32 Cam which is very efficient for security purposes. ESP32 Cam which is fixed at the front door of the house shows live visualization over a home. This process can be explained in different forms.

Case 1:- If someone/guest is at the front door the ESP32 cam will recognize the face if the face is registered then the solenoid lock will automatically open and allows the person into the house.

Case 2:- If someone is at front door whose face is not registered then ESP32 cam will click a snap and send it through the internet and also alert message will send to the user through a web-based API system. Thus the user will decide to allow or not through a virtual button provided in the application. If yes then the door lock will open or the lock stay still.

Case 3:- If the user is out of town or house and expecting a guest to house user can access ESP32 Camera through the IP address of the device and see the live feed of home.

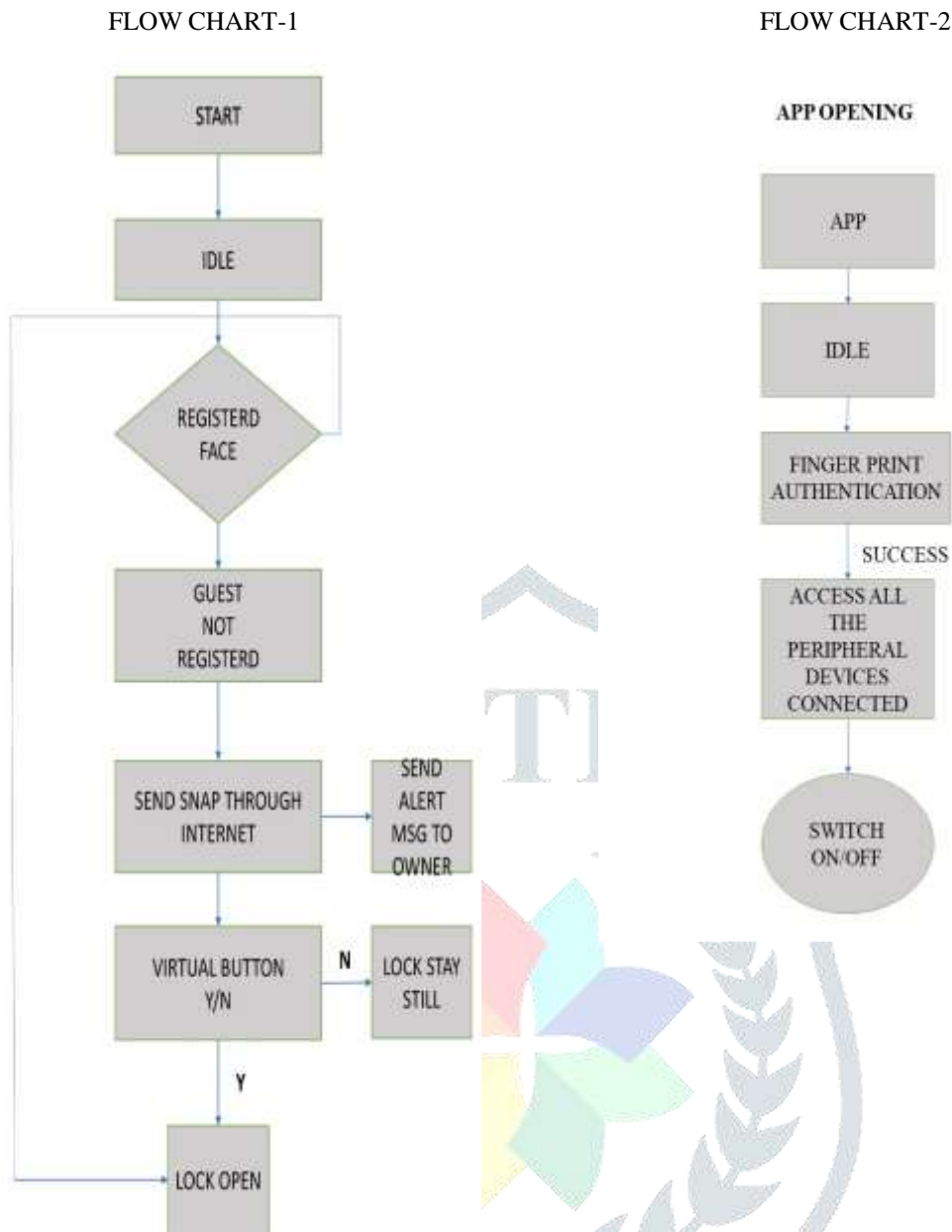


Fig 4 Implementation setup



Fig 5 main interface of the app

V. FLOW CHART



VI.FURTHER SCOPE

As the system is completely controlled by the user and the user can make decisions whether to allow the unknown person inside the house or not. The system can capture the photo and hence can prevent robbery. By using the android app on the mobile phone the user can control all the devices in the house and can turn on and off all the devices in the house. Users can save the power used in the house using the android app which is installed on the mobile phone. This security system gives the house a high level of security and is completely secure to use.

VII.CONCLUSION

According to the findings of the research paper, all home automation systems use various types of modules such as ESP8266 and Raspberry Pi. The ultimate goal of these modules is to make human life easier by controlling any appliance in the house. This device also helps to secure the home from burglars by installing an automatic lock at the front door that prevents those who do not have access to the home from entering. This prototype can be used as a security and home automation system.

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