

IOT Based Home Automation System

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Abstract - Now days the life is getting easier and simpler in all aspect, the reason is Internet of Things. At present world mostly automatic systems are preferred by human being. IOT is growing technology, using this technology we can monitor and control digital devices from anywhere.

In this project we are presenting proposed system for home automation technique with raspberry pi, ESP32 and Arduino Uno using IOT and it is done by integrating camera, motion sensor & matrix keypad into cloud using internet, and also integrating fingerprint module, gas sensor, and water level system locally means for them we are not using a cloud..

Key Words: Home Automation, IOT, Raspberry Pi, Cloud, ESP32 Dev Board, Arduino Uno.

1.INTRODUCTION

Home Automation System is a system which can be used to handle home appliances like light, fan etc. conveniently & efficiently. Now a days home automation system is necessary to make day to day life easier & also for home safety & security. In our system there are two sections first is switching & second is security.

In switching section we have controlled light, fan & other home appliances over the cloud which can be controlled from anywhere & it is time consuming also. In security sections there are subsystems which are biometric door lock system, security, camera, gas leakage detection & password door lock system. Our project is focused on IOT. We have tested all the systems & ensure the proper working of project..

2.PROJECT OVERVIEW

In our project for the complete system we are using Raspberry pi 3B+ model. It is the main control unit and all the components are interfaced with this module. In our project we are presenting system for home automation with raspberry pi, ESP 32, and Arduino Uno R3 using IOT .It is done by integrating camera with telegram cloud using internet and fingerprint module for door lock security system, gas sensor for detection of leakage of gas, and water level monitoring system to monitor water level. Esp 32 Used for switching home appliances on or off with the help of relay it also used to control gate using Blynk cloud.

3. PROPOSED SYSTEM

Proposed system is a home automation system that will control the house hold appliances conveniently and efficiently, also this system provides security of the home.

3.1 SYSTEM REQUIREMENTS

3.1.1 Raspberry Pi-3B plus model



Fig -1: Raspberry Pi-3B plus model

Raspberry pi 3B plus is controlling major system Such as Water level monitoring system, keypad based door lock system security camera and gas leakage detection system of our home automation project.

3.1.2 Esp-32



Fig -2: Esp-32

Esp-32 devkit v1 is based on Esp-32 microcontroller which consist of wifi and bluetooth used for switching home appliances on and off with the help of relay.

3.1.3 Arduino UNO R3



Fig -3: Arduino Uno R3

It is a microcontroller board having ATmega328 AVR microcontroller. It is used for finger print based door lock system.

3.1.4 R307 Fingerprint Scanner Module



Fig -4: Fingerprint Scanner Module

It is optical finger print sensor module used to scan finger of user and check whether it is authorized to open door.

3.1.5 Camera Module

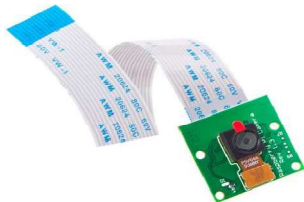


Fig -5: Camera Module

Camera is used to capture real time image of the object which is in front of PIR motion sensor or person who press the bell (push button)

3.1.6 Mq-2 Gas Sensor Module



Fig -6: Mq-2 Gas Sensor Module

Gas leakage sensor module is used in gas leakage monitoring system and it is continuously monitoring the leakage of gas.

3.1.7 4X4 UNIVERSIAL 16 KEY KEYPAD



Fig -7: 4x4 Universal 16 Key Keypad

It is a 4X4 matrix keypad and it is used to enter the password by the user. If the password is correct then door will open.

3.1.8 16x2 LCD Module

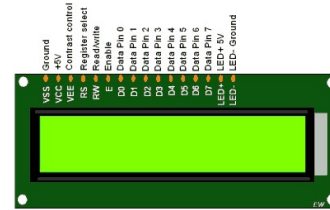


Fig -8: 16x2 LCD Module

LCD display is having 16 pins which are connected to raspberry pi. Lcd display show the password enter by the user.

3.1.9 Balena Etcher

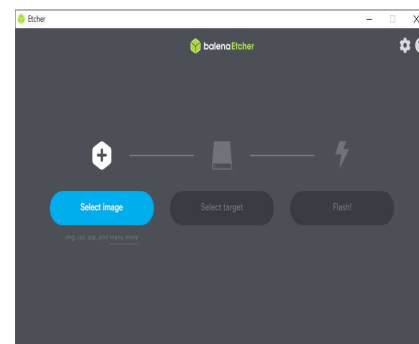


Fig -9: Balena Etcher

This is open source windows software used to write raspbian OS on SD card. We have to add downloaded raspbian OS iso file to the software and then select SD card on which raspbian OS to be install then click on flash. For successful connection between raspberry pi and local wifi we have to add conf file to the SD card.

3.1.10 Advance IP Scanner

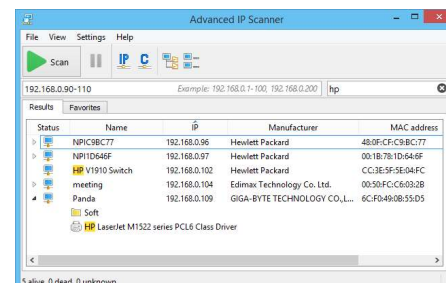


Fig -10: Advance IP Scanner

We need to find out the IP address of the raspberry pi assigned by local router. Open up Advanced IP Scanner and hit on "Scan". A list of the connected devices and their local ip address will be generated.

3.1.11 VNC viewer

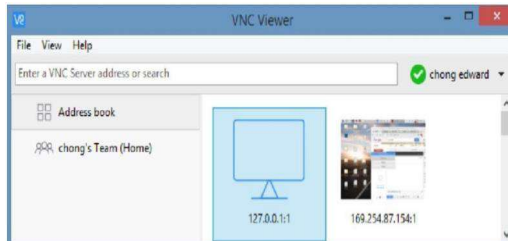


Fig -11: VNC viewer

Click on “File” button on top left corner in software, and select “New Connection”. Type ip address in the VNC server and type a name for this connection, click OK Connect to the Raspberry Pi by double clicking the connection which has just been created. Enter username and password. VNC set up is done.

3.1.12 Arduino 1.8.10



Fig -7: Arduino 1.8.10

ARDUINO 1.8.10 used with Arduino UNO R3 : Connect Arduino UNO R3 to pc using the USB cable .Choose Arduino UNO board from the tools menu and choose the correct com port. Click on verify button to compile the sketch after successful compilation hit an upload button to upload the sketch.

ARDUINO 1.8.10 used with ESP-32 : Connect ESP-32 to pc using the USB cable. ESP 32 board is not preinstalled in the software so we have to add and install esp-32 board . Go to the files then click on preferences then paste following link in additional board manager URL and then click on ok. Link =” https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json”. Then choose Board Manager in board menu to install board. After successful compilation hit an upload button to upload the sketch.

3.1.13 Python



Fig -13: Python

Python IDE is a free and open source programming software and an IDE stand for integrated development environment for Python. In Raspbian OS, python IDE is a built

in software. To control hardware connected to raspberry pi python programming is used.

3.2 Block Diagram

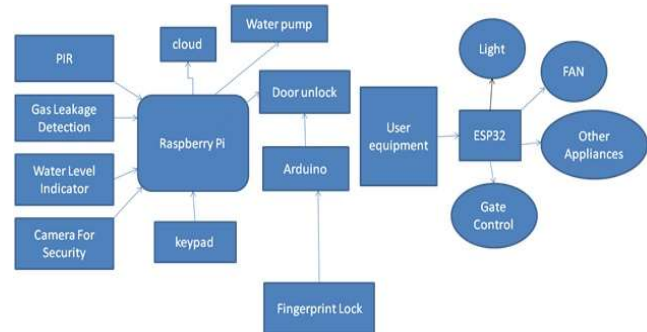


Fig-14 : block diagram

System consist of Raspberry pi 3B plus as controlling unit for security camera, gas leakage detection ,water level monitoring system and keypad based door lock system. Switching of home appliances such as fan,light etc are controlled by Esp-32 by using blynk application on android phone. Arduino uno r3 is used for fingerprint based door unlock system.

4. Methodology

The IOT Based Home Automation System has two main sections. First Section Is Switching Section. Second Is Security Section. These two sections has explained below.

4.1 SWITCHING SECTION

4.1.1 Home Appliances Switching

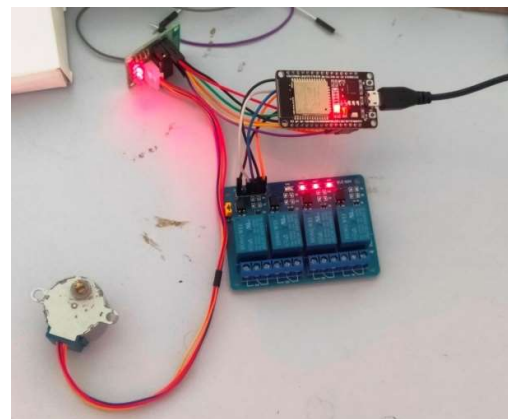


Fig -15: Home Appliances Switching

Here we have implemented cloud based home appliances switching. In these we are going to control fan, light & gate .Blynk app is used to control home appliances from users mobile. Here Esp-32 is receiving commands from user and with the help of relay's we are going to switch home appliances.

4.1.2 Water level monitoring & pump control system

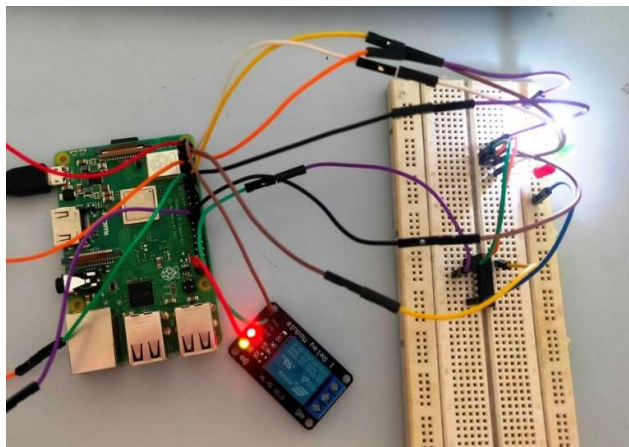


Fig -16: Water level monitoring & pump control system

In this system we have implemented water level monitoring and pump control system. Here we assign three levels for water that is 25%, 50%, 90%. When water level goes below 25% the water pump will automatically start and Orange LED will glow on monitoring board. When water level reaches to 50% the Green LED will glow on monitoring board. When water level goes above 90% the water pump will automatically off and Red LED will glow on monitoring board

4.2 SECURITY SECTION

4.2.1 Finger print based door lock/unlock system

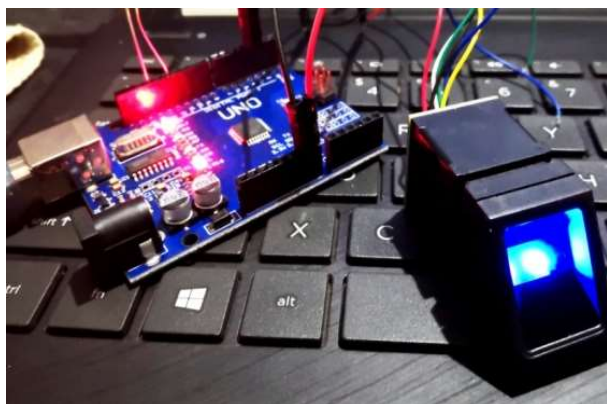


Fig -17: Finger print based door lock/unlock system

In this system we have stored authorized persons fingerprints. When authorized person scans his fingerprint then he will get access & he can enter in home. In this system we have used R307 optical fingerprint sensor and arduino UNO R3. We can store upto one thousand fingerprint samples in R307 fingerprint sensor.

4.2.2 Security Camera

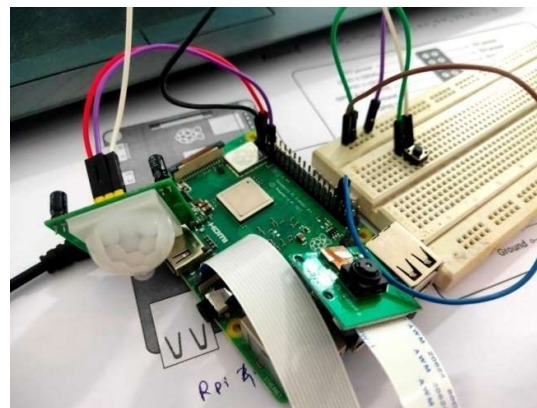


Fig -18: Security Camera

When a person comes in front of the door or press bell (push button) then 'motion detected' message is send to the owner's telegram account by the telegram bot. If the owner want to see who is in front of the door then he can reply as '/send pic' to the Telegram bot and telegram bot will send the real time picture of the person who is in front of the door.

4.2.3 Password based door Unlock system

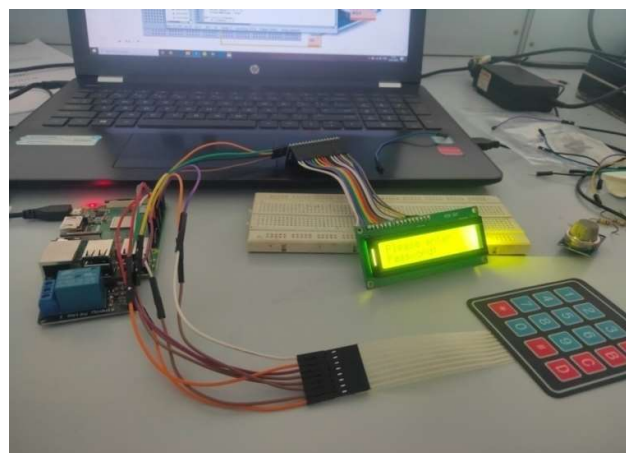


Fig -19 : Password based door Unlock system

In this system we have set one password which is only known to the owner & his family members. When the owner or any family member wants to enter the home he/she should have to enter the password. If unauthorized person tries to open door with wrong password then 'wrong password' message will display on the LCD screen and the door will not get open.

4.2.4 Gas leakage detection

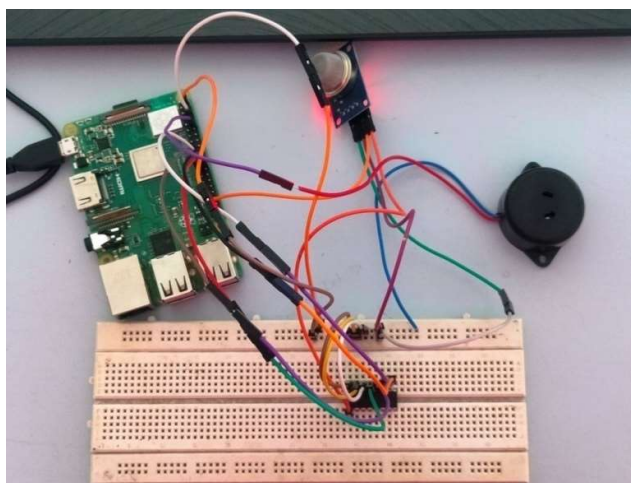


Fig -20 : Gas leakage detection

In this system MQ-2 gas leakage sensor is used to detect leakage of gas .When there is leakage of gas in home, this system will detect it and buzzer will start ringing.

5. RESULT

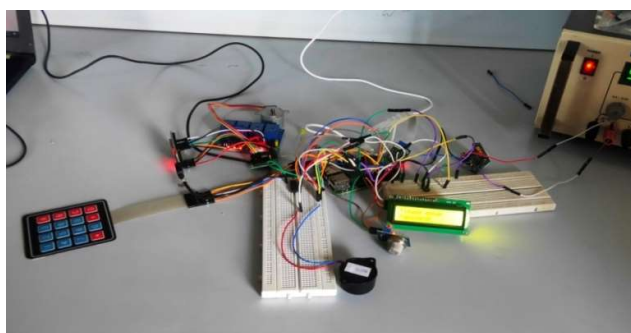


Fig -21 : Breadboard connection diagram



Fig -22 : IOT Based Home Automation System Model

6. CONCLUSIONS

The project has proposed idea of home automation system using IOT. Home Automation is a huge system that includes multiple technologies & application that can be used to provide security & control of the home easily. This project discussed designed modules like sensor circuits, monitoring & tracking of the home through IP camera, mobile notifications.

The IOT system integrates electrical devices in a house with each other. The techniques which are going to use in home automation can be include in building automation as well as for the control of domestic activities such as TV, fan, electric tube, refrigerator,etc.

7. FUTURE SCOPE

There are a variety of enhancement that could be made to this system . Greater accuracy in sensing and detection. Project can be powered by solar system it will save power.We can also provide security for compound wall.Light & fan will be automatically on by entering person in the room using PIR sensor & counter.

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