SMART FIRE DETECTION AND ALARM SYSTEM

Mini Project Report

BACHELOR OF TECHNOLOGY

in

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

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CERTIFICATE

This is to certify that the project report entitled **"SMART FIRE DETECTION AND ALARM SYSTEM"** is the Bonafide record of project work carried out under my supervision by **J.RITESH (20L31A5430), G.V.JYOTSNA (20L31A5428), K.MOUNIKA (20L31A5464), D.KAMALA (21L35A5401) and U.RAJINI (20L31A5459)**, during the academic year 2021-2022, in partial fulfillment of the requirements for the mini project of Bachelor of Technology in Artificial Intelligence and Data Science of Jawaharlal Nehru Technological University, Kakinada. The results embodied in this project report have not been submitted to any other University or Institute for the award of any Degree or Diploma.

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PROFESSOR AND HoD

EXTERNAL EXAMINER

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DECLARATION

We hereby declare that the project report entitled **"SMART FIRE DETECTION AND ALARM SYSTEM"** has been written by us and has not been submitted either in part or whole for the award of any degree, diploma or any other similar title to this or any other university.

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ABSTRACT

Housefires occur in houses mostly in the kitchens and bedrooms. It leads to damage of the property and also lives. In order to avoid that or to minimize the damage caused by a fire outbreak an IOT (Internet Of Things) technology is used to control such a kind of risk. NodeMCU based IoT fire detector is one of the solutions we implemented for this kind of issue. In this model, we have fitted a fire indicator by making practical and effective use of NodeMCU which is connected with a flame sensor and buzzer along with LED's. Flame sensor is most sensitive to normal light. That's why this sensor module is used in flame alarms. Buzzer interfaced with it makes an alert sound and lights also blink along with them. The response of these sensors is faster as well as more accurate compared with a heat/smoke detector because of its mechanism while detecting the flame. The buzzer stops itself at whatever point the temperature falls to comfortable indoor temperature and the amount of heat decreases. NodeMCU fire finder serves best because at whatever point it indicates fire or smoke, then it immediately alarms the admin or user about the fire through the SMS that is sent using the Blynk application. The device can be switched on and off using Google assistant using the "Switch on" and "Switch Off" commands "Connecting Blynk with Google assistant using IFTTT". At whatever point a fire happens, the user gets the alert notification through smartphone.

CHAPTER - 1

INTRODUCTION

INTRODUCTION

One of the major problems that security must deal with is the fire outbreak that can happen everywhere including houses, schools, factories, offices and many other places. Fire is one of the big reasons for fortuitous deaths in the world claiming valuable lives and expensive property. Hence, fire detector systems are essential in alerting people in time before fire engulfs their homes. They help in detecting fire at an early stage so that many lives and property can be saved. However, fire detector systems, today, require a lot of wiring and labour to be installed. This thing intimidates the users to place it in their homes. Hence, we have planned to make an IoT based wireless fire detector system which is not very difficult to place.

IOT stands for "Internet Of Things" which means to connect the physical objects or things to the digital world by fixing various sensors, software connected to a central hub that measures the criterion and boundary of the real world as they keep varying and can make a database of the readings or values gathered. Once the data gets to the cloud, software processes it and then it decides to perform an action, such as sending an alert or transfer of data without the need of the user. The Internet of Things refers to inter-connecting and inter-relating objects, devices and people through wireless networks, it has risen itself as the new business technique in different sectors.

IOT devices are used in our daily life to monitor and control the mechanical, electrical and electronic systems used in buildings and homes.

IOT now-onwards is becoming very famous in the commercial market. Its systems and components associated with it are becoming more popular and that includes the (wireless sensor network) which is used for security purposes and in this case, it is used for protection against fire outbreak. Wireless sensor network here does its job by monitoring the surrounding conditions and has achieved a big amount of attention now-a-days and it is also very well established. We have used a NodeMCU, for which we get an inbuilt Wi-Fi.

A wireless sensor network is formed from properly spaced and positioned nodes provided with a sensing device to check and to measure attributes of the physical environment at different locations. Each of these nodes consists of a microcontroller (NodeMCU) connected to smoke detector sensors that continuously sense the surrounding environment to detect the presence of fire. These nodes generate their own Wi-Fi network. At the stage when fire is detected by this node, it sends a signal to a centre node that is reminded to send the SMS to the fire-fighter office and the user, and then it informs the user and alerts the house by processing a local buzzer, when it is switched on. The buzzer keeps going on till the temperature is high. It stops buzzing on its own when the temperature falls to ordinary value and smoke decreases.

This system is very useful whenever the user is not in the proximity of the affected area. Sometimes it takes so much time for the firefighter officers to reach where a fire outburst has taken place and start their work on eliminating the fire. Thus, this model and buzzer will contribute as an early alarm system which will send an email confirmation to our mobile phones, fire department and the nearby hospitals if any sudden appearance of fire has occurred. By this we get to know about the situation

happening at the location clearly and before it gets very late, we tend to avoid the consequences and damages in some cases where the fire outburst is observed after a long time from its explosion.

1.2 PROBLEM STATEMENT

•The existing fire alarm system in the market nowadays is too complex in terms of its design and structure.

• Since the system is too complex, it needs regular maintenance to be carried out to make sure the system operates well. Meanwhile, when the maintenance is being done to the existing system, it could raise the cost of the system.

•The problem is that the conventional fire extinguishing systems are not enough to take prompt action during a fire outbreak and hence, save life.

1.3 WHAT IS SMART ALARM SYSTEM?

Fire Detectors play a very important role in Industries, Shops, Malls, Residential complexes, parking areas, etc. They help in detecting fire or smoke at an early stage and can help in saving lives. Commercial Fire detection systems usually have alarm signalling, with the help of a buzzer or Siren. We have designed an IOT based Fire Alerting System using Temperature and a smoke sensor which would not only signal the presence of fire in a particular premise but will also send related information through IOT.

Internet of Things (IoT) is basically the network of 'things' by which physical things can exchange data with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. In this IOT based fire alarm system using NodeMCU and flame sensor using the IOT project, we can send ALERT to the user through email or SMS

1.4 APPLICATIONS AND ADVANTAGES OF SMART FIRE DETECTION AND ALARM SYSTEM

- This project therefore seeks to design a microcontroller fire alarm and control system that will continuously monitor the presence of a significant amount of heat and activate an alarm and send an SMS alert.
- The project is designed with a low cost and all level users can have one for a safety purpose.

- This project therefore seeks to design a fire alarm system that will continuously monitor the presence of a significant amount of heat.

- Send a Short Message Service (SMS) alert and extinguish the fire as a safety measure to contain the situation.

- Fire alerting systems have a wide range of applications. IOT based fire alarm systems using Arduino can be used in Chemical Factories, shopping malls, local shops, educational institutes, Parking Areas, Companies etc.

- IoT Based Fire Alarm Notification System Using WIFI can be used as a precautionary measure at all the places listed above, which can help in notifying the fire departments early. If appropriate and immediate action is taken as soon as the buzzer turns ON, it can help in avoiding an accident.

- Future Development of the IOT Based Fire Detection System — This project can be enhanced to sense leakage of LPG GAS

CHAPTER - 2

SYSTEM ANALYSIS

2.1 EXISTING SYSTEM

Conventional or "point wired" fire detection and alarm systems were for many years the standard method for providing emergency signalling. In a conventional system one or more circuits are routed through the protected space or building. Along each circuit, one or more detection devices are placed. Selection and placement of these detectors is dependent upon a variety of factors including the need for automatic or manual initiation, ambient temperature and environmental conditions, the anticipated type of fire, and the desired speed of response. One or more device types are commonly located along a circuit to address a variety of needs and concerns.

A disadvantage is that for large buildings, they can be expensive to install because of the extensive amounts of wire that are necessary to accurately monitor initiating devices.

Conventional systems may also be inherently labour intensive and expensive to maintain. Each detection device may require some form of operational test to verify it is in working condition. Smoke detectors must be periodically removed, cleaned, and recalibrated to prevent improper operation. With a conventional system, there is no accurate way of determining which detectors are in need of servicing. Consequently, each detector must be removed and serviced, which can be a time consuming, labour intensive, and costly endeavour. If a fault occurs, the "trouble" indication only states that the circuit has failed, but does not specifically state where the problem is occurring. Subsequently, technicians must survey the entire circuit to identify the problem.

2.2 PROPOSED SYSTEM

The above proposed system requires no manpower as it is completely automated. NodeMCU is used for controlling the whole process. LED and flame sensor are connected to. The flame sensor senses the data and if received values are above the threshold value the LED gets ON. If a rise in temperature is detected then the buzzer gets ON. The NodeMCU collects the readings from the sensor, and differentiate them with the threshold value. If the figures shown by the sensor are about to reach the limit, the Arduino/NodeMCU performs necessary actions. It sends a warning SMS to the user's mobile phone to inform him about the situation, it can also be used to send a notification to the fire stations and hospitals in case of any fire outbreak. The software used for writing programs is Arduino IDE, an open-source software that can be embedded onto the board. In this code, which is being written in C++ language we are having two main functions void setup() & void loop(). The code helps us to give the desired output during simulation.

When this system is powered on, the NodeMCU board connects to the Blynk cloud through the internet. Then, we can turn ON and OFF this system using the Blynk app interface. When the system is activated, the smartphone receives a push notification as soon as the red LED and buzzer is activated in the event of a fire. Afterward, the system goes back to normal. Then the green LED bulb is activated.

CHAPTER - 3

SYSTEM REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

3.1.1 NODE MCU

Description: -

Node MCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266

The ESP8266 is a low cost WiFi microchip with full TCP/ IP stack and micro controller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

Figure: Node MCU with inbuilt WiFi module

This module provides access to the GPIO (General Purpose Input / Output) sub system. All access is based on the I/O index number on the Node MCU dev kits, not the internal GPIO pin. For example, the D0 pin on the dev kit is mapped to the internal GPIO pin16. Please refer to the below GPIO pin maps for the index ↔ gpio mapping.

IOindex	ESP8266 6 pin	IOindex	ESP8266pin
0 [*]	GPIO16	7	GPIO13
1	GPIO5	8	GPIO15
2	GPIO4	9	GPIO3
3	GPIO0	10	GPIO1
4	GPIO2	11	GPIO9
5	GPIO14	12	GPIO10
6	GPIO12		

Table: Node MCU index ↔ gpio mapping

Advantages of the NODEMCU: -

• Low cost: The Node MCU is less costly than any other IOT based Devices. Because the wifi module which is used in it is of lowest cost.

• Hardware Part: It has Arduino Like hardware I/O. It is becoming very popular these days that Arduino IDE has extended their software to work in the field of ESP8266 Field module version.

• Network API: Node MCU has an easily configurable network API.

• Integrated Wi-Fi Module: ESP8266 is incorporated in NODEMCU. It is an easily accessible wifi module.

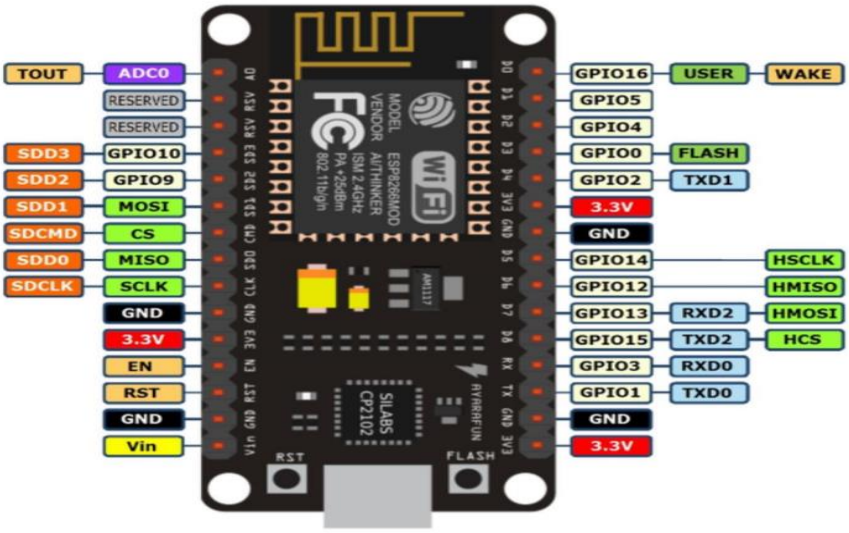
Disadvantages: -

• The operation of the circuit depends on the working internet connection. If the working internet connection is not available then it will not run.

• It also depends on the free server provided by the third party, if the free server is not working then it will not run. • NODE MCU has less resources of official documentation.

MCU Definition: -

MCU stands for Micro Controller Unit - which really means it is a computer on a single chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. They are used to automate automobile engine control, implantable medical devices, remote controls, office machines, appliances, power tools, toys etc



ESP8266-01 Features: -

• Low cost, compact and powerful Wi-Fi Module • Power Supply: +3.3V only

• Current Consumption: 100mA

• I/O Voltage: 3.6V (max) • I/O source current: 12mA (max)

• Built-in low power 32-bit MCU @ 80MHz • 512kB Flash Memory

• Can be used as Station or Access Point or both combined

• Supports Deep sleep Supports serial communication hence compatible with many developments platform like Arduino

• Can be programmed using Arduino IDE or AT-commands or Lua Script

3.1.2 FLAME SENSOR MODULE

A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged by high temperatures. So this sensor can be placed at a certain distance from the flame. The flame detection

can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in firefighting robots like a flame alarm.

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compared with a heat/smoke detector because of its mechanism while detecting the flame.

flame-sensor

Working Principle

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, or otherwise ice.

The pin configuration of this sensor is shown below. It includes four pins which include the following. When this module works with a microcontroller unit then the pins are

- Pin1 (VCC pin): Voltage supply rages from 3.3V to 5.3V
- Pin2 (GND): This is a ground pin
- Pin3 (AOUT): This is an analog output pin (MCU.IO)
- Pin4 (DOUT): This is a digital output pin (MCU.IO)

Different Types

Flame-sensors are classified into four types

- IR single frequency
- IR multi-spectrum
- UV flame detectors
- UV/ IR flame detectors

Features & Specifications

The features of this sensor include the following.

- Photosensitivity is high
- Response time is fast
- Simple to use
- Sensitivity is adjustable
- Detection angle is 600,
- It is responsive to the flame range.
- Accuracy can be adjustable

- Operating voltage of this sensor is 3.3V to 5V
- Analog voltage o/ps and digital switch o/ps
- The PCB size is 3cm X 1.6cm
- Power indicator & digital switch o/p indicator
- If the flame intensity is lighter within 0.8m then the flame test can be activated, if the flame intensity is high, then the detection of distance will be improved.

3.1.3 5V BUZZER

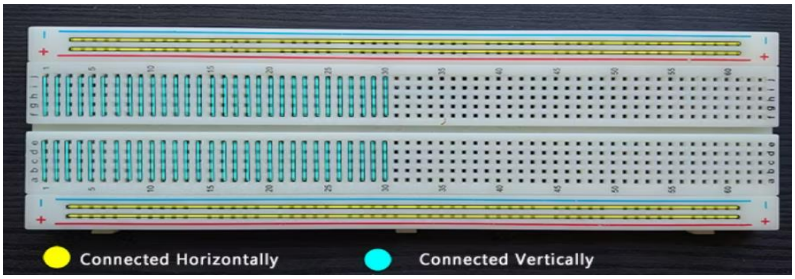
A piezo audio transducer that is epoxy sealed at base and suitable for PCB mounting. The piezo transducer generates a range of audible tones and frequencies when energised by 5V peak square wave. They can be driven directly from CMOS ICs with low power consumption. Although generally run at higher frequencies, they work well with the 500 Hz PWM output from the Arduino boards.

3.1.4 BREADBOARD

A breadboard is a simple device designed to let you create circuits without the need for soldering. They come in various sizes, and the design can vary, but as a general rule they look something like this:

The power rails run horizontally in two rows at the top and bottom. Meanwhile, the vertical columns run inwards as you move along the board.

If you were to pull any one of these metal pieces out, you would see their purpose. They're designed to grab onto the legs of any components pushed through the breadboard holes. This allows you to test circuits without having to worry about soldering, or making good contact with the board.



Breadboarding tips:

It is important to breadboard a circuit neatly and systematically, so that one can debug it and get it running easily and quickly. It also helps when someone else needs to understand and inspect the circuit. Here are some tips:

1. Always use the side-lines for power supply connections. Power the chips from the side-lines and not directly from the power supply.

2. Use black wires for ground connections (0V), and red for other power connections.

3. Keep the jumper wires on the board flat, so that the board does not look cluttered.

4. Route jumper wires around the chips and not over the chips. This makes changing the chips when needed easier.

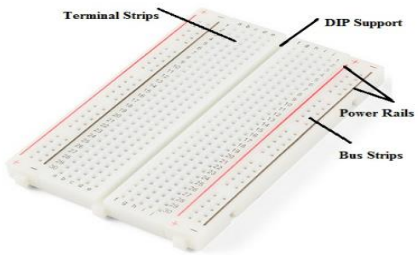
5. You could trim the legs of components like resistors, transistors and LEDs, so that they fit in snugly and do not get pulled out by accident.

Specifications & Features

The specifications & features of a breadboard, include the following.

- Distribution Strips are two

- Wire Size is 21 to 26 AWG wire
- Tie Points are two hundred
- Withstanding Voltage is 1,000V AC
- Tie points within IC are 630
- Insulation Resistance is DC500V or 500MΩ
- Dimension is 6.5*4.4*0.3 inch
- Rating is 5 Amps
- ABS plastic through color legend
- ABS heat Distortion Temperature is 183° F (84° C)Hole or Pitch Style is 2.54mm



Breadboard Layout

Advantages

The advantages of solderless breadboards include the following.

- It doesn't require soldering to connect the components on board.
- If the circuit is not working properly then, we can easily check and rectify them by taking out the components & replacing them easily.

Disadvantages

The disadvantages of solderless breadboards include the following.

- Components that are connected to the breadboard can come loose once the breadboard is pushed or moved.
- This kind of breadboard is available with high parasitic capacitances because of the capacitances among different components which are being close to each other.
- These breadboards are restricted to below or 10 MHz frequencies.

3.1.5 JUMPER WIRES

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

Fig: Jumper wires

Types: -

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. Some common connectors are:

❖ Solid tips – are used to connect on/with a breadboard or female header connector. The arrangement of the elements and ease of insertion on a breadboard allows increasing the mounting density of both components and jump wires without fear of short-circuits. The jump wires vary in size and colour to distinguish the different working signals.

❖ Crocodile clips – are used, among other applications, to temporarily bridge sensors, buttons and other elements of prototypes with components or equipment that have arbitrary connectors, wires, screw terminals, etc.

❖ Banana connectors – are commonly used on test equipment for DC and low-frequency AC signals.

❖ Registered jack – are commonly used in telephone (RJ11) and computer networking (RJ45).

❖ RCA connectors – are often used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable.

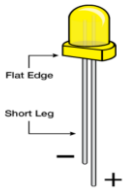
❖ RF connectors – are used to carry radio frequency signals between circuits, test equipment, and antennas.

3.1.6 LED (LIGHT EMITTING DIODE)

Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.

Uses of LED

LEDs find applications in various fields, including optical communication, alarm and security systems, remote-controlled operations, robotics, etc. It finds usage in many areas because of its long-lasting capability, low power requirements, swift response time, and fast switching capabilities. Below are a few standards LED uses:



Advantages of LEDs over Incandescent Power Lamps

Some advantages of LEDs over Incandescent Power Lamps are:

- LEDs consume less power, and they require low operational voltage.
- No warm-up time is needed for LEDs.
- The emitted light is monochromatic.
- They exhibit long life and ruggedness.

3.2 SOFTWARE REQUIREMENTS: -

3.2.1 ARDUINO INSTALLATION:

After learning about the main parts of the NodeMCU, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board. In this section, we will learn in easy steps how to set up the Arduino IDE on our computer and prepare the board to receive the program via USB cable.

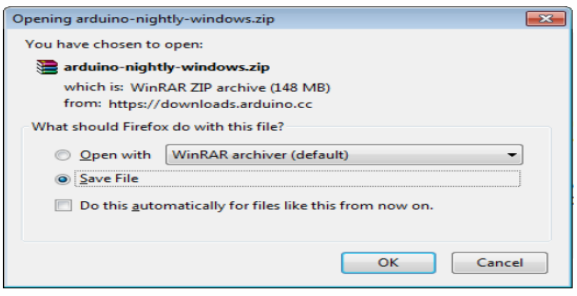
Step 1

First you must have your NodeMCU board and a USB cable. In case you use ESP8266, you will need a standard Micro-USB cable the kind you would connect to a USB printer as shown in the following image.

Fig: Esp8266 connecting cable

Step 2 − Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Arduino Official website. You must select your software, which is compatible with your operating system. After your file download is complete, unzip the file.



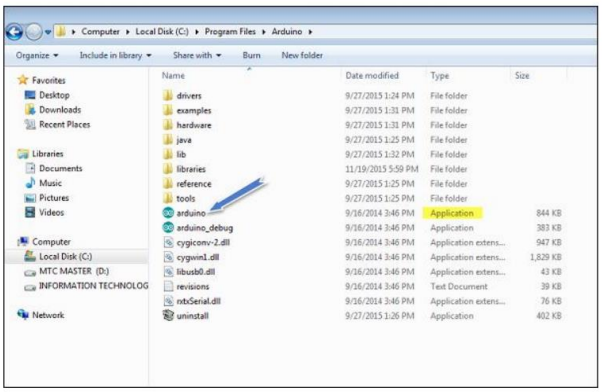
Step 3 − Power up your board.

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either the USB connection to the computer or an external power supply. If you are using an Arduino Decimal, you have to make sure that the board is configured to draw power from the USB

connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED should glow.

Step 4 − Launch Arduino IDE.

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label application.exe application.exe. Doubleclick the icon to start the IDE

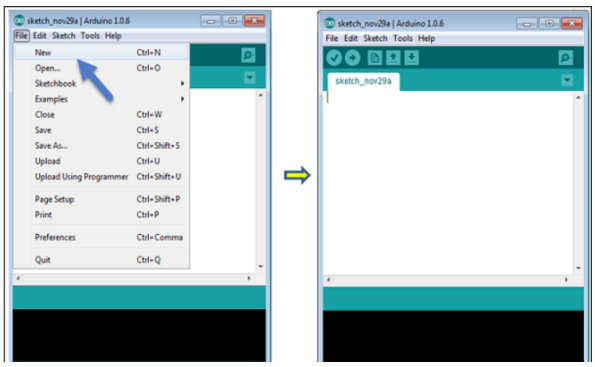


Step 5 − Open your first project.

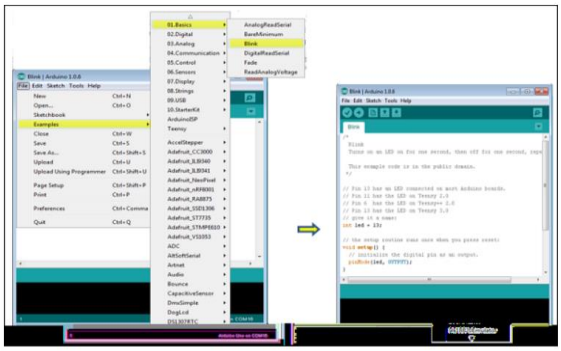
Once the software starts, you have two options −

❖ Create a new project.

❖ Open an existing project example. To create a new project, select File → New.



To open an existing project example, select File → Example → Basics → Blink.

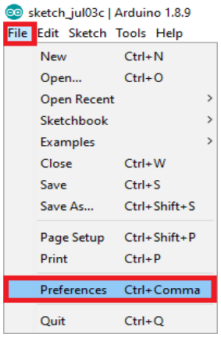


Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example from the list.

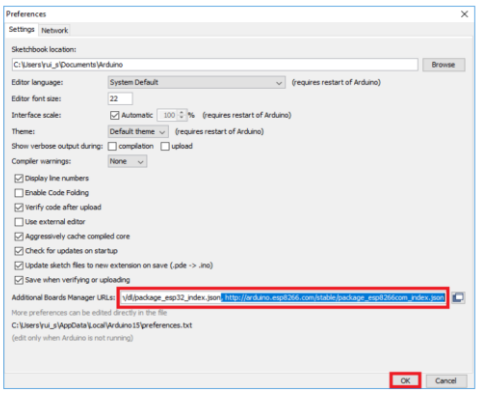
Step 6 – Install ESP8266 Add-on in Arduino IDE:-

To install the ESP8266 board in your Arduino IDE, follow these next instructions:

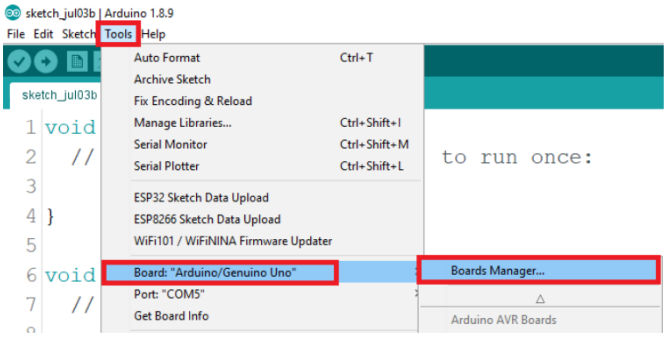
1. In your Arduino IDE, go to File> Preferences



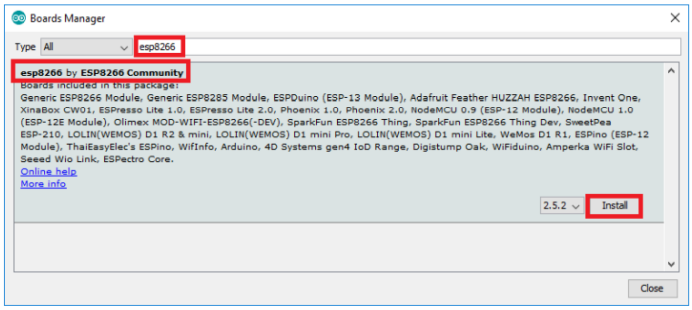
2. Enter http://arduino.esp8266.com/stable/package_esp8266com_index.json into the "Additional Boards Manager URLs" field as shown in the figure below. Then, click the "OK" button:



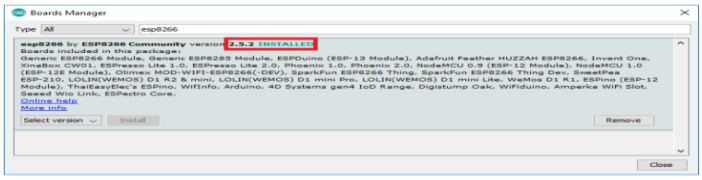
3. Open the Boards Manager. Go to Tools > Board > Boards Manager…



4. Search for ESP8266 and press install button for the “ESP8266 by ESP8266 Community“:

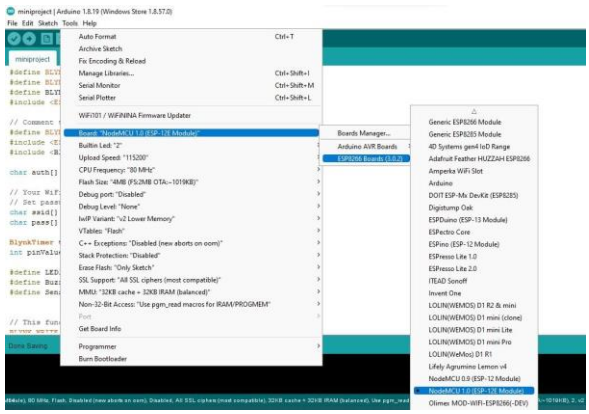


5. That’s it. It should be installed after a few seconds.



Step 7 − Select your ESP8266 board.

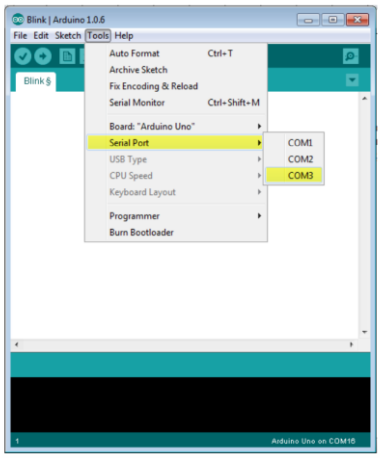
To avoid any error while uploading your program to the board, you must select the correct ESP8266 board name, which matches with the board connected to your computer. Go to Tools → Board and select your board.



Here, we have selected the NodeMCU 1.0 (ESP-12E Module) board.

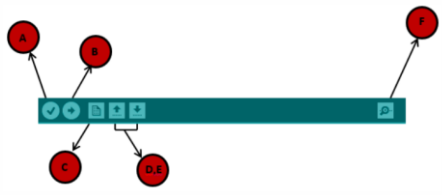
Step 8 − Select your serial port.

Select the serial device of the Arduino board. Go to Tools → Serial Port menu. This is likely to be COM3 or higher. To find out, you can disconnect your Arduino board and reopen the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



Step 9 − Upload the program to your board.

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.



- A − Used to check if there is any compilation error.
- B − Used to upload a program to the Arduino board.
- C − Shortcut used to create a new sketch.
- D − Used to directly open one of the examples sketches.
- E − Used to save your sketch.
- F − Serial monitor used to receive serial data from the board and send the serial data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note − If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

CHAPTER - 4

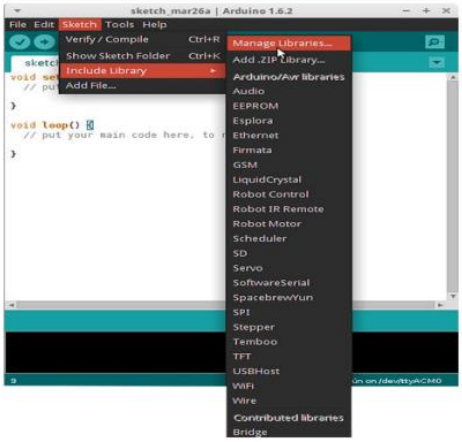
WORKING PROCESS

4.WORKING PROCESS

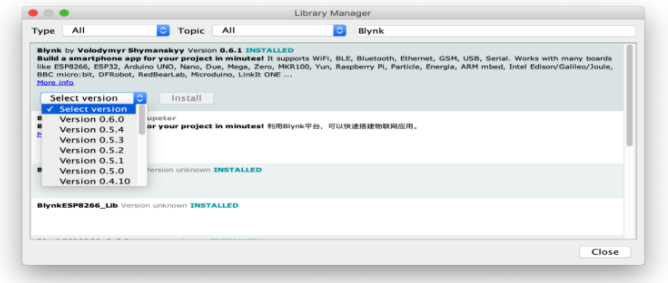
When this system is powered on, the NodeMCU board connects to the Blynk cloud through the internet. Then, we can turn ON and OFF this system using the Blynk app interface. When the fire alarm system is activated, the smartphone receives a push notification as soon as the red LED and buzzer is activated in the event of a fire. Afterward, the system goes back to normal. The device can be switched on and off using Google assistant using the “Switch on” and “Switch Off” commands.

4.1 Install Blynk Library for Arduino IDE

1. Install Blynk Library using built-in library manager in Arduino IDE install a new library into your Arduino IDE you can use the Library Manager. Open the IDE and click to the "Sketch" menu and then Include Library > Manage Libraries.



Then the Library Manager will open and you will find a list of libraries that are already installed or ready for installation. Search for Blynk library and in the version selection choose the latest version to date.



Finally click on Install and wait for the IDE to install the new library. Downloading may take time depending on your connection speed. Once it has finished, an Installed tag should appear next to the Bridge library. You can close the library manager.

You can now find the new library available in the Sketch > Include Library menu.

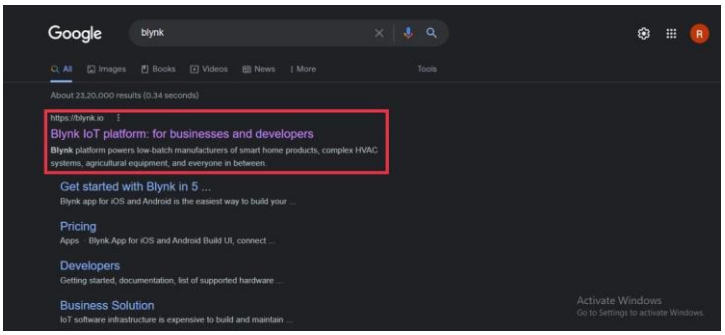
2. Install Blynk as a ZIP file in Arduino IDE.

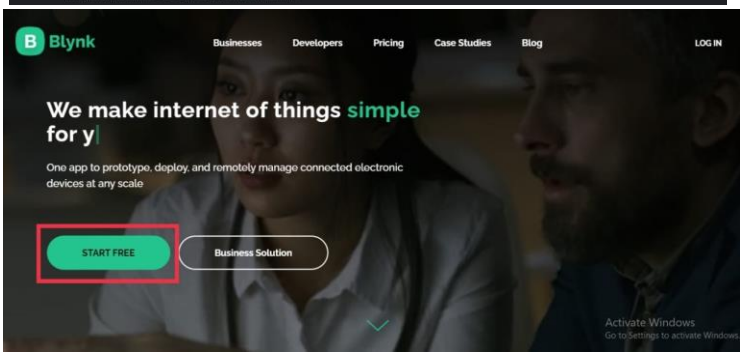
3. Install Blynk library manually.

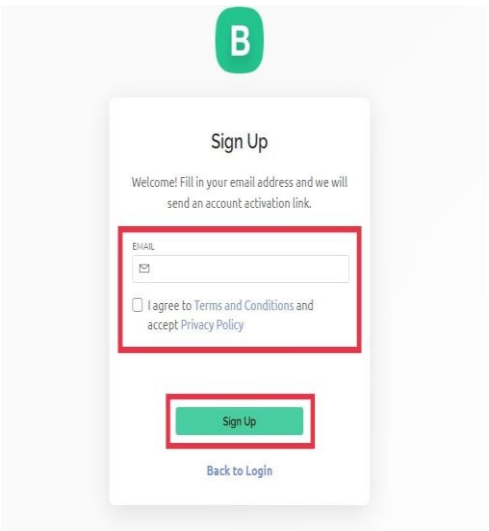
SETTING UP BLYNK APPLICATION FOR FIRE ALARM

Let's set up the Blynk web application step by step. For that, use the instructions below.

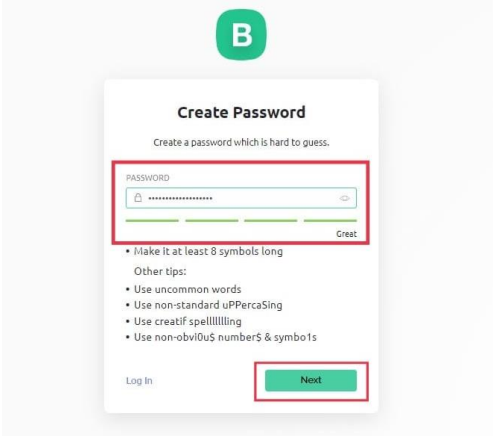
Step 1: Go to the Blynk website using your browser. Then, click the "Start Free" button and sign up using your Gmail address.

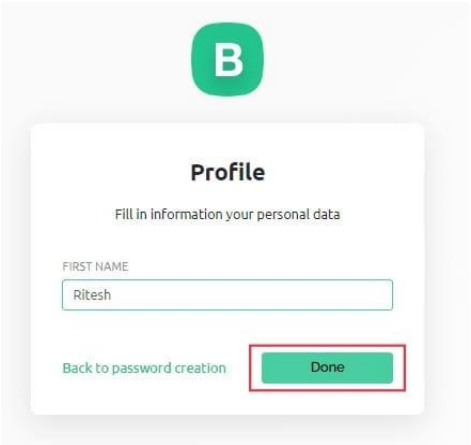




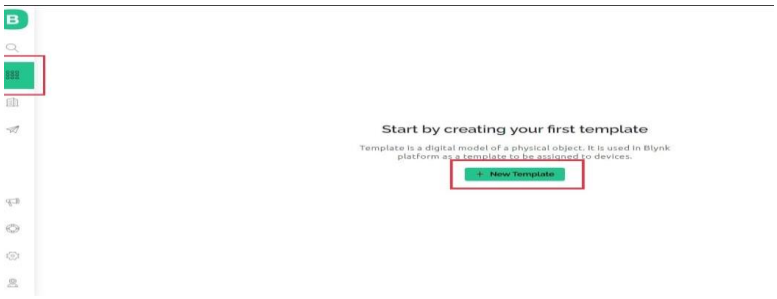


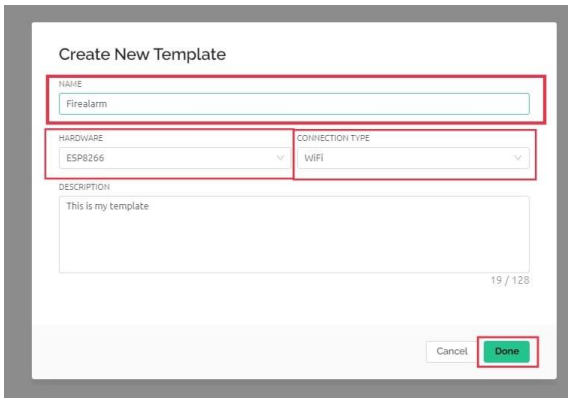
STEP 2: Check your registered email address and click the new Blynk email. After that, create your strong password as you like. Also, include the profile name and click the "done" button.



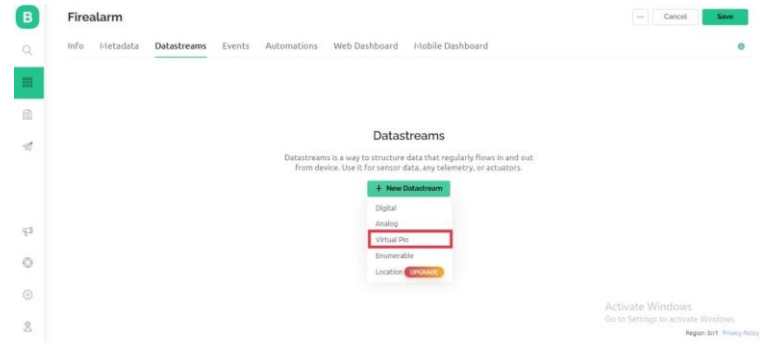


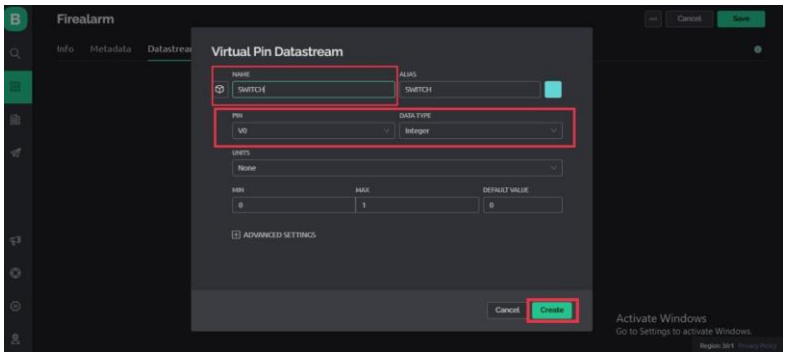
STEP 3: Now you can see the Blynk web app interface. Next, click the template button and create your first template. For that, first include your template name, device name, and connection type. Finally, click the “done” button.



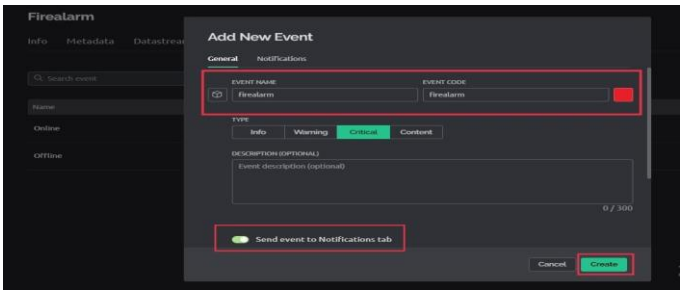


STEP 4: Next, go to the datastreams tab and select the Virtual PIN. Then, enter the name of your choice. Also, select the PIN as V0 and select the data type as integer. Finally click the “create” button.

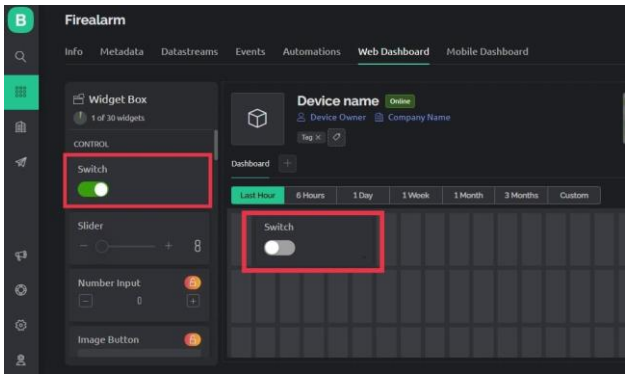


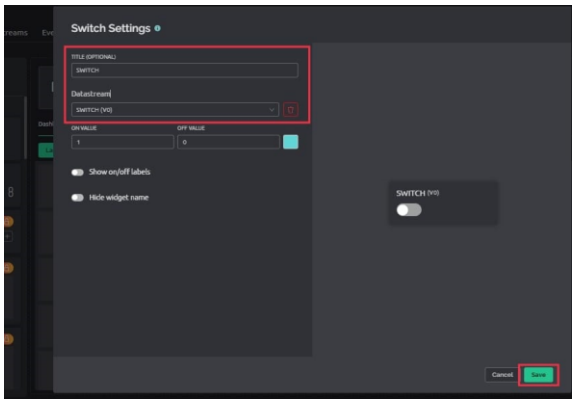


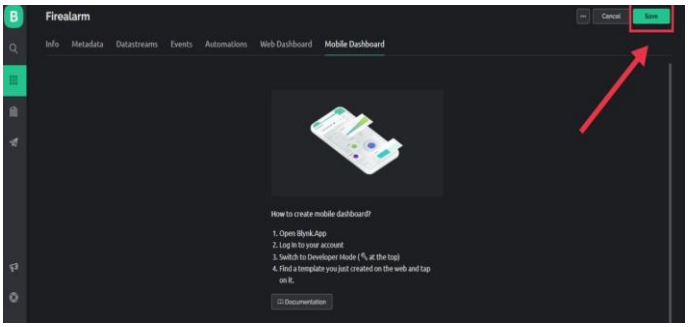
STEP 5: Now add an event for fire alert and enable the notifications.



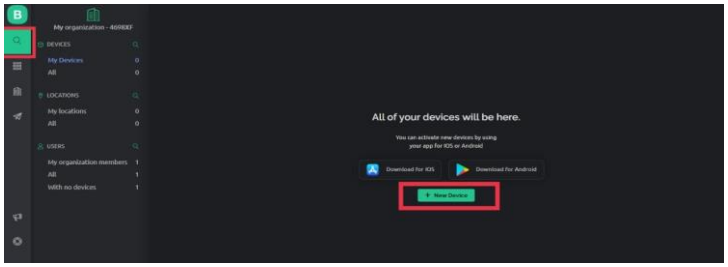
STEP 6: Next, go to the Web dashboard tab. Now you can set up your web dashboard. For that, drag and drop the widgets to the dashboard. I used one button. After, click the setting icon in the button and select your datastream we created earlier. Finally click the save button.

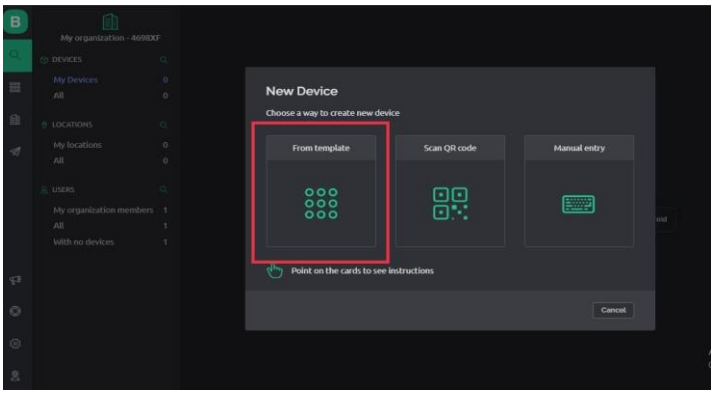


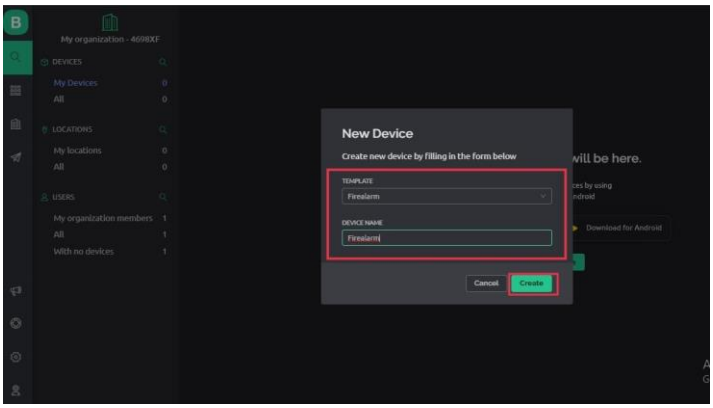




STEP 7: Now, click the search icon and create a new device. For that, click the "New device" button and select your template we created earlier.

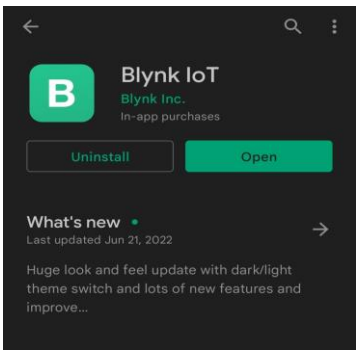




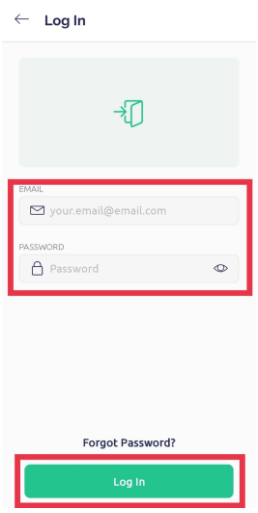


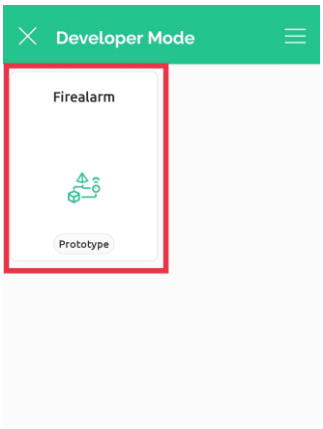
Now the Blynk web app is ready for us.

STEP 8: Now install the blynk app on the mobile.

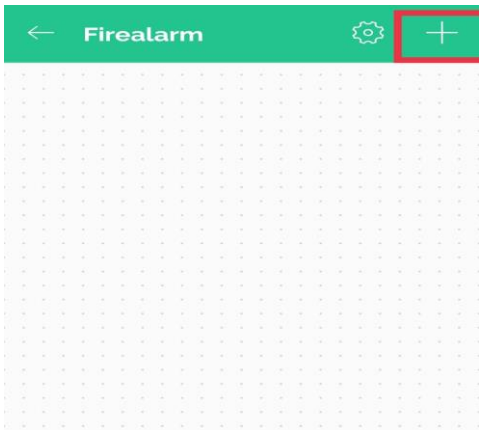


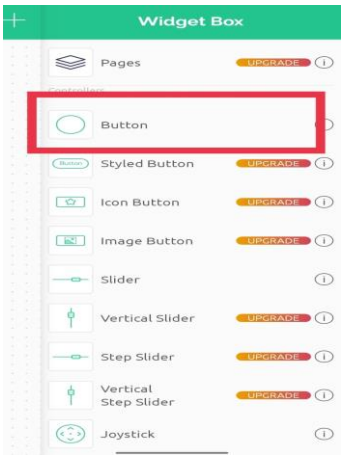
STEP 9: Next, enter your email and password that we created in the blynk web application. Now you can see the template we created in the web app. After that, click on this template and set up your mobile dashboard.

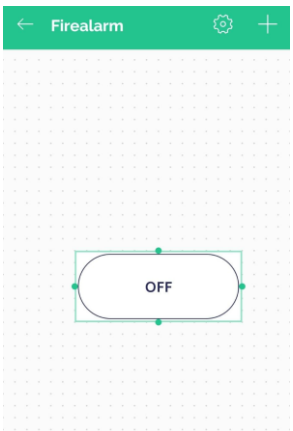




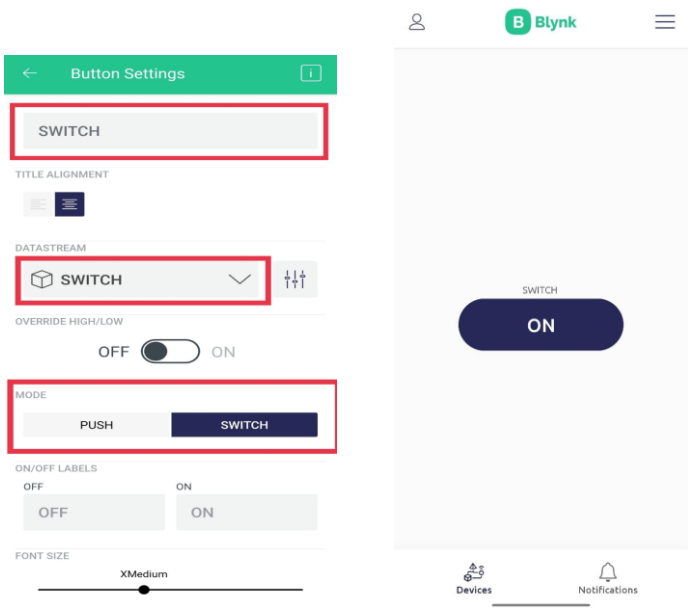
STEP 10: Now, click the button in the upper right corner and add one button widget to the dashboard. Then customize this button to your liking.







STEP 11: Next, click on this button and name it as you like. After, select data stream. For that, select the data stream we created in the web app. Finally, change the button mode as a switch.



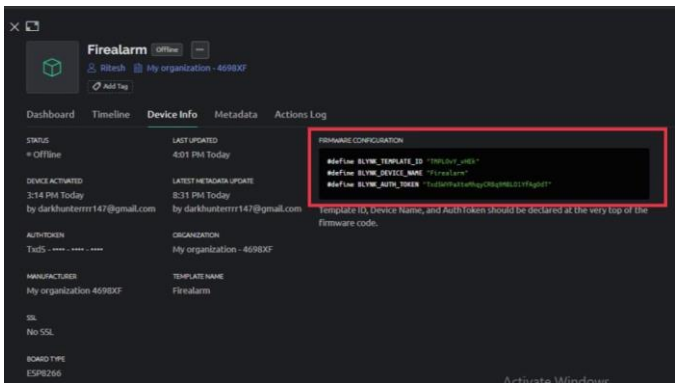
Now Blynk web and mobile versions are ready for us.

STEP 12: After creating the account in the blynk application again move to arduino ide for pasting

“#define BLYNK_TEMPLATE_ID "TMPLOvY_vHEk

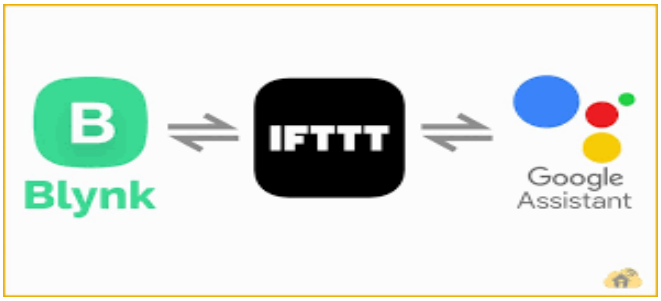
#define BLYNK_DEVICE_NAME "Firealarm"

#define BLYNK_AUTH_TOKEN "Txd5WYPaXteMhqyCRBq9MBLD1YfAgOdT" in the code.

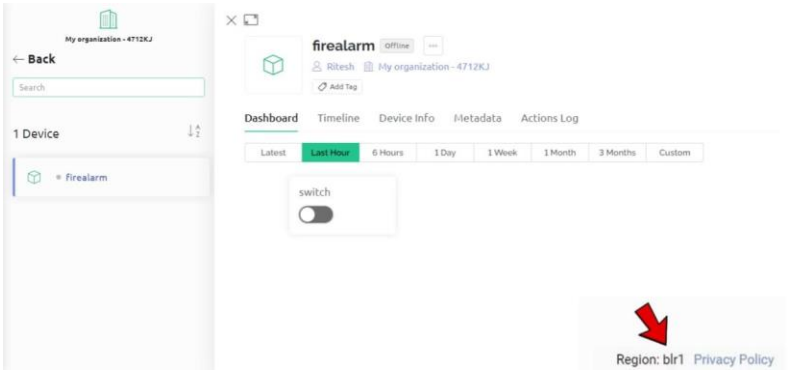


4.2 ADD-ON FEATURE

4.2.1 CONNECTING BLYNK WITH GOOGLE ASSISTANT USING IFTTT

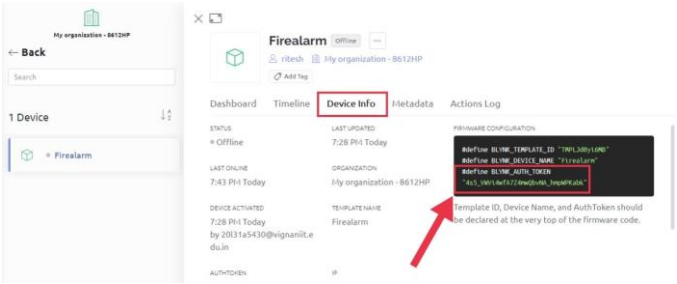


Step 1: For connecting the IFTTT with the Blynk server, you need the Blynk server address for your region and the Authentication Token for the Blynk project.



Step 2: How to get the Blynk Cloud server address?

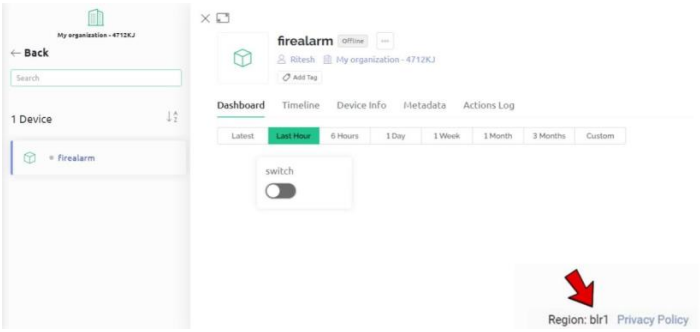
Identify the region of the Blynk server. For that login to the Blynk account, then go to the device. You can find the region at the bottom right corner. After that, visit Blynk Server Address Details to get the server address according to the region.



Step 3: How to get the Blynk Auth Token?

Login to the Blynk account, then go to the Devices tab and click on the device name to get all the details related to that device. Now to get the Auth Token, go to the “Device Info” tab. Then copy the Blynk Auth Token.

Update the {server_address} as per the region, then enter the {token} (Auth Token) and related {pin} for the Datastream and the {value} to be updated.

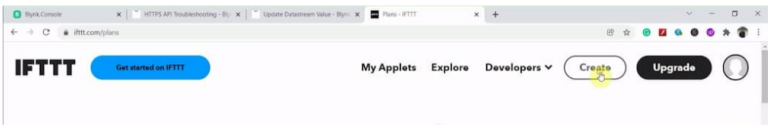


Step 4: Connect IFTTT Blynk to integrate Google Assistant

Create Account in IFTTT

Visit the following link and create a FREE account in IFTTT.

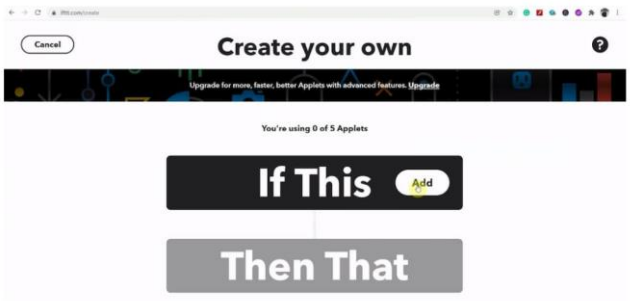
https://ifttt.com



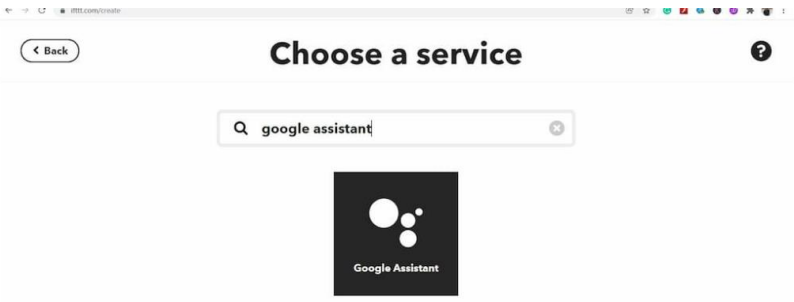
Step 5: Create Applet in IFTTT with Blynk Webhook URL

○ After login, first, you have to create an Applet. For that click on the “Create” button on the top.

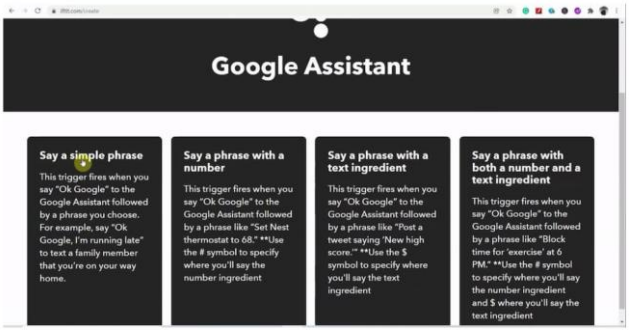
● For each applet, you have to create a trigger and an action. Here if you say any predefined commands in Google assistant, then the related Webhook request will be sent to the Blynk Cloud server.



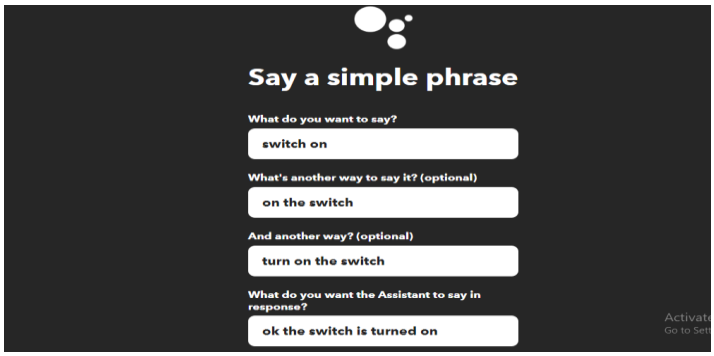
● In the trigger, you have to select Google Assistant. For that click on the “Add” button.



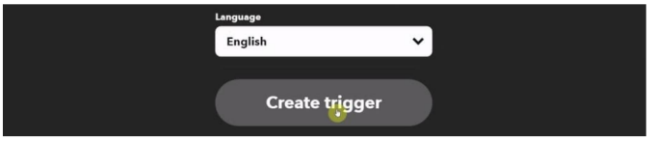
- Then search for Google Assistant and click on it.



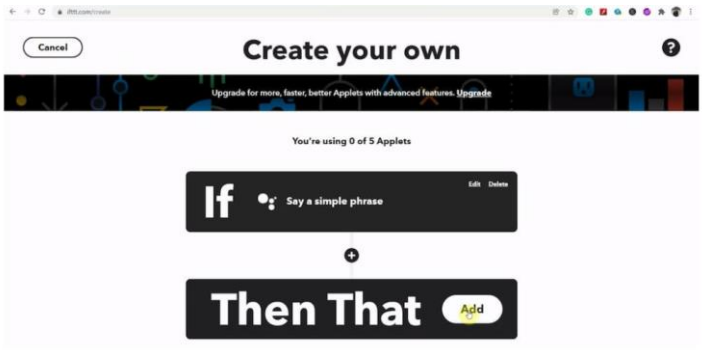
- Click on "Say a simple phrase". You also select other options as per requirements. Then click on "Connect" and give the required permission from the google account which you use for the Google Assistant.



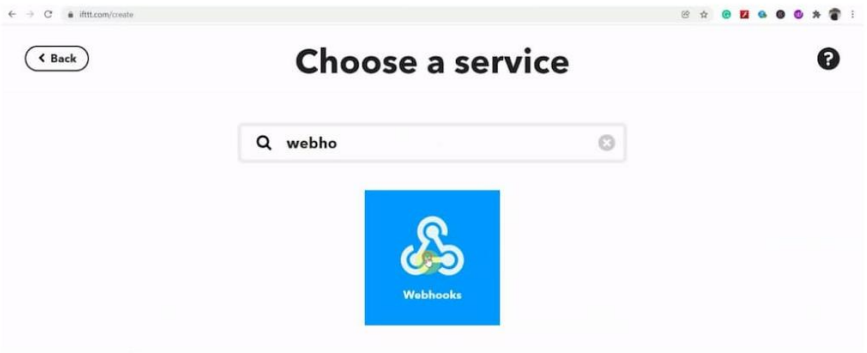
- After that, you have to enter what you want to say to Google Assistant to send the Webhook request to the Blynk server and what Google Assistant to say in response.



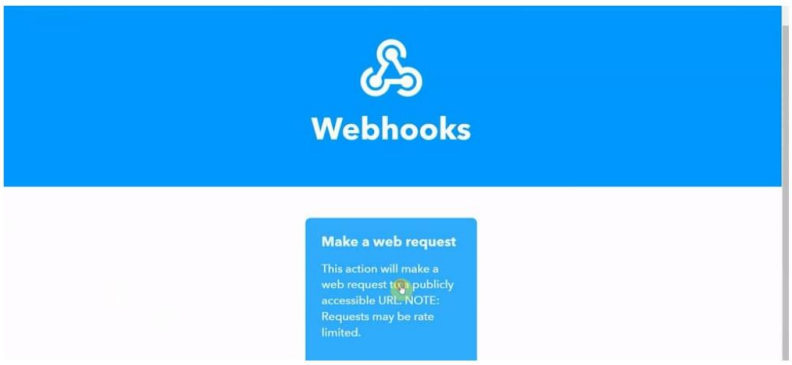
- Now, click on the "Create trigger" button.



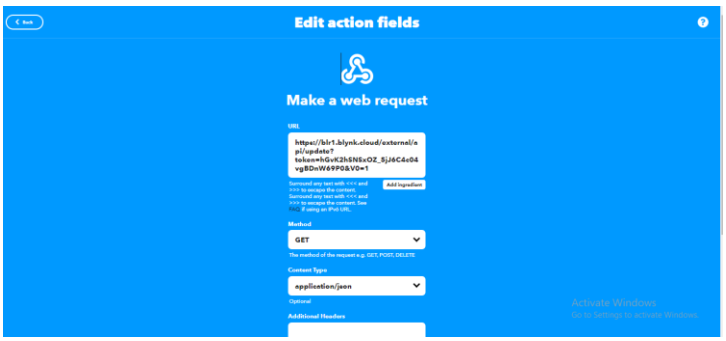
- Now you have to create action for the trigger you have just created. So click on the next “Add” button.



- Then search for Webhooks and click on it.



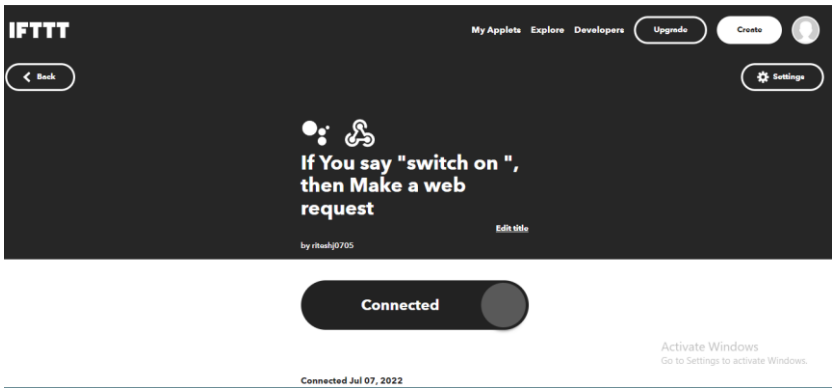
- Click on “Make a web request“.



- Now, enter the related Blynk URL to update the Datastream value. The method will be “GET”. Keep other details as it is.

- Click on the “Create action” button.

- We have created both the trigger and action for the first applet. So click on “Continue”.



- Now click on the “Finish“.

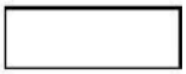
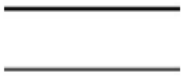
CHAPTER - 5

DESIGN

5.1 Data flow diagrams

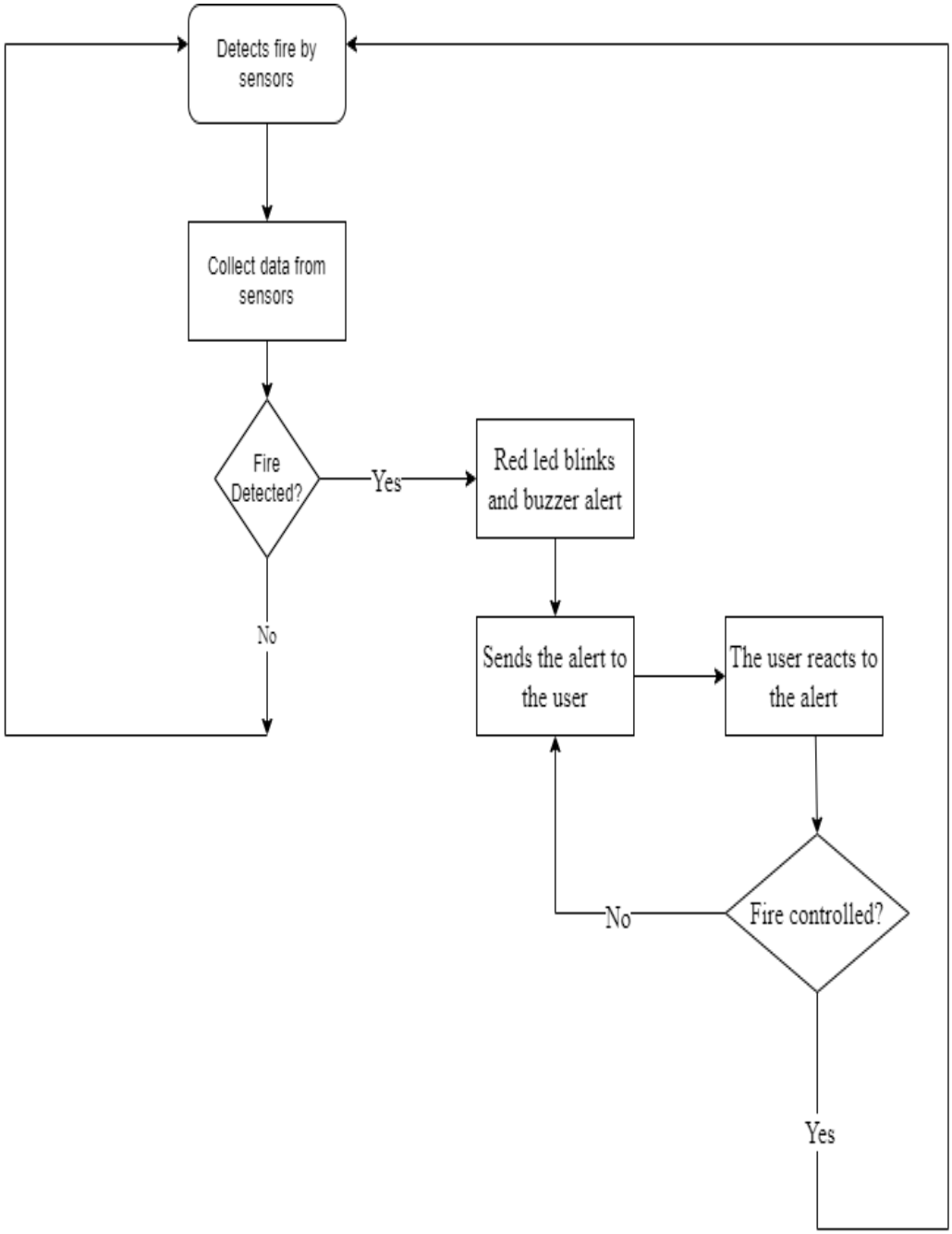
A data flow diagram is a graphical view of how data is processed in a system in terms of input and output. Data flow diagram is a graphical representation of flow of data through an information system modelling as its process aspects. A DFD shows what kind of information will be input to and output from the system, how data will advance through the system and where the data will be stored. The Data flow diagram (DFD) contains some symbols for drawing the data flow diagram.

Data flow diagram symbol: -

Symbol	Description
	**Data Flow** – Data flow are pipelines through the packets of information flow.
	**Process:** A Process or task performed by the system.
	**Entity:** Entity is object of the system. A source or destination data of a system.
	**Data Store:** A place where data to be stored.

:

5.2 FLOW DIAGRAM



5.3 UML Diagrams:-

UML means Unified Modelling Language. UML is used for visualizing, constructing and documenting the artifacts of software intensive systems. UML makes a clear conceptual distinction between models, views and diagrams. UML can be used to develop diagrams and provide users with ready-to-use, expressive modelling examples. Some UML tools generate program language code from UML.

UML can be used for modelling a system independent of a platform language. Unified Modelling Language (UML) is a non-proprietary specification language for object modelling. UML is a general-purpose modelling language that includes a standardized graphical notation used to create an abstract model of a system, referred to as a UML model.

UML is a standard language for specifying, visualizing, constructing, and documenting the artifacts of software systems.UML was created by the Object Management Group (OMG) and UML 1.0 specification draft was proposed to the OMG in January 1997. OMG is continuously making efforts to create a truly industry standard.

❖ UML stands for Unified Modelling Language.

❖ UML is different from the other common programming languages such as C++, Java, COBOL, etc.

❖ UML is a pictorial language used to make software blueprints.

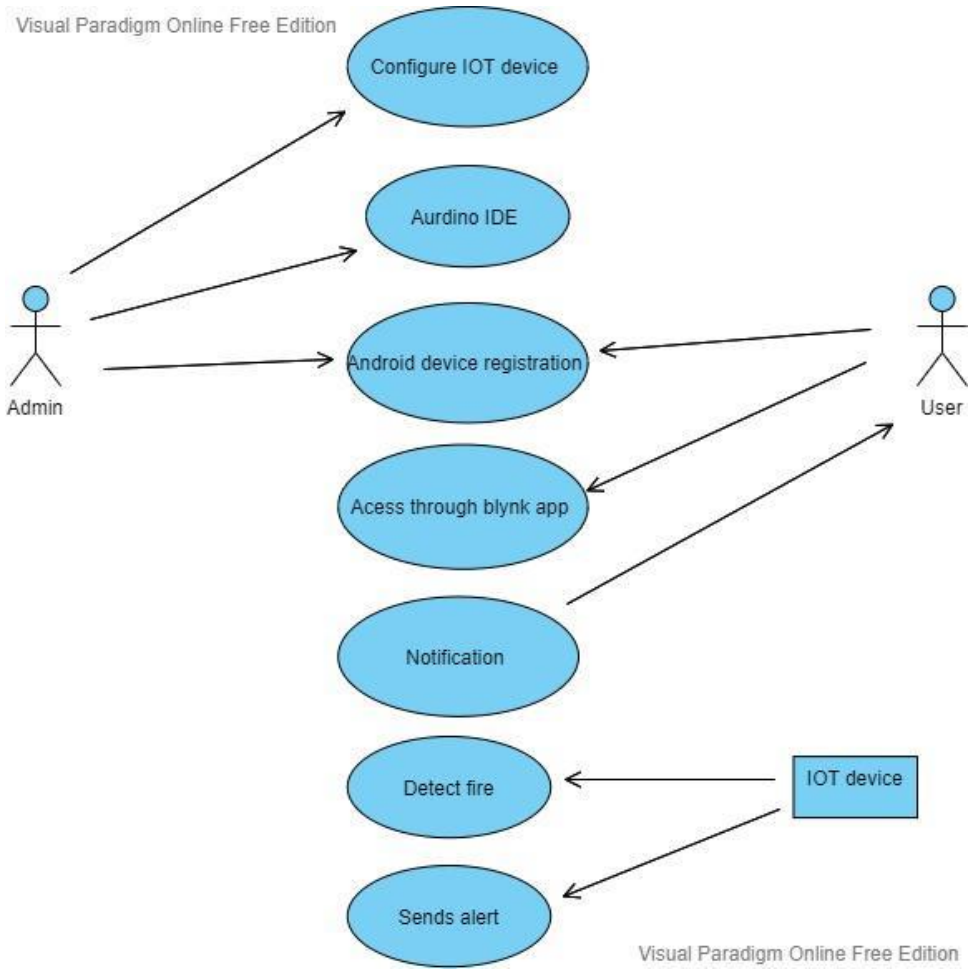
❖ UML can be described as a general-purpose visual modelling language to visualize, specify, construct, and document software systems.

❖ Although UML is generally used to model software systems, it is not limited within this boundary. It is also used to model non-software systems as well. For example, the process flows in a manufacturing unit, etc.

5.3.1 Use Case Diagram:-

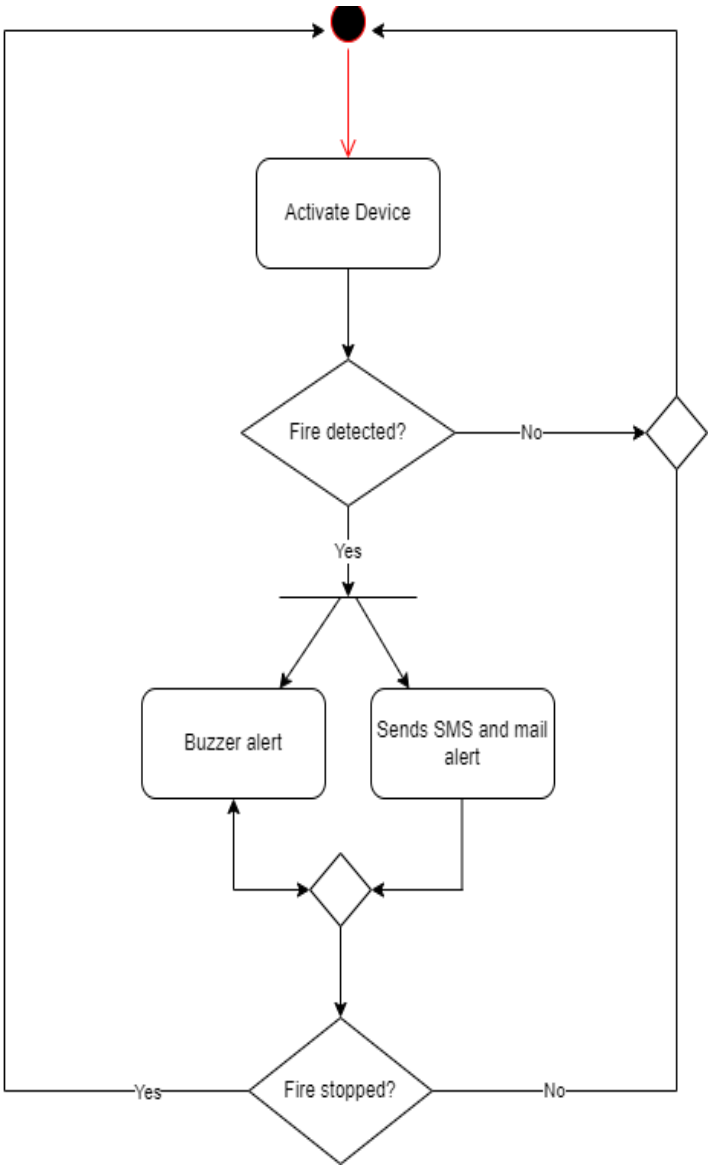
A use case diagram shows a set of use cases and actors and their relationships. Use case is represented as an eclipse within a name inside it. Use cases are used to capture high level functionalities of a system .Each use case should provide some observable and valuable result to the actors or other stakeholders of the system. Use case diagrams have a specialization of class diagrams and class diagrams are structured diagrams.

Use case diagrams are in fact two fold they are both behaviour diagrams because they describe behaviour of the system



5.3.2 Activity diagram:-

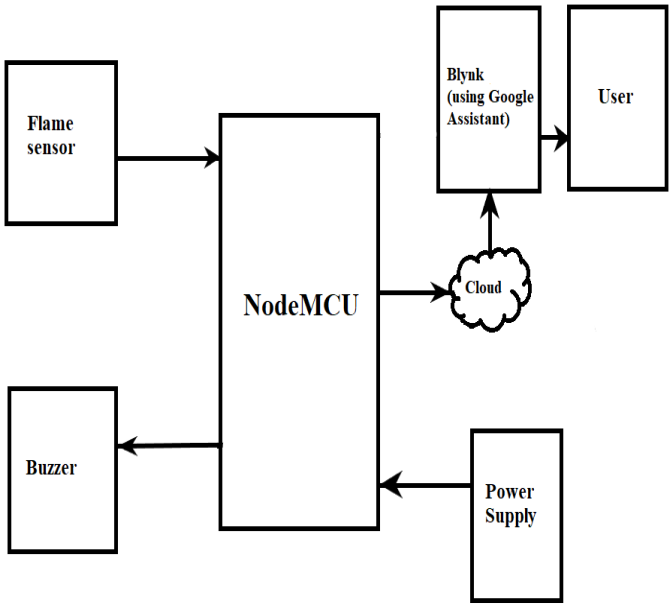
Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all types of flow control by using different elements such as fork, join, etc.



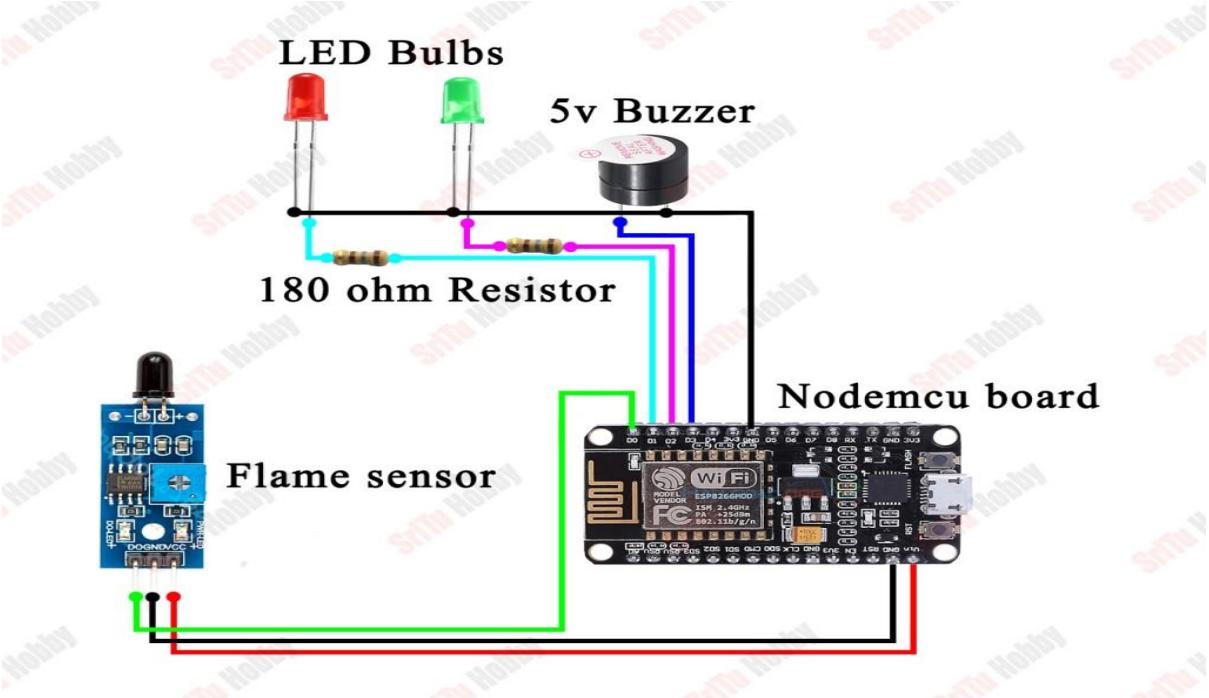
CHAPTER - 6

CIRCUIT DIAGRAM

6.1 BLOCK DIAGRAM



6.2 CIRCUIT DIAGRAM



CHAPTER - 7

SOURCE CODE

```
#define BLYNK_TEMPLATE_ID "TMPLOvY_vHEk"
#define BLYNK_DEVICE_NAME "Firealarm"
#define BLYNK_AUTH_TOKEN "Txd5WYPaXteMhqyCRBq9MBLD1YfAgOdT"

#include <ESP8266WiFi.h>
// Comment this out to disable prints and save space
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

char auth[] = BLYNK_AUTH_TOKEN;

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "";
char pass[] = "";
//WidgetLCD lcd(V4);
BlynkTimer timer;
int pinValue = 0;

#define LED1 D1
#define Buzzer D3
#define Sensor D0

// This function is called every time the Virtual Pin 0 state changes
```

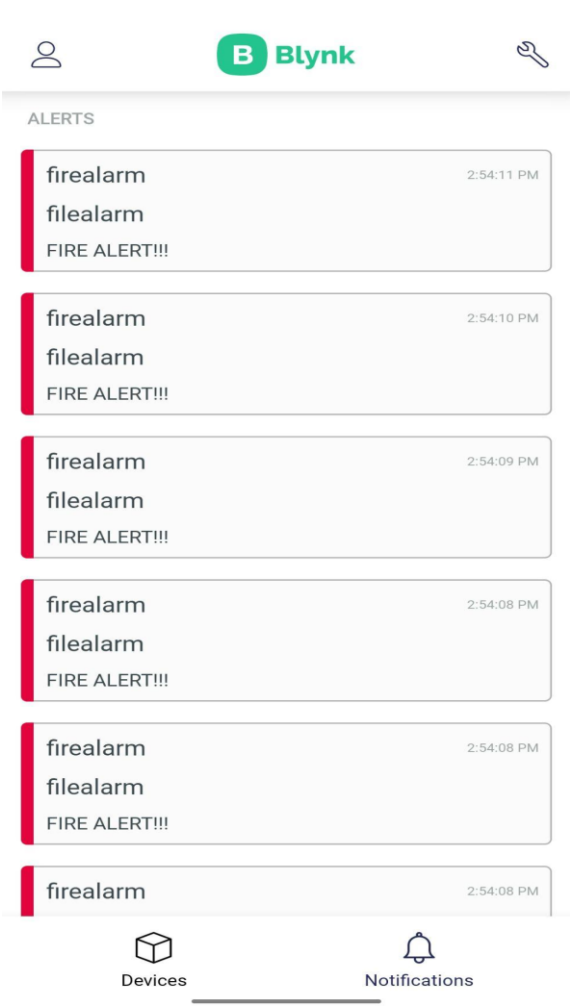
```
BLYNK_WRITE(V0) {
  pinValue = param.asInt();
}
BLYNK_CONNECTED() {
  // Request the latest state from the server
  Blynk.syncVirtual(V0);
}
// This function is called every time the device is connected to the Blynk.Cloud
// This function sends Arduino's uptime every second to Virtual Pin 2.
void notification() {
  int sensor = digitalRead(Sensor);
  if (pinValue == 1) {
Serial.println("System is ON");
    if (sensor == 1) {
      digitalWrite(LED1, LOW);
      digitalWrite(Buzzer, LOW);
    } else {
      Blynk.logEvent("fire alarm","FIRE ALERT!!!");
      digitalWrite(LED1, HIGH);
      digitalWrite(Buzzer, HIGH);
}
  } else{
        Serial.println("System is OFF");
}
 }
```

```
void setup()
{
  // Debug console
  Serial.begin(115200);
  pinMode(LED1, OUTPUT);
  pinMode(Buzzer, OUTPUT);
  pinMode(Sensor, INPUT);
Blynk.begin(auth, ssid, pass);
  // You can also specify server:
  //Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,150), 8080);

  // Setup a function to be called every second
  timer.setInterval(1000L, notification);
}
void loop()
{
  Blynk.run();
  timer.run();
  // You can inject your own code or combine it with other sketches.
  // Check other examples on how to communicate with Blynk. Remember
  // to avoid delay() function!
```

CHAPTER - 8

OUTPUT SCREENS


Blynk
ALERTS
firealarm
filealarm
FIRE ALERT!!!
2:54:11 PM
firealarm
filealarm
FIRE ALERT!!!
2:54:10 PM
firealarm
filealarm
FIRE ALERT!!!
2:54:09 PM
firealarm
filealarm
FIRE ALERT!!!
2:54:08 PM
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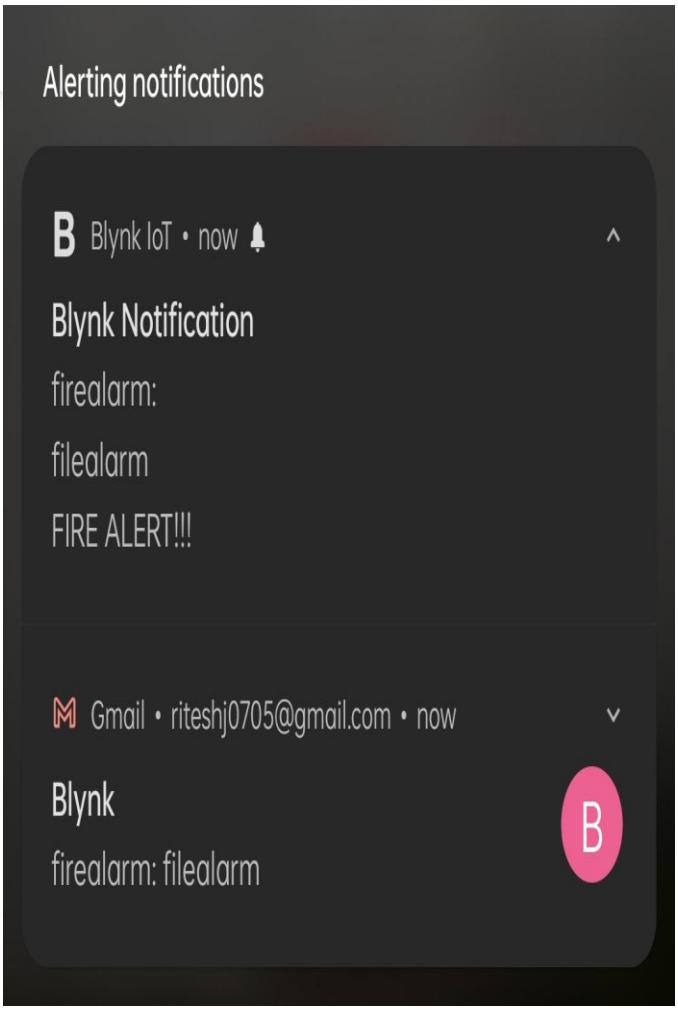
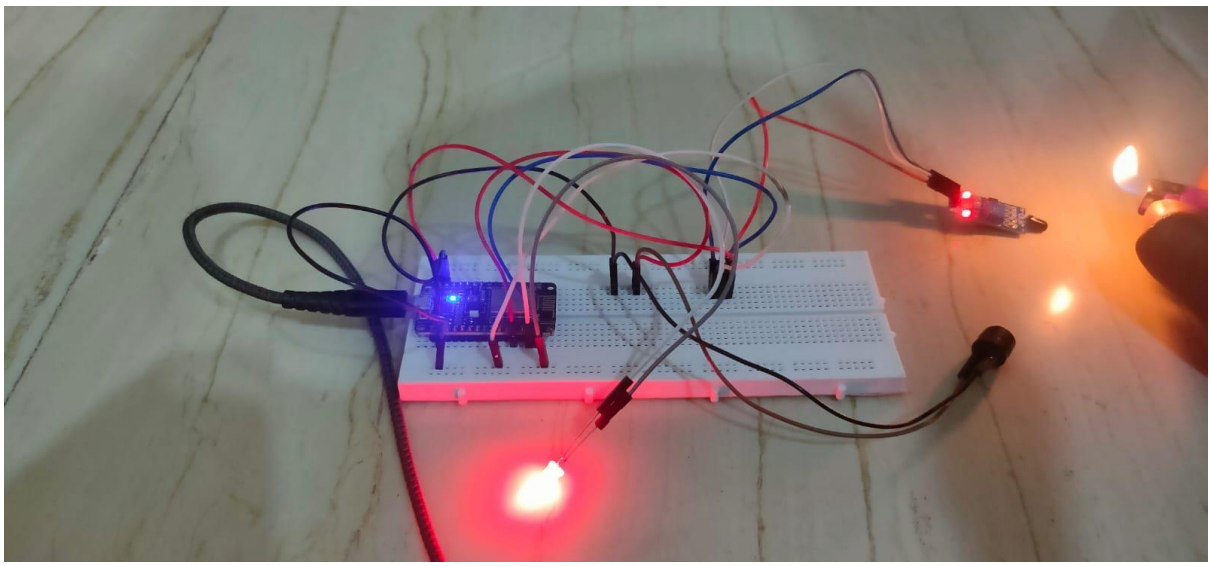
filealarm
FIRE ALERT!!!
2:54:08 PM
firealarm
2:54:08 PM
Devices
Notifications


Alerting notifications
Blynk IoT • now
Blynk Notification
firealarm:
filealarm
FIRE ALERT!!!
Gmail • riteshj0705@gmail.com • now
Blynk
firealarm: filealarm
B



CHAPTER - 9

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SMART FIRE DETECTION AND ALARM SYSTEM

- AN INTERNET OF THINGS(IOT) BASED PROJECT
- PROJECT BATCH -08

1. J.RITESH 20L31A5430
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3. K.MOUNIKA 20L31A5464
4. D.KAMALA 21L35A5401
5. U.RAJINI 20L31A5459

ABSTRACT

- Fire outbreak is a major concern at homes, offices, industries etc. It is dangerous and requires high security and control and control to avoid destruction. One if the preventive measures to avoid the danger is to install an automatic fire alarm detection .
- When this system is powered on, the Nodemcu board connects to the Blynk cloud through the internet. Then, we can turn ON and OFF this system using the Blynk app interface. When the system is activated, the smartphone receives a push notification as soon as the red LED and buzzer is activated in the event of a fire. Afterward, the system goes back to normal. Then the green LED bulb is activated.
- The system uses the components such as Nodemcu board(ESP8266) , Flame sensor, LED, 180-ohm resistor , Buzzer , Breadboard, Jumper wires .

DISADVANTAGES OF EXISTING SYSTEM

- The existing fire alarm system in market nowadays is too complex in terms of its design and structure.
- Since the system is too complex, it needs regular maintenance to be carried out to make sure the system operates well. Meanwhile, when the maintenance is being done to the existing system, it could raise cost of the system.
- The problem is that the conventional fire extinguishing systems are not enough to take prompt action during fire outbreak and hence, save life.

ADVANTAGES OF PROPOSED SYSTEM

- This project therefore seeks to design a microcontroller fire alarm and control system that will continuously monitor the presence of significant amount of heat and activate an alarm and send an SMS alert .
- The project is designed with a low cost and all level users can have one for a safety purpose.
- This project therefore seeks to design a fire alarm system that will continuously monitor the presence of significant amount of heat .
- Send a Short Message Service(SMS) alert and extinguish the fire as a safety measure to contain the situation.

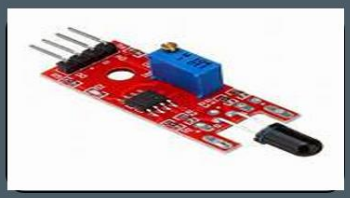
COMPONENTS

- Nodemcu board(ESP8266)
- FLAME SENSOR MODULE
- LED
- 180-ohm resistor
- 5v buzzer
- Breadboard
- WIRES

COMPONENT DETAILS:

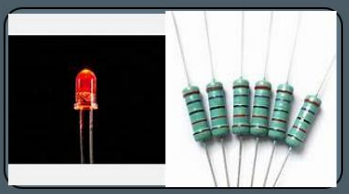
Nodemcu board(ESP8266)

NodeMCU is predicated on the Esperessif ESP8266-12E Wi-Fi System-On-Chip. It is based on Lua-based firmware and is open-source.



FLAME SENSOR MODULE

It is also known as the Infrared IR Fire Sensor Detector. This Flame Sensor is extremely sensitive to IR wavelengths between 760-1100nm light. This flame sensor is ideal for short-range fire detection and can be used to monitor projects or as a safety, precaution to cut devices OFF / ON or to turn ON buzzers or Send SMS.

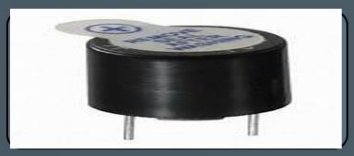


LED &180-ohm resistor

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

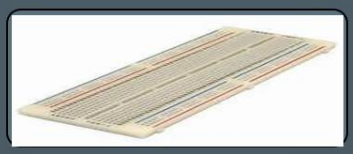
The main purpose of resistor is to reduce the current flow and to lower the voltage in any particular portion of the circuit.

COMPONENT DETAILS:



5v buzzer

It has a total of three male headers. The middle pin is not used. The + pin is connected with one of the Arduino's I/O pins while the – pin is connected with the Arduino's ground.



Breadboard

Breadboard is a prototype that acts as a construction base of electronics.

Connecting wires

Allows an electrical current to travel from one point on a circuit to another, because electricity needs a medium through which to move.

BENEFIT OF SMART FIRE DETECTION AND ALARM SYSTEM TO THE SOCIETY

HOUSEFIRES OCCUR IN HOUSES MOSTLY IN THE KITCHENS AND BEDROOMS. IT LEADS TO DAMAGE OF THE PROPERTY AND ALSO LIVES. IN ORDER TO AVOID THAT OR TO MINIMIZE THE DAMAGE CAUSED BY A FIRE OUTBREAK AN IOT (INTERNET OF THINGS) TECHNOLOGY IS USED TO CONTROL SUCH A KIND OF RISK. NODEMCU BASED IOT FIRE DETECTOR IS ONE OF THE SOLUTIONS WE IMPLEMENTED FOR THIS KIND OF ISSUE. IN THIS MODEL, WE HAVE FITTED A FIRE INDICATOR BY MAKING PRACTICAL AND EFFECTIVE USE OF NODEMCU WHICH IS CONNECTED WITH A FLAME SENSOR AND BUZZER ALONG WITH LED'S. FLAME SENSOR IS MOST SENSITIVE TO NORMAL LIGHT. THAT'S WHY THIS SENSOR MODULE IS USED IN FLAME ALARMS. BUZZER INTERFACED WITH IT MAKES AN ALERT SOUND AND LIGHTS ALSO BLINK ALONG WITH THEM. THE RESPONSE OF THESE SENSORS IS FASTER AS WELL AS MORE ACCURATE COMPARED WITH A HEAT/SMOKE DETECTOR BECAUSE OF ITS MECHANISM WHILE DETECTING THE FLAME. THE BUZZER STOPS ITSELF AT WHATEVER POINT THE TEMPERATURE FALLS TO COMFORTABLE INDOOR TEMPERATURE AND THE AMOUNT OF HEAT DECREASES. NODEMCU FIRE FINDER SERVES BEST BECAUSE AT WHATEVER POINT IT INDICATES FIRE OR SMOKE, THEN IT IMMEDIATELY ALARMS THE ADMIN OR USER ABOUT THE FIRE THROUGH THE SMS THAT IS SENT USING THE BLYNK APPLICATION. THE DEVICE CAN BE SWITCHED ON AND OFF USING GOOGLE ASSISTANT USING THE "SWITCH ON" AND "SWITCH OFF" COMMANDS "CONNECTING BLYNK WITH GOOGLE ASSISTANT USING IFTTT". AT WHATEVER POINT A FIRE HAPPENS, THE USER GETS THE ALERT NOTIFICATION THROUGH SMARTPHONE.