



A Project Report on

IOT BASED FIRE ALARM

Performed By

Pramod P. Patil

19UEE036

Department of Electrical Engineering

D.K.T.E Society's

Textile and Engineering Institute, Ichalkaranji
(An Autonomous Institute Affiliated to Shivaji University Kolhapur)

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Chapter-1

Introduction

Having a fire alarm system is essential to ensure the safety for the people lives and reduces the amount of losses as much as possible. However, most of the homes lack these fire alarm systems, which might put the resident in danger when a fire break out in their home, either in their presence or absence. Even though some residence have a conventional fire alarm system installed in them, these conventional fire alarm system have some limitation specially when it comes to being activated while the owners of the house are not present, or they are asleep and cannot hear the alarm. This paper tackles and mentioned problem by proposing a fire alarm system that can communicate with the firefighting department to speed up the process of rescuing lives and properties.

Several smart fire alarm system were proposed. For example “nest protect” is a smart fire alarm device, it could function as a single stand alone device with smoke and carbon monoxide detector. Nest produces an alarm sound and send a notification to the users when fire is detected

This system based on wireless connectivity between sensing nodes , each of which were composed NodeMCU ESP-8266/ESP-32 along with wifi shield that are connected to temperature and humidity sensor IR FLAME SENSOR .The sensing node collect the surrounding’s required information and these data to the cluster head that does the data aggregation and the data packet transmissions .Then the data is transmitted wirelessly to the gateways that will then be used for notification using Andriod studio programming . In their design, the central node is always powered so as not to lose energy, while the other nodes are powered using a battery, which means they are exposed energy depletion. When fire is detected

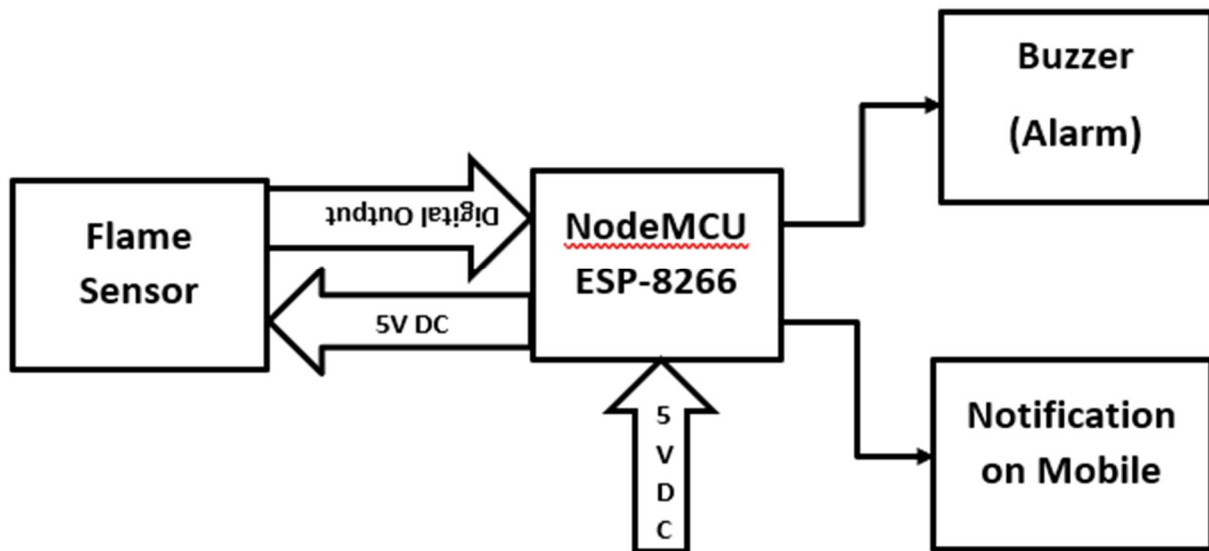
The signal from the sensing nodes is sent to the centralized node that in turn will notify the user by sending a notification on their mobile device with the user by sending a notification on their mobile device with the details of the sensor and a message.

System described earlier are dedicated to fire detection and notification to connected parties. The proposed IoT – based fire alarm system resembles these system as well. However, notification to user will be done via wifi module. The system consist a different distributed nodes that communicate with each other once triggered externally either users by request or by a fire and the gateway of this system will be single centralized nod. The nodes communicate within the network via their wifi.

Chapter 2

System Implementation

2.1 Block Diagram with Explanation:



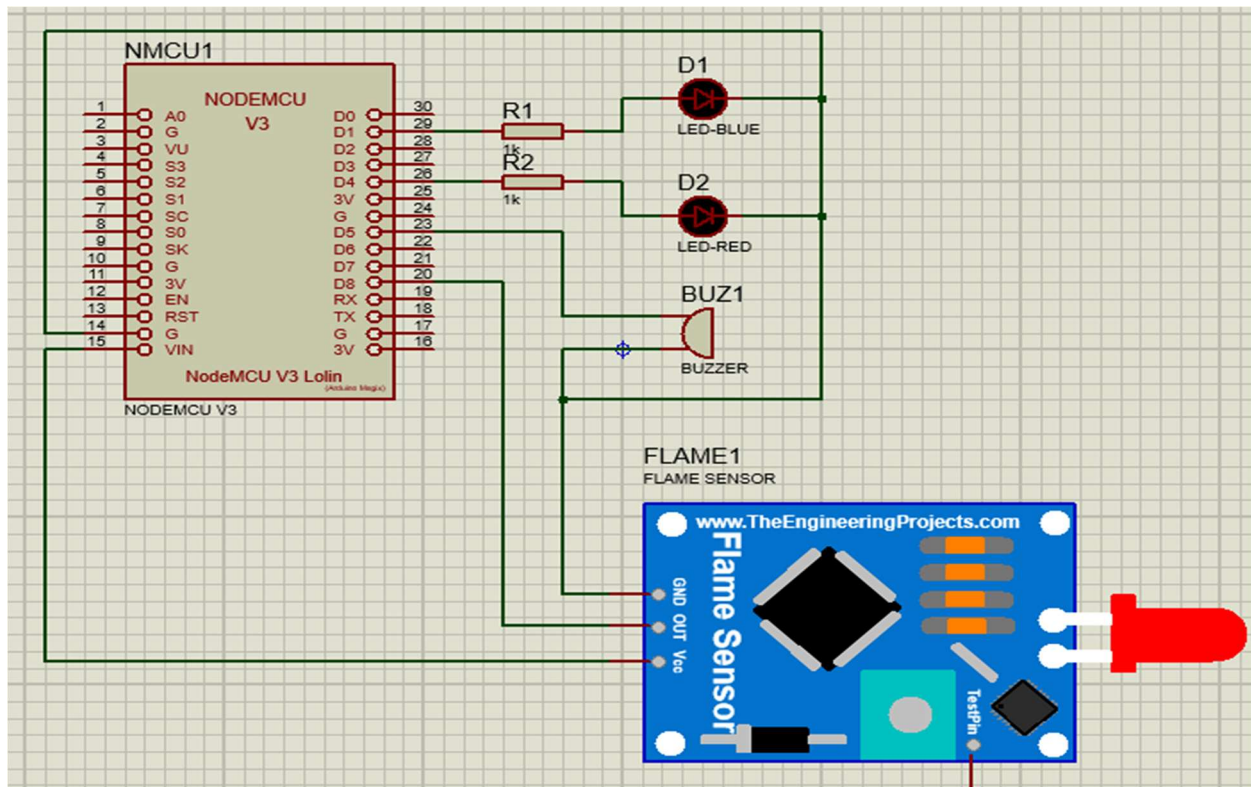
In this project, NodeMCU ESP-8266/ESP-32 is main component & processing unit. It is powered by 5V DC power supply. All other components are peripheral to NodeMCU ESP-8266/ESP-32. This component is connected with network through wifi and send notification on smartphone to user when fire detected.

Flame sensor is Infrared fire detecting sensor which gives digital input to NodeMCU ESP-8266/ESP32 when fire detected. This sensor takes power from NodeMCU. This works as input device.

Buzzer is connected to NodeMCU as output device. This buzzer makes sound/alarm when receives signal from NodeMCU.

Red and Blue LEDs are connected to NodeMCU through resistors. These LEDs act as indicators.

2.2 Circuit Diagram with Explanation:



Circuit Diagram of IoT based Fire Alarm

DO pin of flame sensor is connected to D8 pin of NodeMCU. Vcc and GND pins of flame sensor is connected to VIN and GND pins of NodeMCU respectively.

Blue LED's anode is connected D1 pin of NodeMCU through 1K resistor. Also Red LED's anode is connected to D4 pin of NodeMCU through 1K resistor. Anode of Buzzer is connected to D5 pin of NodeMCU. Cathode terminals of Blue LED, Red LED and Buzzer are commonly grounded or connected to GND pin of NodeMCU.

NodeMCU ESP-8266 is connected to network through wifi connection.

2.3 Description of Hardware Components

- 1) **NodeMCU ESP-8266/ESP-32:** The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections. It has 17 GPIO pins through which user can connect various devices and sensors.
- 2) **Flame Sensor:** It is a device which is used to detect the presence of fire in its surrounding. In this project we will be using Infrared Flame Sensor to detect the fire. Infrared Flame Sensor consists of a photodiode coated with black epoxy which makes it sensitive to the infrared radiations having wavelength between 700nm to 1mm and can detect fire up to distance of 100cm within 60 degrees of angle of detection.
- 3) **Buzzer:** When current is applied to the buzzer it causes the ceramic disk to contract or expand and this creates sound which we hear. It is used to get alarm.
- 4) **LED's:** These are light emitting diodes which glows when they are forward biased. Here they act as indicators.
- 5) **Resistors:** This component limits current flowing through it. It is used to limit current which is given to LRD's.
- 6) **Breadboard:** This board is used to check working of built circuit before fabricating it. This helps to find out errors in circuit and remove it. Here all components are placed on breadboard and all are connected to each other by means of jumper wires or connecting wires.
- 7) **DC Supply:** All components are powered by 5V DC power supply. This power is supplied by power bank or smartphone charging adapter.

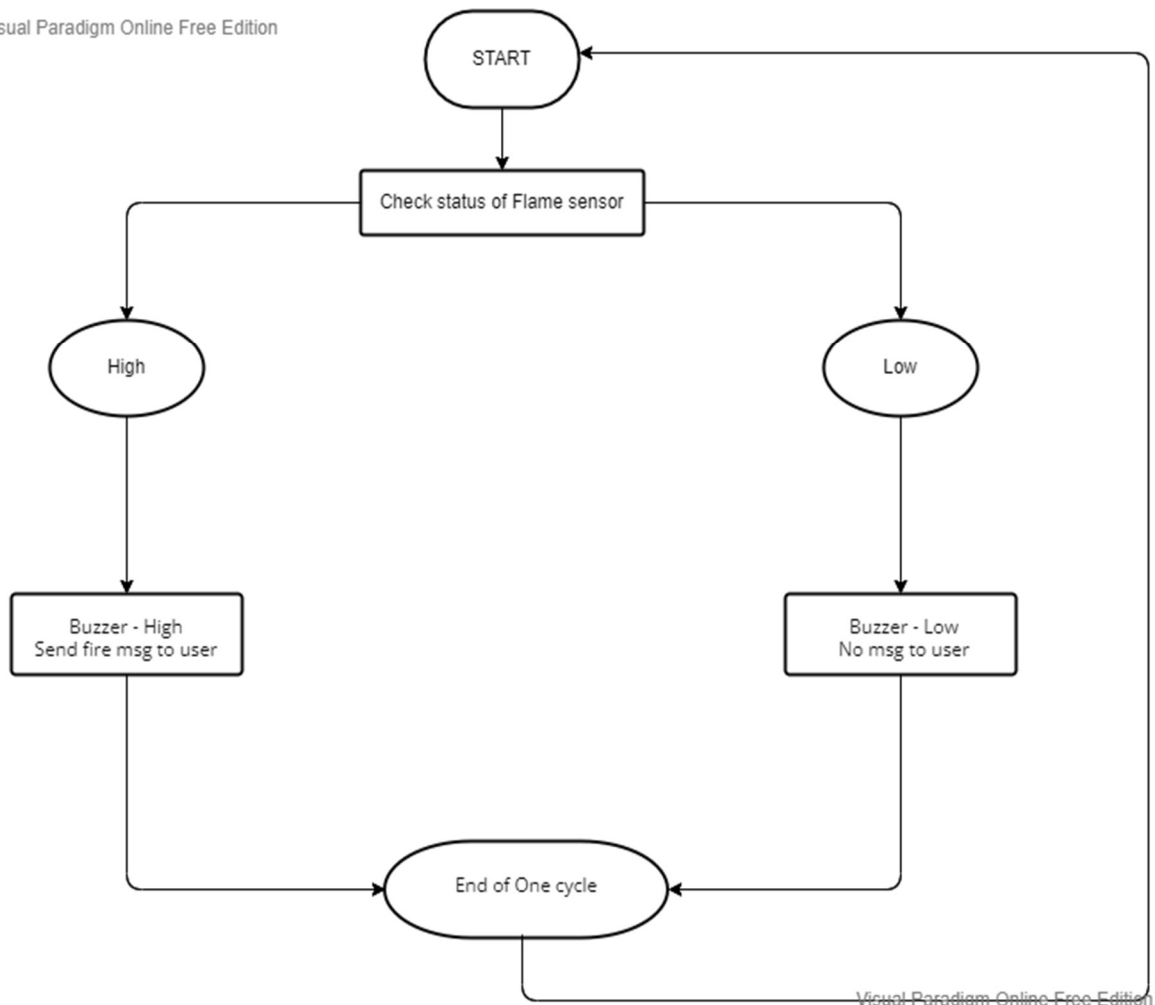
Softwares / Android Applications

- 1) **Arduino IDE:** This software is made for programming of various Arduino boards and NodeMCU boards. Program/ Code used in this project is compiled and uploaded to board using this software.
- 2) **Blynk IoT App:** This android application help users to manage their network connected devices and services. In this project, it is used to get fire notification on smartphone.

2.4 Algorithm (steps) of implemented work

- **Algorithm:**

Visual Paradigm Online Free Edition



Visual Paradigm Online Free Edition

- **Implementation steps:**

1. Place components on breadboard.
2. Make wiring connections as per circuit diagram.
3. Connect NodeMCU ESP-8266/ ESP-32 to computer/laptop using micro-USB cable.
4. Upload program to NodeMCU board using Arduino IDE.
5. Install Blynk app on user devices and set app using Authentication code provided in program.
6. Connect NodeMCU board and user device to internet through Wifi.

7. Now IOT based Fire alarm is ready to work.

- **Arduino Program/Code:**

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

int LED = D2;

int RELAY = D4;

int Flame_sensor = D1;

int Flame_detected;

BlynkTimer timer;

char auth[] = "A-pg5N8aDW6n1uFk-qxDV-Z7F5LqyNB5"; //Auth code sent via Email

char ssid[] = "Redmi";

char pass[] = "12345678";

void notifyOnFire()

{

    Flame_detected = digitalRead(Flame_sensor);

    Serial.println(Flame_detected);

    //delay(100);

    if (Flame_detected == 0) {

        Serial.println("Flame detected...! take action immediately.");

        Blynk.notify("Alert : Fire detected...! take action immediately.");

        digitalWrite(LED, HIGH);

        digitalWrite(RELAY, LOW);

        delay(500);
```



```

    }

    else if (Flame_detected == 1)

    {

        Serial.println("No Fire detected. stay cool");

        digitalWrite(LED, LOW);

        digitalWrite(RELAY, HIGH);

    }

}

void setup()

{

    Serial.begin(115200);

    Blynk.begin(auth, ssid, pass);

    pinMode(LED, OUTPUT);

    pinMode(RELAY, OUTPUT);

    digitalWrite(RELAY, HIGH);

    pinMode(Flame_sensor, INPUT_PULLUP);

    timer.setInterval(1000L, notifyOnFire);

}

void loop()

{

    Blynk.run();

    timer.run();

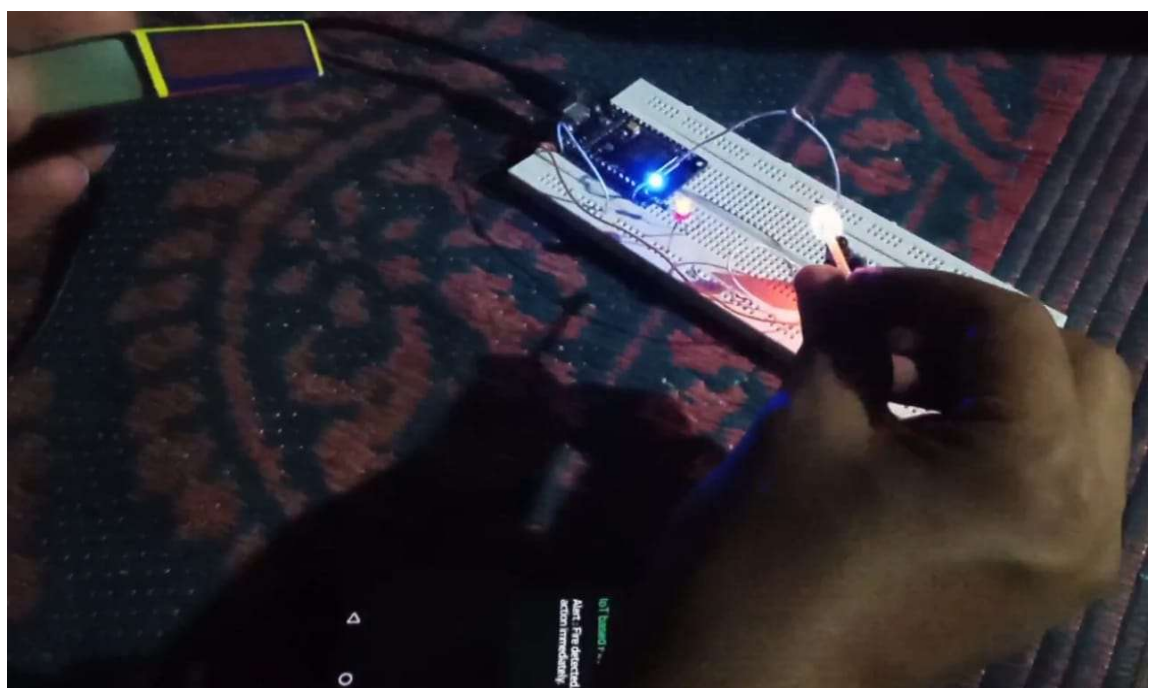
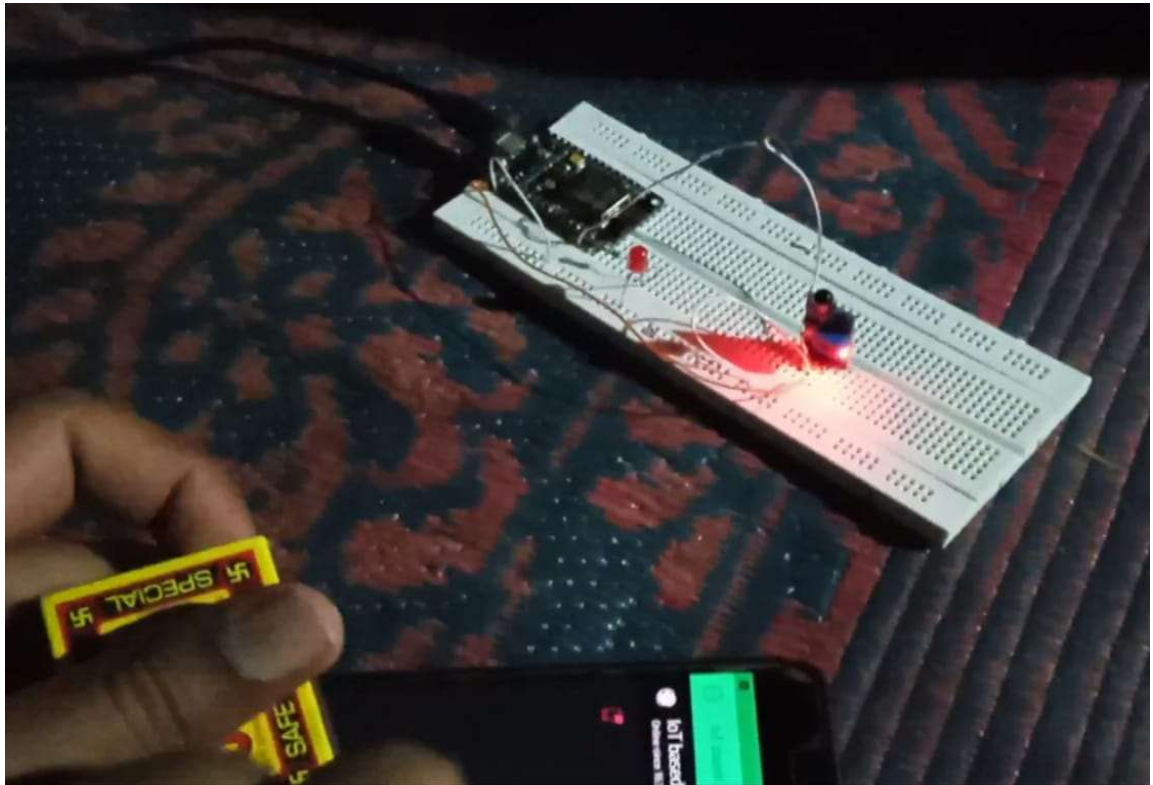
}

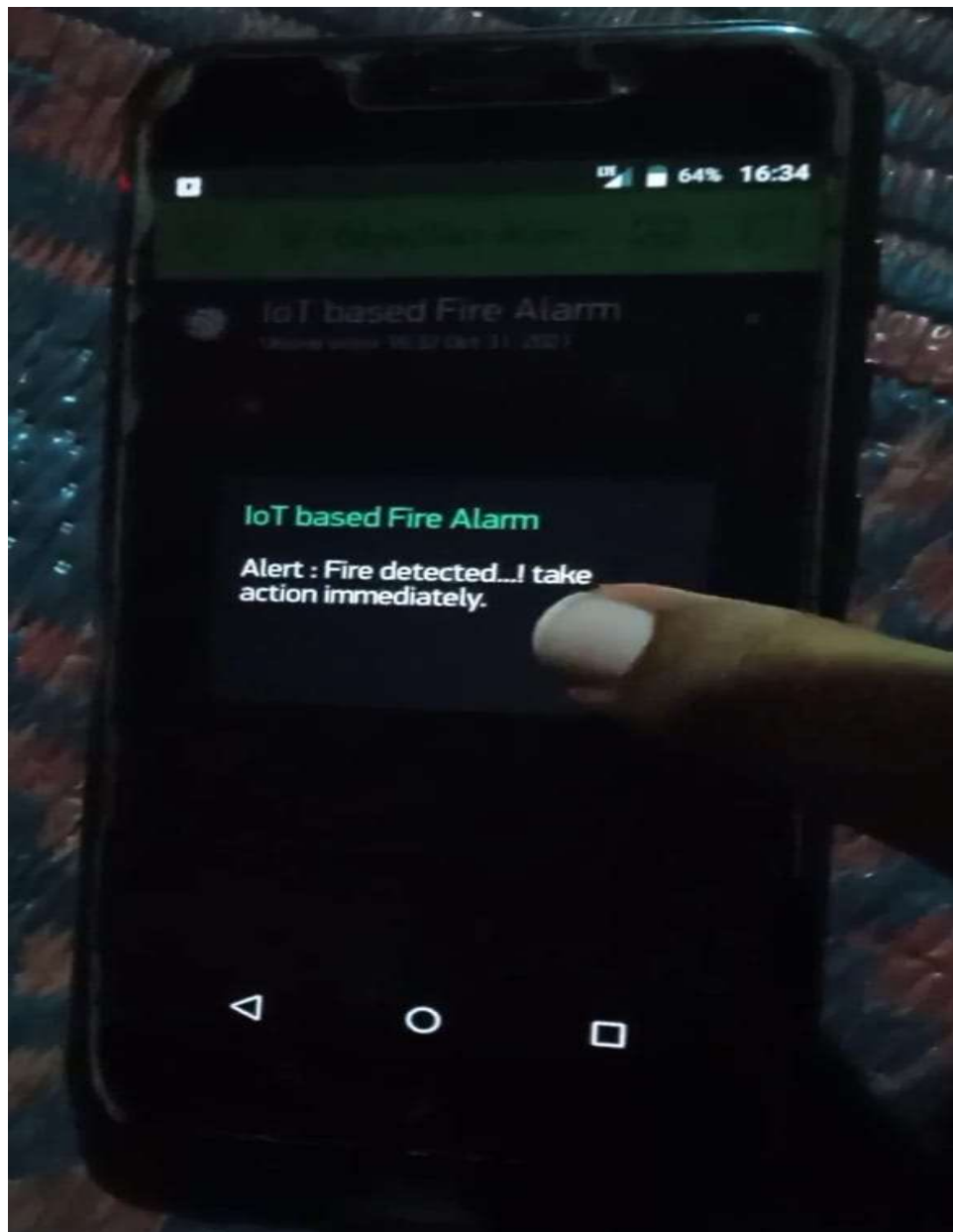
```

Chapter 3

Results

Proposed system is fully working & capable of achieving its main goals which were mainly building an IOT based fire alarm system. It detects the presence of fire, communicates with the user device and notify them when fire is detected. As an improvement, system can be made to work on a rechargeable battery source instead of power supply.





Chapter 4

Conclusion

Our proposed system was capable of achieving its main goals which were mainly building an IOT based fire alarm system that is capable of detecting the presence of fire, communicating with the concern parties by notifying them when fire is detected, and receiving and responding to SMS request from user. As an improvement, the sensing nodes could depend on a rechargeable battery source instead of power supply. Additionally, mobile application may be developed to be able to easily access the system remotely.

Chapter 5

Applications with Advantages and Limitations

5.1 Applications

- 1) This Fire Alarm is very useful in safety against fire and it covers very large area.
- 2) This IoT based Fire Alarm can be used in remotely controlled protection devices.
- 3) This Fire Alarm can be implemented as part of Home & Industrial Automation.

5.2 Advantages

- 1) This Fire Alarm works only on 5V DC power supply.
- 2) This Fire Alarm can send notification to user present at any part of world.
- 3) This Fire Alarm can notify user in various forms such as SMS, E-mail, Call, Pop-up Notification, etc.
- 4) Flame sensor used in this Fire Alarm has detection distance of 100 cm and detection angle of 60 degrees, hence this Fire Alarm covers wide area.
- 5) Multiple flame sensors can be connected to single NodeMCU board which help help to cover wide area of halls and big industrial sheds.
- 6) This fire alarm detects fire from far distance if flame is larger.

5.3 Limitations

- 1) This Fire Alarm should be always connected to network.
- 2) User's device should be always connected to network to get notification.
- 3) This Fire Alarm cannot detect fire's smoke, it only detects fire's flame and notify user.

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