

# **Fire and Smoke Alarm System**

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**T. E. Information Technology**

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# CERTIFICATE

This is to certify that the project entitled “**Fire and Smoke Alarm System**” is a bonafide work of “**Prithvi Shetty-01, Shitaanshu Singh-02, Nishit Thakkar -03, Nelkin Eldho -04**” submitted to the University of Mumbai towards completion of mini project work for the subject of Sensor Network Lab.

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2.-----

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## **DECLARATION**

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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## **ABSTRACT**

Fire is the most destructive thing which can take lives, destroy things, pollute nature and has many more consequences. The avoidance of such a disaster is of the biggest need in today's time. A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. To address this problem, this study aims to implement a fire detection and smoke alarm system that would not only detect the fire using integrated sensors but also alert property owners to protect lives and valuable assets simultaneously by alarming them.

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# **Chapter 1**

## **Introduction**

### **1.1 Introduction to domain**

A Wireless sensor network can be defined as a network of devices that can communicate the information gathered from a monitored field through wireless links. Wireless networking is a method by which homes, telecommunications networks and business installations avoid the costly process of introducing cables into a building, or as a connection between various equipment locations. Admin telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level (layer) of the OSI model network structure.

### **1.2 Motivation**

In a metropolitan city like Mumbai with the presence of large of number of people, homes pose a huge fire threat due to negligence and also with so many inflammable items –upholstery, decorative material, gas leaks and electrical gadgets among others. India has lost 60,607 lives during the period 2015-18 of which 56% were accounted for home/residential fire. (ADSI) [1]. Thus, residential fire becoming the largest source of fatalities. Fire alarm and detection technology should help to detect fire at sufficiently early stage so that it can help to reduce the damage to human life and property.

### **1.3 Problem Formulation**

The aim of this project is to create a Bluetooth and Arduino based fire and smoke alarm system through which fire can be detected and the nearby person can be alerted to avoid further damage to lives and properties.

## 2. Review of Literature

### 2.1 Review of all the literature

A literature review is a type of review article that presents the current knowledge including substantive findings as well as theoretical and methodological contributions to a topic.

Literature reviews help in understanding the existing research relevant to a particular topic. This helps in building our knowledge and gives us a clear and wide range of understanding of our topic.

Table2.1.1. Literature review

Ref.	Abstract	Advantages	Disadvantages
[1]	Here a Gas sensor (MQ-05) is used with Bluetooth module and Arduino is used for detection of fire and gas.	Design is cost effective	Only mq-05 sensor is used.
[2]	A DHT 11 sensor which is connected to internet to monitor temperature and humidity rate.	Design and implementation of fire detection is customizable and flexible .	Sensor doesn't have higher range coverage.
[3]	A node system is used where a node contains two sensor and Ethernet connecting to a ZigBee connection. As soon as fire and smoke are detected it is transmitted to the nearest node and a message is sent to the cloud.	Using ZigBee connection, it can be monitored anytime.	This system is expensive to implement.



[4]	GSM based fire alarm system uses GSM module, Arduino, LCD and LM35 as main temperature sensor.	Easy implementation, maximum reliability, user friendly and low cost which could be used for home and industrial security system.	The system is not fire proofed.
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## **2.2 Problem definition**

To develop a fire detection system which can be used for houses and residential places to detect fire and alert the residents. Our system will use MQ2 sensor (smoke sensor) and flame sensor in combination for reliability and dependability. The system will notify using a buzzer which will go off as soon as smoke or fire is detected.

## 3. System Design

### 3.1 Block Diagram

This is the block diagram for our system that shows the components used, working and flow of the system.

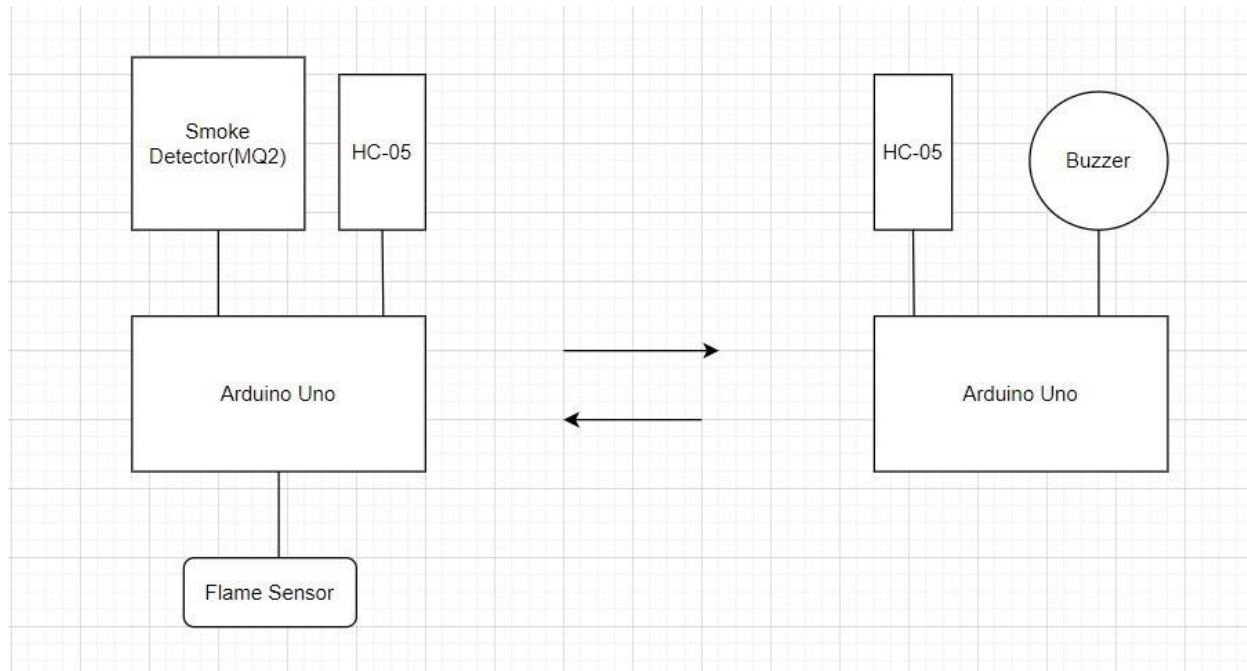


Fig.3.1.1: Block Diagram

### 3.2 Block diagram steps

- a) **Step 1:** Interface Bluetooth module with Arduino uno.
- b) **Step 2:** Interface buzzer, MQ-2 sensor and flame sensor with arduino.
- c) **Step 3:** Connect the Bluetooth modules to set the communication path.
- d) **Step 4:** Configure the app buttons to send desired commands to bluetooth Module.

### 3.3 Hardware and Software requirements

## Hardware Requirements:

Sr. No	Name of Component	Price per unit (INR)	No. of units	Total price (INR)
1	HC-05 Bluetooth Module	350	2	700
2	Breadboard	100	2	200
3	Jumper wires	4	15	60
4	MQ 2 Sensor	225	1	225
5	Flame sensor	25	1	25
6	Resistor 1k ohm	3	1	3
9	Buzzer	50	2	100
10	Transistor	20	1	20
11	Arduino uno	450	2	900
Total Cost (INR)				2233

## Software requirements

1. Arduino IDE
2. windows 7 and above os

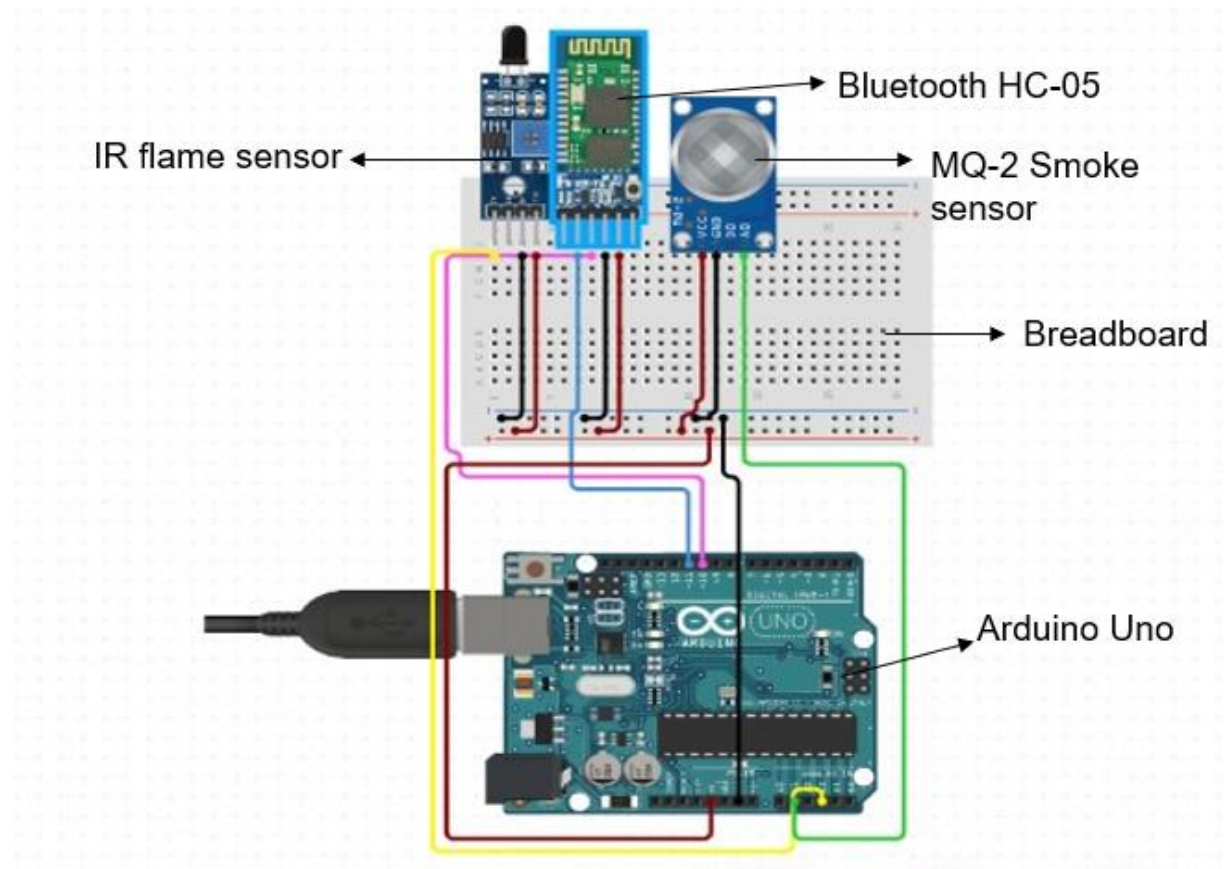
### 3.4 Application Areas

- In homes for safety measures from fire.
- In warehouses to keep the items safe from fire.

## 4. Implementation and results

### 4.1 Circuit diagram

Circuit diagrams are used for designing and constructing the circuit of a system. The following circuit diagram shows the connection of components done to build the system.



Fig,4.1.1 Circuit diagram for transmitter side

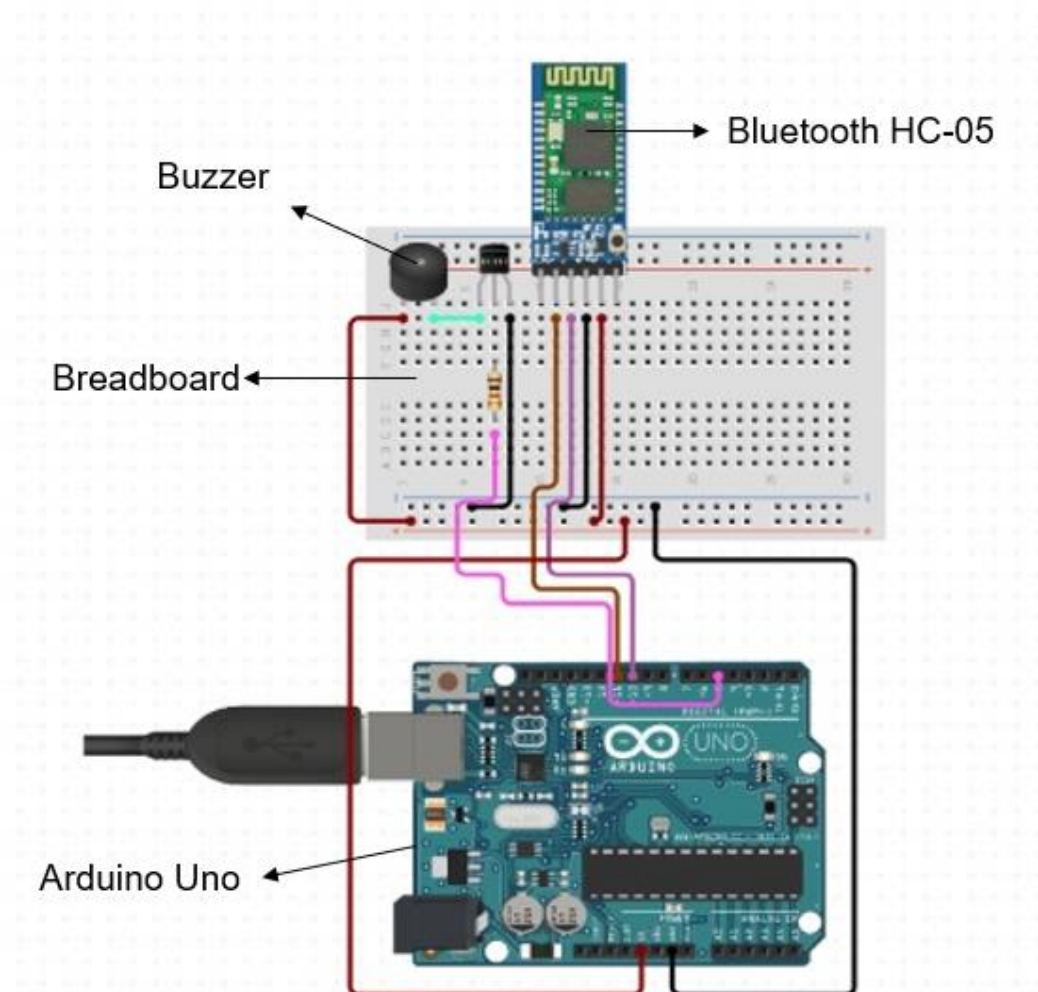


Fig.4.1.2 Circuit diagram for Receiver side

## 4.2 Pin Configurations

**Step 1:** Interface arduino with bluetooth module HC-05 (Master)

Arduino uno pin	HC-05 pin
Tx	Rx
Rx	Tx
Vcc	Vcc
Gnd	Gnd

Table 4.2.1 Pin configuration

**Step 2:** Interfacing Smoke sensor with Arduino

Arduino uno pin	HC-05 pin
A1	A0
Vcc	Vcc
Gnd	Gnd

Table 4.2.2 Pin configuration

**Step 3:** Interface arduino with bluetooth module HC-05 (Slave)

Arduino uno pin	HC-05 pin
Tx	Rx
Rx	Tx
Vcc	Vcc
Gnd	Gnd

Table 4.2.3 Pin configuration

**Step 4:** Interfacing Piezo electric buzzer with Arduino

Arduino uno pin	Piezo buzzer
Gnd	Negative potential
D9	Positive potential

Table 4.2.4 Pin configuration



## Implementation code:

### ***Master (Transmitter): -***

```
#define gasPin A1
int gasVal=0;
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  pinMode(gasPin, INPUT);
}
void loop() {
  // put your main code here, to run repeatedly:
  gasVal=analogRead(gasPin);

  if(gasVal>200      ){
    Serial.print("1");
  }
  else{
    Serial.print
    ("0");
  }
}
```

### ***Slave (Receiver): -***

```
#define buzzer 9
int state=0;

void setup()
{
  // put your setup code here, to run once:
  Serial.begin(9600);
  pinMode(buzzer, OUTPUT);
}
void loop()
{
  // put your main code here, to run repeatedly:
  if(Serial.available()>0)
  {
    state = Serial.read();
    Serial.write(state);
  }
  if(state == '1')
  {
```

```
    tone(buzzer, 1000, 200);  
    delay(100);  
  }  
  else if(state == '0')  
  {  
    noTone(buzzer);  
    delay(100);  
  }  
}
```

### 4.3 OUTPUTS:

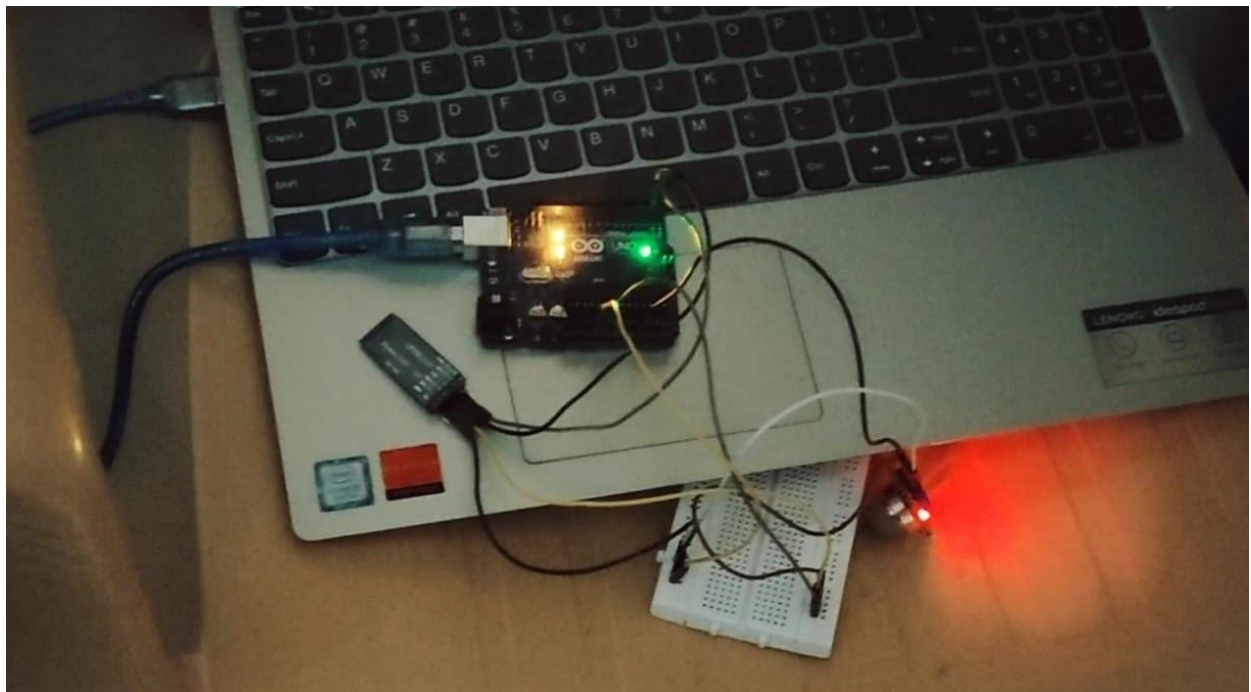


Fig.4.3.1 Transmitter side with flame and smoke sensors

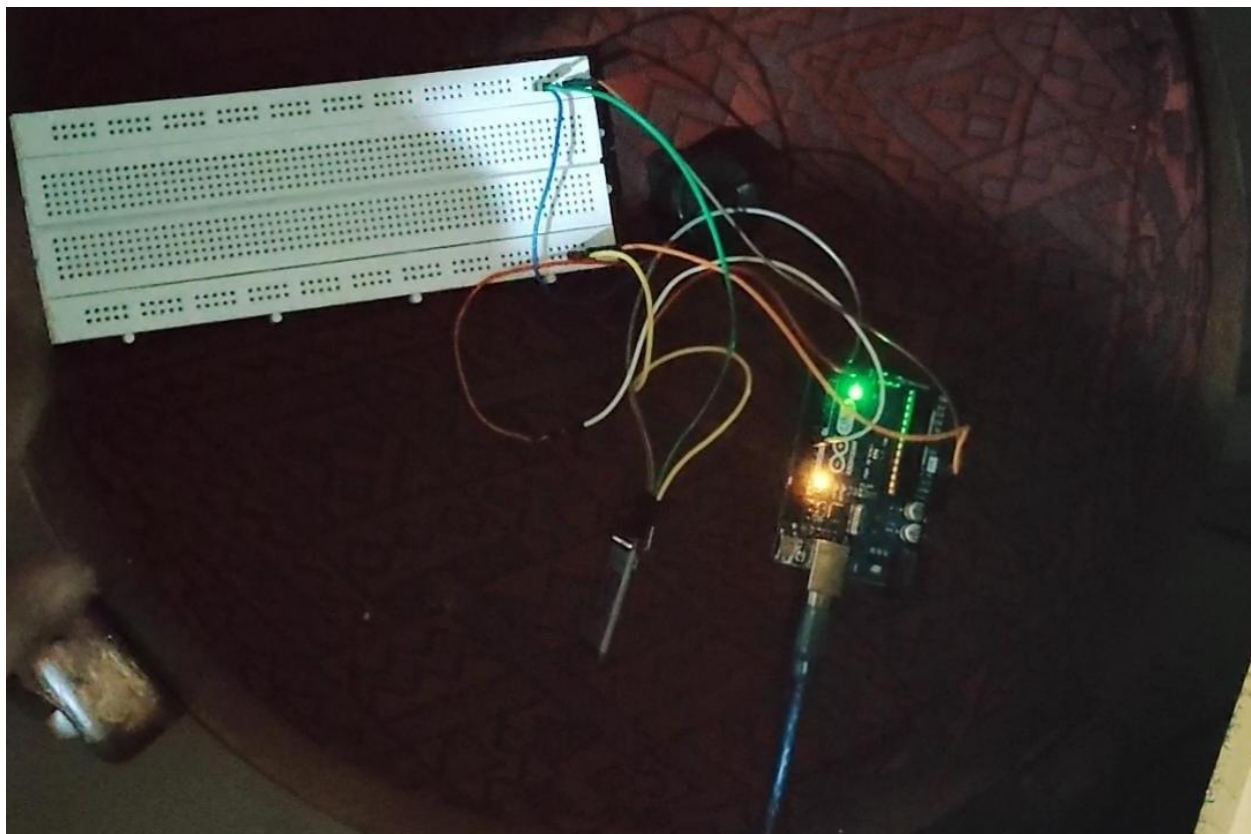


Fig.4.3.2 Receiver side with the Buzzer to raise alarm

## **5. Conclusion**

The project developed a Fire and Smoke Alarm System using Bluetooth technology and Arduino Uno which enables to raise an alarm when there is fire and smoke detected and can be used at a house, warehouse, fuel stations, etc.

## 6. References

- [1] <https://www.news18.com/news/opinion/how-far-are-we-from-making-our-country-fire-safe-2486987.html>
- [2] P.Pushpa, T.Sudheer Kumar, P.Bhulaxmi, “Detection of fire and gas using Arduino and Bluetooth module” International Journal of Engineering Research & Technology (IJERT) 2020 (Volume: 07 Issue: 01)
- [3] Dr. Abdul Khaleq, Noor & Khalaf, Osamah & Addulsahib, “IOT fire detection system using sensor with Arduino”, International Journal of Electrical and Electronics Research, vol. III, pp. 264-269, 2015.
- [4] P.S. Jadhav , V.U. Deshmukh, “Forest Fire Monitoring System Based On ZIG-BEE Wireless Sensor Network”,International Journal of Emerging Technology and Advanced Engineering,(Volume 2, Issue 12, December 2012)
- [5] Dhurvajyothi Paul ,Arnab Ghosh ,Soumya Jyothi Banerjee(2016). “GSM Based Fire Sensor Alarm Using Arduino”, September 08, 2020, from International Journal of Scientific & Engineering Research.(Volume 7,Issue 4)