International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 03 | Mar 2023 www.irjet.net p-ISSN: 2395-0072

# IoT based Fire Intimation and Fire Extinguisher Robot with Call & Messages Alert through GSM Sim Card

**Rahul S[1], Shashank S[2], Aniket S[3], Kamlesh S[4], Prof. Yogesh S[5].**

[1,2,3,4]*Student, Dept. of Mechanical Engineering, Bharat College of Engineering, Badlapur, Maharashtra, India*

---

**Abstract –** *Major incident are caused by unawareness of the potential cause and leads to heavy damages. The incident if reported and intimated at earliest to the right person straight away helps to minimize the impact of the fire incident. Various area which are very remote place and difficult for continuous human surveillance can be monitor by fire detection techniques which could be fixed sensor based or smoke detectors, but sensors have limitation of place they have been installed and may not be accurate or effective for detecting any fire hazard at early stage. If all these things are considered, then one can estimate the big losses can be minimize and by taking corrective preliminary action one can save damage going to cause to any material, warehouse, store items etc. The purpose is to achieve best efficient intimation technique with maximum effectiveness to various type structured and designed rooms, storage facilities and so many long architects which need safety and precautions from potential fire hazards.*

***Key Words*: GSM Sim, Call Alert, Arduino Uno, Flame sensor, smoke detector, servo motor.**

## 1.INTRODUCTION

Fire is one of the most dangerous emergencies that a storage facility, warehouse, any architectural construction can experience. In case of a fire, it's important for first responders to be as quick as possible and to know where the fire is. With the increasing use of IoT devices in buildings, it's natural to wonder how this technology could be used in the emergency response team.

A fire detection robot has been developed that uses GSM signals to send notification alerts to the concern people related to that building when there is a fire. The robot will also send images of the scene to the authorities so that they can respond more quickly.

This innovative project provides an improved way of notifying people inside a building in case of afire. By using GSM signals, the notification system is rapid and efficient.

In today's world, almost everything is connected. From our cars to our smartphones, we rely on electronic systems to do our jobs. Unfortunately, these same electronic systems can also pose a danger when they're not properly managed or monitored. In this paper, we will discuss one IoT-based issue - fire. Fire is one of the most common and deadliest disasters in modern society. Every year, fire kills more people than weapons accidents and car crashes combined. Fire emergency response requires personnel with specialized knowledge and equipment, which can be difficult to deploy in an emergency when distances are large and communication lines are blocked by smoke or flames.

Thankfully, we have developed technologies that allow us to remotely control devices and warn people about emergencies. One such technology is IoT-based fire alarm system. With this system, firefighters can directly receive alerts about fires from sensors installed throughout the building or area they are trying to contain. This system allows firefighters to dispatch the correct amount of personnel based on the situation at hand.

We hope this paper has illustrated the importance of IoT-based fire alarm systems and demonstrated their usefulness in emergency response times. We believe that these systems will play an increasingly important role in disaster preparedness as our world becomes increasingly interconnected

### 1.1 Related Work

Automatic AI Fire detection and alert sending robot with water extinguisher mechanism has been created to help people detect fires and send alerts in real time. This technology uses several sensors to detect fires, as well as identify any potential water sources that could be used to put out the fire. Once the robot has detected a fire or a potential water source, it will send an alert to your phone.

This technology could save lives; not only by detecting fires, but also by sending alerts in real time. If you are ever worried about a fire in your home, automatic AI Fire detection and alert sending robot with water extinguisher mechanism could be an invaluable tool for you.

### 1.2 Block Diagram

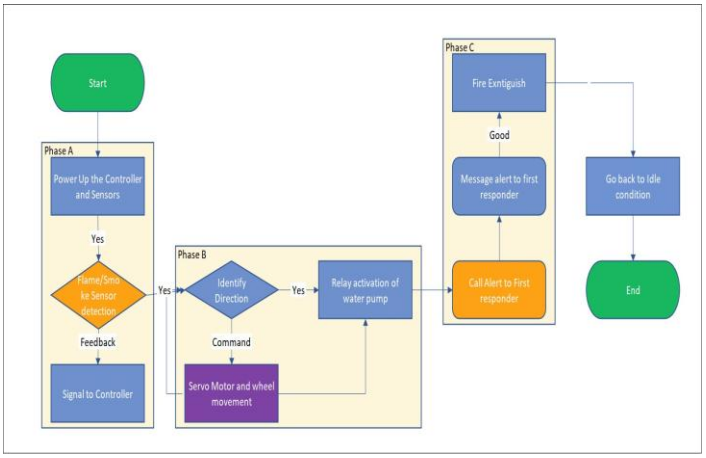


**Fig -1**: Flow Chart

### 2. Component Details -

Arduino Uno board has been used as main controller for brain of the robot. It has been programmed using C programming.

| Sr. No. | Name of Material | Quantity |
|---|---|---|
| 1 | BU Motor | 4 |
| 2 | Gas Detector | 1 |
| 3 | Flame Sensor | 3 |
| 4 | Servo Motor | 1 |
| 5 | Water Pump | 1 |
| 6 | Arduino Uno Controller | 1 |
| 7 | GSM Sim | 1 |
| 8 | Motor Driver | 1 |
| 9 | Relay 5V | 1 |
| 10 | Battery | 2 |
| 11 | Wheels | 4 |
| 12 | Chassis Set | 1 |
| 13 | Wiring | Lot |
| 14 | Water Storage | Lot |
| 15 | Water Tube | Lot |

**Table -1:** Major Component details

### 3. SLD Diagram for Prototype

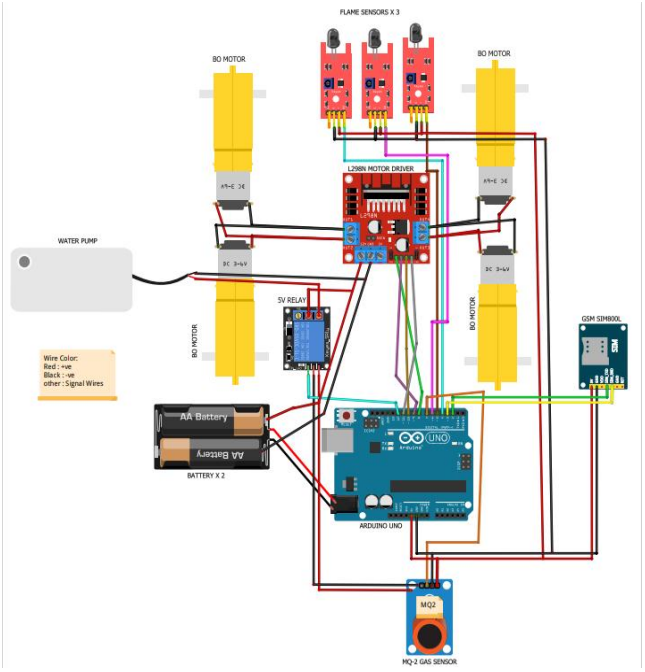


**Fig -2**: Proto Wiring Diagram.

Diagram is made using fritzing. Controller used in proto is Arduino Uno. The Arduino Uno comes with USB interface, 6 analog input pins, 14 I/O digital ports that are used to connect with external electronic circuits. Out of 14 I/O ports, 6 pins can be used for PWM output.

**Fig -3**: Proto Wiring Diagram.

Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller.

The software used for Arduino devices is called IDE (Integrated Development Environment) which is free to use

and required some basic skills to learn it. It can be programmed using C and C++ language.

### 3. Logic and Codes –

```
/*------ Arduino Fire Fighting Robot ver 2.0 Code---- */

#include <Servo.h>          //include servo.h library
#include <SoftwareSerial.h>   //include SoftwareSerial.h library

Servo myservo;

int pos = 0;
boolean fire = false;

const String PHONE = "+919403369629"; //use your number with country code

#define rxPin 2
#define txPin 3
SoftwareSerial sim800L(rxPin,txPin);
#define Left 4        // left sensor
#define Right 5       // right sensor
#define Forward 6     //front sensor
#define GAS_SENSOR 7   //Gas sensor
#define LM1 8         // left motor
#define LM2 9         // left motor
#define RM1 10        // right motor
#define RM2 11        // right motor
#define pump 12       //water pumb

void setup()
{

 Serial.begin(115200);

 sim800L.begin(9600);

 sim800L.println("AT");
 delay(1000);
 sim800L.println("AT+CMGF=1");
 delay(1000);

 pinMode(Left, INPUT);
 pinMode(Right, INPUT);
 pinMode(Forward, INPUT);
 pinMode(GAS_SENSOR, INPUT);
 pinMode(LM1, OUTPUT);
 pinMode(LM2, OUTPUT);
 pinMode(RM1, OUTPUT);
 pinMode(RM2, OUTPUT);
 pinMode(pump, OUTPUT);

 myservo.attach(13);
 myservo.write(90);

  while(sim800L.available()){
 Serial.println(sim800L.readString());
 }

}

void put_off_fire()
{


   digitalWrite(LM1, HIGH);
  digitalWrite(LM2, HIGH);
  digitalWrite(RM1, HIGH);
  digitalWrite(RM2, HIGH);
  digitalWrite(pump,HIGH);
  delay(500);

   for (pos = 50; pos <= 110; pos += 1) {
  myservo.write(pos);
  delay(10);
 }
 for (pos = 110; pos >= 50; pos -= 1) {
  myservo.write(pos);
  delay(10);
 }
 digitalWrite(pump,LOW);
 myservo.write(90);
 fire=false;
}

void loop()
{

 myservo.write(90); //Sweep_Servo();

 if (digitalRead(Left) ==1 && digitalRead(Right)==1 && digitalRead(Forward) ==1)
   {
  delay(500);
  digitalWrite(LM1, HIGH);
  digitalWrite(LM2, HIGH);
  digitalWrite(RM1, HIGH);
  digitalWrite(RM2, HIGH);
  }
  else if (digitalRead(Forward) ==0)
  {
  digitalWrite(LM1, HIGH);
  digitalWrite(LM2, LOW);
  digitalWrite(RM1, HIGH);
  digitalWrite(RM2, LOW);
  fire = true;

  }

  else if (digitalRead(Left) ==0)
  {
  digitalWrite(LM1, LOW);
```

```
digitalWrite(LM2, LOW);
digitalWrite(RM1, HIGH);
digitalWrite(RM2, LOW);
}

else if (digitalRead(Right) ==0)
{
digitalWrite(LM1, HIGH);
digitalWrite(LM2, LOW);
digitalWrite(RM1, LOW);
digitalWrite(RM2, LOW);
}
delay(220);//change this value to change the distance

 if(digitalRead(GAS_SENSOR)== 0)
{
 Serial.println("Gas is Detected.");
  send_sms();
}

 while (fire == true)
 {
  put_off_fire();
  Serial.println("Fire Detected.");
  make_call();
 }}
 void make_call()
{
  Serial.println("calling....");
  sim800L.println("ATD"+PHONE+";");
  delay(20000); //20 sec delay
  sim800L.println("ATH");
  delay(1000); //1 sec delay
}

void send_sms()
{
  Serial.println("sending sms....");
  delay(50);
  sim800L.print("AT+CMGF=1\r");
  delay(1000);
  sim800L.print("AT+CMGS=\""+PHONE+"\"\r");
  delay(1000);
  sim800L.print("Gas Detected");
  delay(100);
  sim800L.write(0x1A);
  delay(5000);
}
```

Infrared Sensor Flame Sensor used to detect fire. Wave length it can detect is 760nm to 1100 nm. It has adjustable threshold value. It has operating voltage of 5VDC.

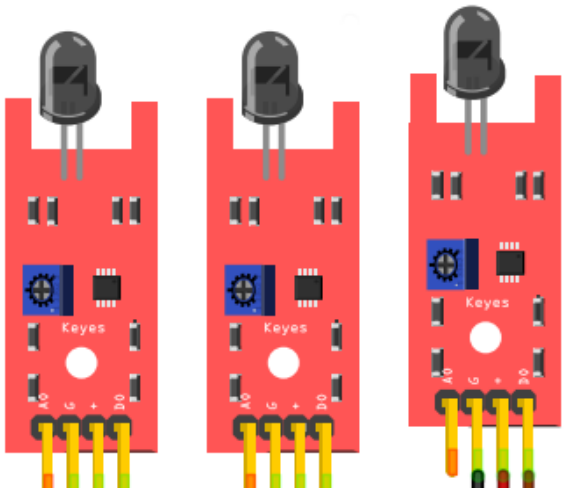


**Fig -4**: IR Flame Sensor.

Smoke Sensor used is MQ-2 Semi-conductor sensor for combustible gas such as butane. Sensitive material of MQ-2 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exists, the sensor's conductivity is higher along with the gas concentration rising. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

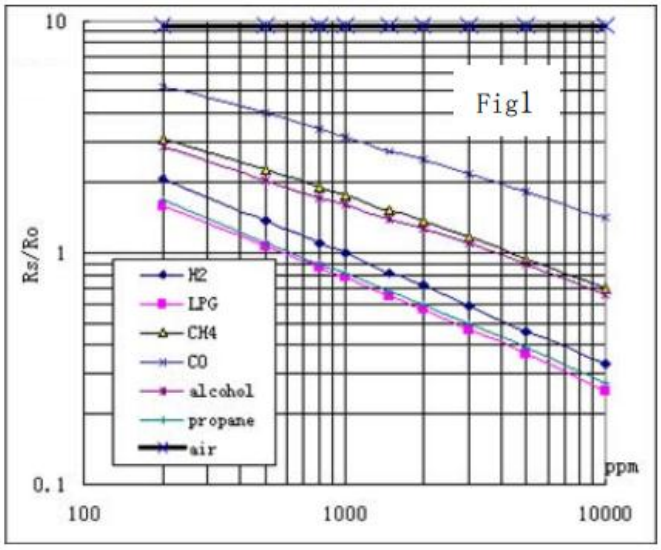


**Fig -4**: MQ-2 Sensitivity Characteristics.

Fig.4 shows the typical sensitivity characteristics of the MQ-2, ordinate means resistance ratio of the sensor (Rs/Ro), abscissa is concentration of gases. Rs means resistance in different gases, Ro means resistance of sensor in 1000ppm Hydrogen. All tests are under standard test conditions.

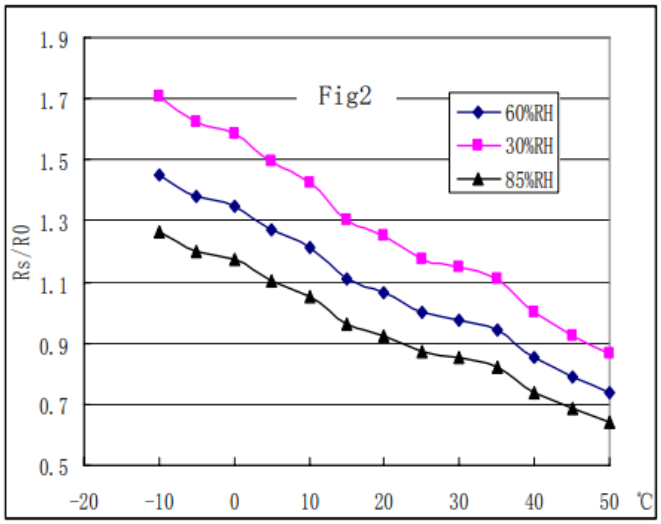


**Fig -5**: MQ-2 Influence of Relative Humidity and Temperature.

MQ-2 Sensor has affect as shown in fig. 5 due to atmospherically conditions of temperature and humidity. Its sensitivity gets reduce as per range gets increase.


**Fig -6**: MQ-2 Graphical resistance.

Logic behind the sensor is to send text message alert on registered mobile number in Arduino program. The text can is selectable and currently the text gets as 'Gas Detected'.

The motors are used are BO Motor, which converts higher RPM to lower RPM with higher torque by its gear ration and set up. It works on DC Voltage.

The 5V relay used to latch water pump after detection of fire. The relay can be used to trigger any fire extinguisher in place of water pump. We can use this point as activation.

To send call and message alerts, proto has provision of GSM SIM800L module. It works on 2G network bandwidth. It requires text message recharge and talk time balance.

Complete module proto is powered by AA two numbers of batteries which are rechargeable.

**Fig -7**: Working Proto Demo.

## Future Scope

IOT can be implemented onto the robot to control it from another location in manual mode. More sensors can be mounted to achieve a better performance and we can also reduce the reaction time detecting the fire source. With the addition of a 360º camera we can achieve a great field of view. The storage can be replaced with a water pipeline for extinguishing larger fire source. Color detection of fire is not very reliable. Hence a thermal camera can be installed rather than the USB camera to achieve better detection of fire source based on intensity.

## Conclusion

Accidents brought on by fire can cause serious injury and property damage. In addition to a thorough evaluation of many fire-fighting robots, this paper discusses autonomous robots for fire detection and extinguishment. A better system for monitoring water quality will definitely arise from this, and prompt intervention can make the water supplies safe. Although there have been many effective fire-fighting gadgets, the study issue is still difficult. This document gives a summary of the current research being done to improve

fire-fighting robot intelligence, cost, and effectiveness. The application of cutting-edge sensors to measure various quality parameters and the use of wireless communication standards to increase productivity

## ACKNOWLEDGEMENT

The authors can acknowledge any person/authorities in this section. This is not mandatory.

## REFERENCES

[1] Vol. 2, Issue 1, pp: (42-46), month: April 2015 – September 2015 at International journal of recent research in mathematics computer science and information technology.

[2] Volume 6, Issue 2 April 2018, ISSN: 2320-2882.

[3] Design and study of firefighting robot, International journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 6 Issue 04, April-2017

[4] Google Search Engine for Technical data sheets of used components.

[5] Hossain, Md Anowar, Himaddri Shakhar Roy, Md Fazlul Karim Khondakar, Md Hasib Sarowar, and Md Azad Hossainline. "Design and Implementation of an IoT Based Firefighting and Affected Area Monitoring Robot." In 2021 2nd International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), pp. 552-556. IEEE, 2021.

[6] Pramod, B.N., K.N.Hemalatha, B. J. Poornima, and R.Harshitha. "Fire Fighting Robot." In 2019 International Conference on Information and Communication Technology Convergence (ICTC), pp. 889-892. IEEE, 2019.

[7] Ramasubramanian, Sreesruthi, Senthil Arumugam Muthukumaraswamy, and A. Sasikala. "Fire Detection using artificial intelligence for fire- Fighting robots." In 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS), pp. 180-185. IEEE, 2020.

[8] Mittal, Shiva, Manish Kumar Rana, Mayank Bhardwaj, Meenakshi Mataray, and Shubham Mittal. "Cease Fire: the firefighting robot." In 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), pp. 1143-1146. IEEE, 2018.

[9] Raj, P. Anantha, and M. Srivani. "Internet of Robotic Things based autonomous fire-fighting mobile robot." In 2018 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), pp. 1-4. IEEE, 2018.

[10] Sampath, B. Swetha. "Automatic fire extinguisher robot. " In 2011 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), pp. 215-218. IEEE, 2011.

[11] Aliff, Mohd, M. Yusof, nor Samsiah Sani, and Azavitra Zainal. "Development of firefighting robot (QROB)."Development 10, no. 1 (2019).

[12] Chien, Ting L. , H. Guo, Kuo L. Su, and Sheng V. Shiau. "Develop a multiple interface based firefighting robot." In 2007 IEEE International Conference on Mechatronics, pp. 1-6. IEEE, 2007

## BIOGRAPHIES

1.
Rahul Sonawane
Student at BCOE, Badlapur
Dept. of Mechanical Engineering

2.
Shashank Singh
Student at BCOE, Badlapur
Dept. of Mechanical Engineering

3.
Aniket Solkar
Student at BCOE, Badlapur
Dept. of Mechanical Engineering

4.
Kamlesh Sonawane
Student at BCOE, Badlapur
Dept. of Mechanical Engineering

5.
Prof. Yogesh Shekate
Faculty of Mechanical Engineering,
BCOE, Badlapur