

# GSM BASED FIRE EXTINGUISHING SYSTEM

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**Abstract** - Fire is a hazardous one that causes much damage to human beings. The advancement in robotics has fire extinguishers and good communication facility to call the fire station to get help. But it requires manpower. If it happens automatically, then the disaster can be reduced and the life of people can be saved. This was the main aim of this project. Whenever the fire occurs, the flame sensor detects the fire and the GSM Module sends the information about the fire accident to multiple person automatically without any human interruption. At the same time, the driver motor drives the system towards the fire and pour water on it. Hence, the disaster will be reduced.

**Key Words:** Arduinio, Fire detection, Obstacle avoidance, Water pump, Automatic call

## 1. INTRODUCTION

Fire accidents can cause lot of damage to industries as well as to the people. Most of the fire accident occurs at industries like nuclear power plant, thermal power plants. There are several possibilities of occurring fire in remote areas. For instance, in cotton mills and electric leakages results in fire. The fire fighter with GSM module uses the Arduino to control the whole system automatically. The main controlling system used is the Arduino UNO, flame sensor, ultrasonic sensor, water pump, DC motor and GSM module.

### 1.1 System Design

The Figure 1 shows the working of the proposed system. The flame sensor in this system is to detect the fire. When the fire emits the infrared rays, the change of resistance can be occurred which is in the analog form. The analog input can be converted into digital form by the in-built ADC channel in the Arduino. The Arduino has 10 bit ADC channel. The ultrasonic sensor is to avoid the obstacles nearby the system. The Arduino is used to control the entire system. After detection of fire, the fire fighting system moves towards the fire with the help of DC motors. The water pump in the system splits the water and shuts off the fire. The GSM module sends the information to the multiple users about the fire accident.

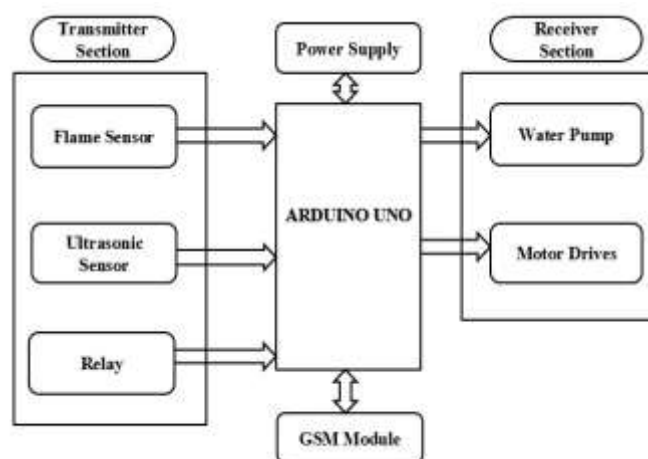


Fig- 1: Block diagram of the System

### 1.2 Working Principle

The main objective is to generate automatic call to multiple users using the GSM Module when the fire occurs. Initially the robot is in roaming state the obstacles are detected by using the ultrasonic sensor when the fire is detected by the flame sensor, the system will stop and pour water on it. The entire process of the system is controlled by using the Arduino Uno. The capacity of

the water tank is about few liters. The call will be generated within 2 seconds and it will be received by the next user with the time interval of 15 seconds.

## 2. HARDWARE TASK

The hardware used in the proposed system is Arduino Uno, flame sensor, ultrasonic sensor, relay, GSM Module, Water pump and Motor drives.

### 2.1 Flame Sensor

The flame sensor is placed in front of the control unit. It consists of a photodiode used to receive the infrared radiations which are emitted during the fire [1]. Therefore the fire will be detected by using the flame sensor and the system will stop and pour water on the fire.



**Fig-2:** Flame Sensor

### 2.2 Ultrasonic Sensor

The ultrasonic sensor used to detect the obstacle so that the robot can move away from the obstacle without hitting it [2]. It can detect the obstacle up to 3cm. Hence the robot can be driven automatically without any interruption.



**Fig-3:** Ultrasonic Sensor

### 2.3 Relay

A relay is an electrically operated device. It has a control system and controlled system. It is frequently used in automatic control circuit. In this one channel relay is used to control the high current in the circuit into a low current signal.



**Fig-4:** Relay

### 2.4 Arduino Uno

Arduino Uno is used to control the entire operation of the robot [3]. It acts as a brain of the system. It controls each and every function of the system. It is cost efficient. The Arduino board consists of digital and analog I/O pins. The board has 14 digital I/O pins capable of 6 analog I/O pins, and is programmable. It can be powered by the USB cable or by an external 9 volt battery.



**Fig-5:** Arduino Uno

## 2.5 GSM Module

The abbreviation of the GSM is Global System Mobile Communication. It is used to generate the auto call to authorities whenever the fire is detected by the robot, so that the damages can be reduced [4]. In this project the auto call will be sent to three people such as Fire Station, Police Station and the owner of the industry. The call will be sent one after another within the time interval of fifteen seconds.



**Fig-6:** GSM Module

## 2.6 DC Motor

The DC Motor is used to drive the robot from one place to another. The motor required power supply is 4 to 12 volts and it provides 100 RPM at 12 volts. Therefore two DC motors are used to drive the robot.



**Fig-7:** DC Motor

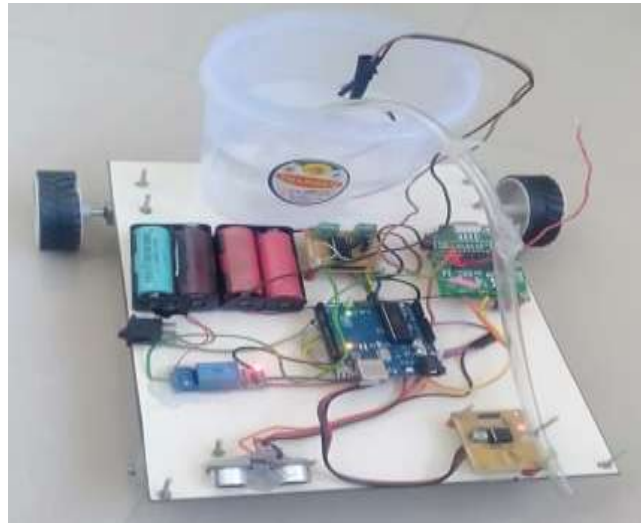
## 2.7 Water Pump

The water pump is used to pour and pump the water on the fire. Its operating voltage is 5v and it can pump the water up to 110 cm. The water pump motor is placed inside the water tank. The capacity of the water tank is about 2 to 4 liters.

## 3. SYSTEM IMPLEMENTATION

The transmitting side of the Arduino Uno is connected to the receiving side of the GSM Module and the receiving side of the Arduino Uno is connected to the transmitting side of the GSM Module. The power supply is given to the Arduino Uno. From the

Arduinio Uno the power is distributed to all other components. The output pin of the flame sensor is connected to the eighth pin of the Arduinio Uno. Each component are connected and controlled by the Arduinio.



**Fig-8:** Top view of proto type system

#### 4. CONCLUSION

The GSM based fire extinguishing system is designed with locally available materials. The flame sensing and obstacle avoidance is checked for its effectiveness. This system can be more effective at darkness. It is well suited for a small fire. By improving the capacity of the system, it can be used at large area. Further it can be extended by using explosive ball to shuts off fire at large area.

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