

# **ARDUINO BASED FIRE FIGHTING ROBOT**

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## **ABSTRACT**

In step with countrywide Crime facts Bureau (NCRB), it's far envisioned that extra than 1.2 lakh deaths were induced due to hearth injuries in India from 2010-2014. despite the fact that there are a variety of precautions taken for fireplace accidents, those natural/man-made screw ups do arise now and then. A fire outbreak is a risky act that results in several results. Detecting a fireplace at an early degree and extinguishing it is able to resource in prevention of numerous injuries. until now we depend on human aid. This frequently leads to risking the lifestyles of that character. consequently, fireplace safety will become an critical factor to shop human lives. With the development of technology in particular in robotics it is very an awful lot possible to replace humans with robots for combating the hearth. this will improve the efficiency of firefighters and would also save you them from risking human lives. As a end result, that allows you to clear up those troubles, our machine turned into evolved a fire combating robotic using Arduino, that allows you to robotically sense the fireplace and start the water pump.

## INTRODUCTION

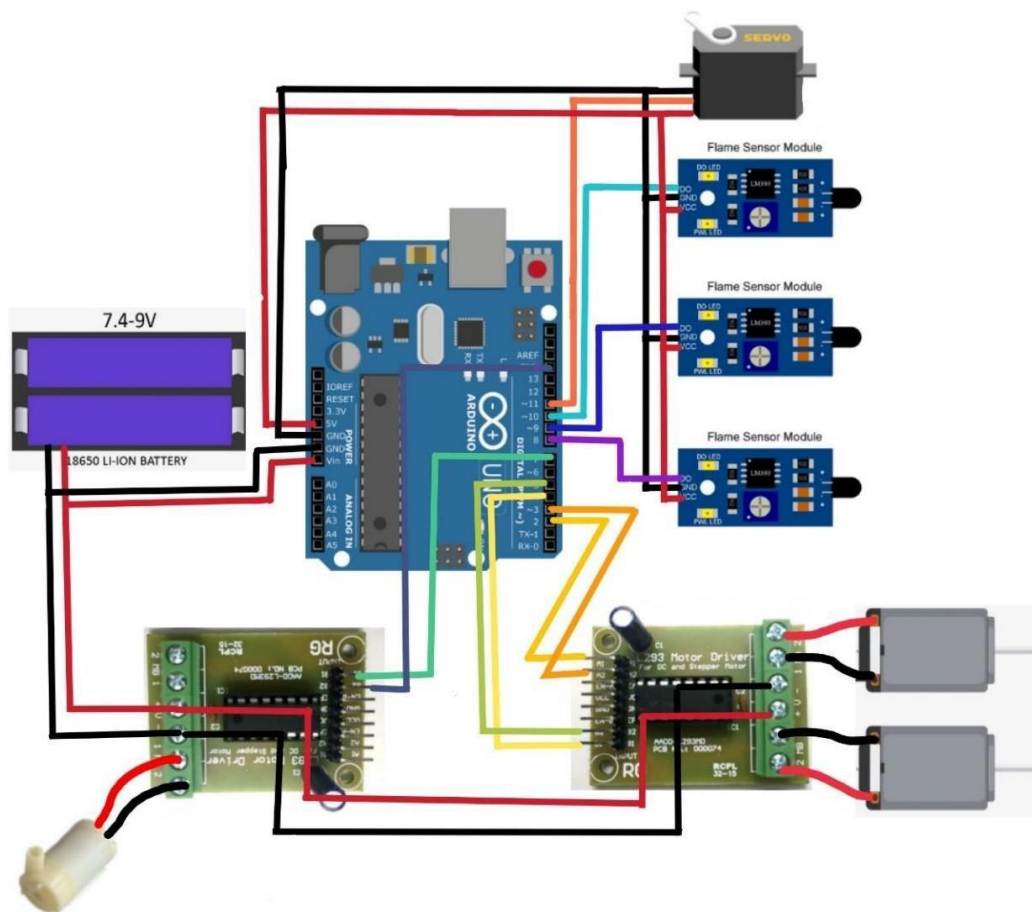
One of the most critical parameters in hearth disaster is lifestyles, i.e., lives misplaced in saving someone else lifestyles. it is occasionally impossible for fireplace-fighters personnel to get right of entry to the website of a fireplace due to explosive materials, smoke, and high temperatures. a quick response to discover the fireplace can avoid many disastrous things. A everyday spark can generate a massive fireplace breakout. no longer only lives of industrial humans but additionally the lives of home human beings is at hazard because of negative fire control device. hearth can take many lives and can injure many people for his or her existence time. but it could be averted the use of proper hearth controlling methods , for such environments, fireplace- fighting robot is proposed. Robots are capable of performing tasks in a greater green, cost-effective, and accurate way than human beings. It has grown in popularity as generation has superior, making human work less complicated. The firefighting robotic is programmed to test for and extinguish fires in affected areas . it will robotically stumble on the hearth with the assist of flame sensors . as soon as it detects the fireplace breakout region it navigates itself therefore to attain the fireplace supply and extinguishes the hearth the use of the water pump gadget .

## RESEARCH METHODOLOGY

The subject of this paper is to mechanically experience the environmental fire and extinguish it without human intervention. The methodology is split into three parts. the first element is on the layout structure, accompanied via hardware description and the sooner or later at the programming design. a lot of these 3 components were assembled collectively and experiments had been then finished to build a gadget that may extinguish the hearth that become finished.

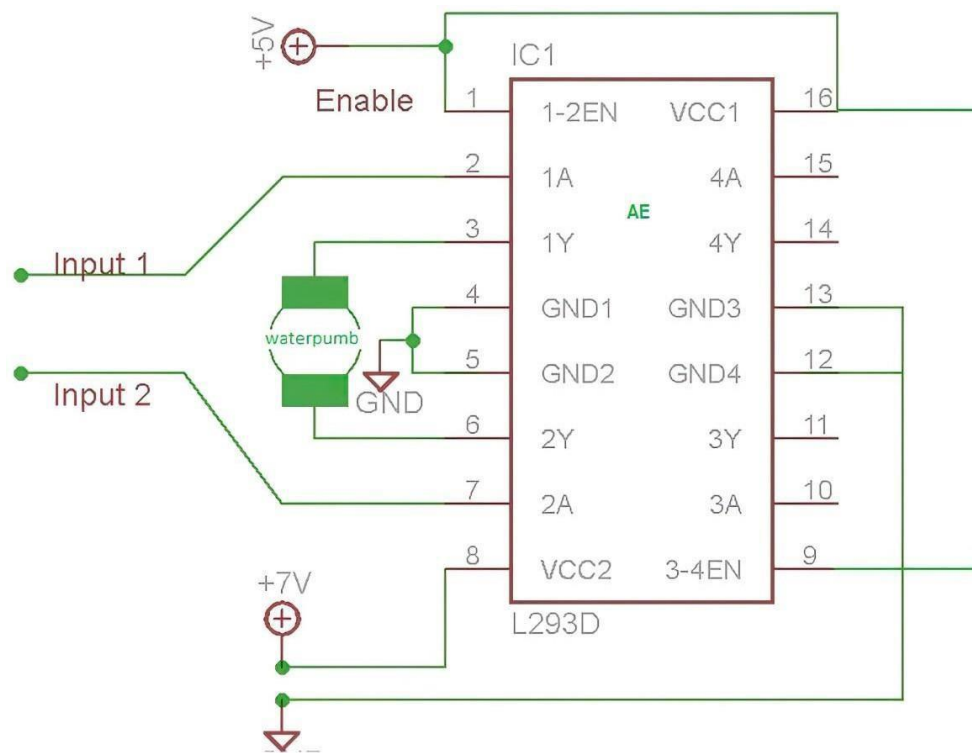
## DESIGN STRUCTURE

In this segment, the prototype of robot device is offered, in which it consists of IR flame sensors, servo vehicles, submersible water pump, motor motive force, mini breadboard, BO vehicles, rubber wheels, processor, and communication module for replacing data among the fire-fighting robot and Arduino software program. The robotic includes 4 primary features: First, it initializes itself i.e. its sensors receives initializes as the electricity is supplied. 2nd, robot feel the encompassing surroundings (for example for the extent of temperature) and become aware of the hearth. 3rd, robotic sends the navigating statistics and starts offevolved to navigate itself towards the fire. Fourth, finally the robot begins to extinguish the fireplace with the assist of servo motors and submersible water pump.



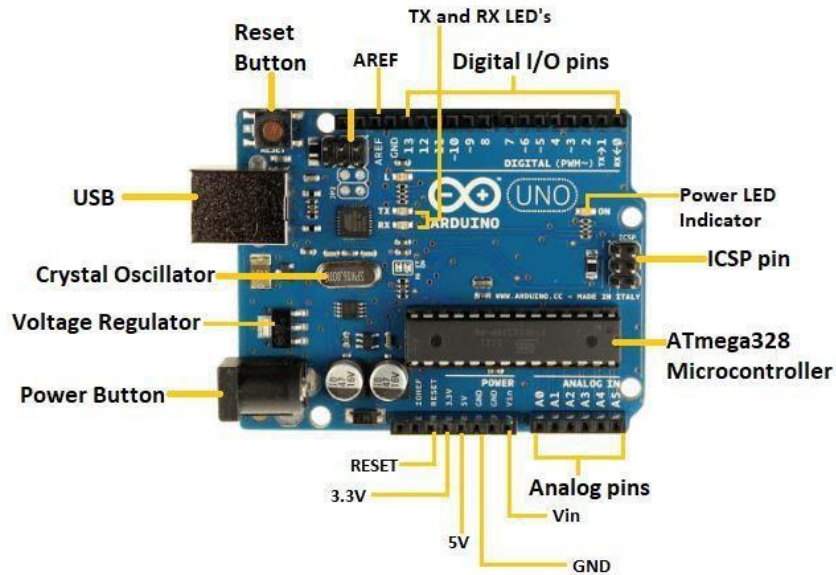
## HARDWARE IMPLEMENTATION

The hardware element is one of the vital elements within the improvement of firefighting robot. It consists of Arduino UNO, IR flame sensors, servo cars, submersible water pump, motor motive force, mini breadboard, BO cars, and rubber wheels. Fig three indicates the block diagram of firefighting robot which includes three IR flame sensors because the enter of the machine. Arduino UNO binds with other components as it is the micro processor . L293D Motor driver is used to power vehicles and is capable of jogging two DC cars (Left DC motor and proper DC motor) at the same time.



# HARDWARE USED

## Arduino UNO



Arduino UNO board is essentially a micro-controller kit that is used to get information from peripheral gadgets (sensors, motors, etc.). The Arduino UNO Micro-controller board is based totally on the ATmega328P IC. The ATmega328P IC is a huge help in creating these kinds of robots as it plays a vital role in smothering fire immediately . Arduino UNO board consist the units of digital and analog pins which could act as an interface to numerous growth forums and other circuits. It incorporates the whole lot had to support the micro-controller. It has,

- 14 virtual input/output pins,
- 6 Analog inputs
- 16MHz Quartz crystal,
- USB connector,
- strength jack,
- ICSP header, and
- Reset button.



## IR Flame Sensor



The IR flame sensor senses the surroundings and detects the presence of fire or flame. The module basically identifies the presence of toxic gases causing the fire using the IR receiver. The signal detection capacity is adjustable. The robotic consists of 3 flame sensors.

## L293D Motor Driver





L293D is a Motor driver or Motor driving force IC which is answerable for the movement of DC motor on both course. L293D is a 16-pin IC via which we're capable of run DC cars simultaneously in any path.

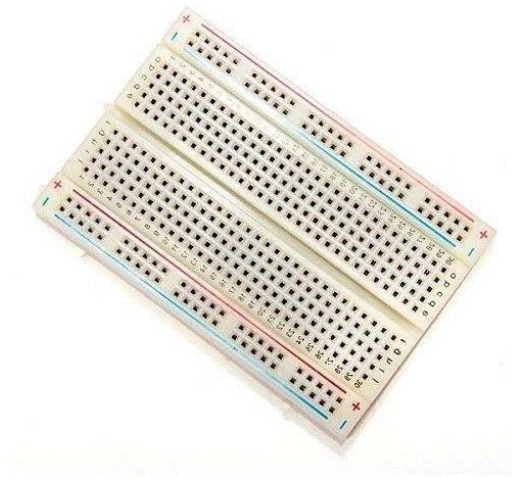
### **Servo Motors**



Servo motors are digital devices which might be particularly used for offering particular velocity and acceleration



## **Breadboard**



A breadboard (now and again referred to as a plugblock) is used for constructing brief circuits. it's far beneficial to designers as it permits components to be eliminated and replaced without difficulty. it's miles useful to the individual that wants to construct a circuit to illustrate its motion, then to reuse the components in another circuit

## **Jumper wires**



A jump cord (also referred to as jumper, jumper twine, DuPont wire) is an electrical cord, or institution of them in a cable, with a connector or pin at every end (or every now and then with out them

– clearly "tinned"), which is generally used to interconnect the components of a breadboard or other prototype or take a look at circuit, internally or with different gadget or additives, without soldering. individual bounce wires are outfitted by means of inserting their "cease connectors" into the slots supplied in a breadboard, the header connector of a circuit board, or a chunk of check system.

### **BO Motors**



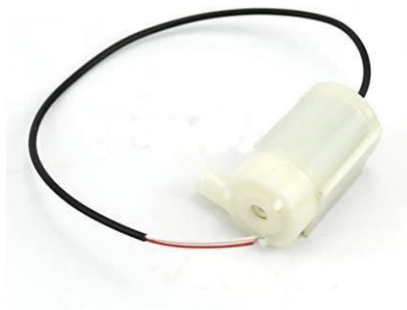
BO Motor is a twin shaft motor having 300rpm. It converts electrical electricity into mechanical energy. it is the substitute to our metallic tools DC cars. Our robot uses 4 dual shaft motors.

## Switch



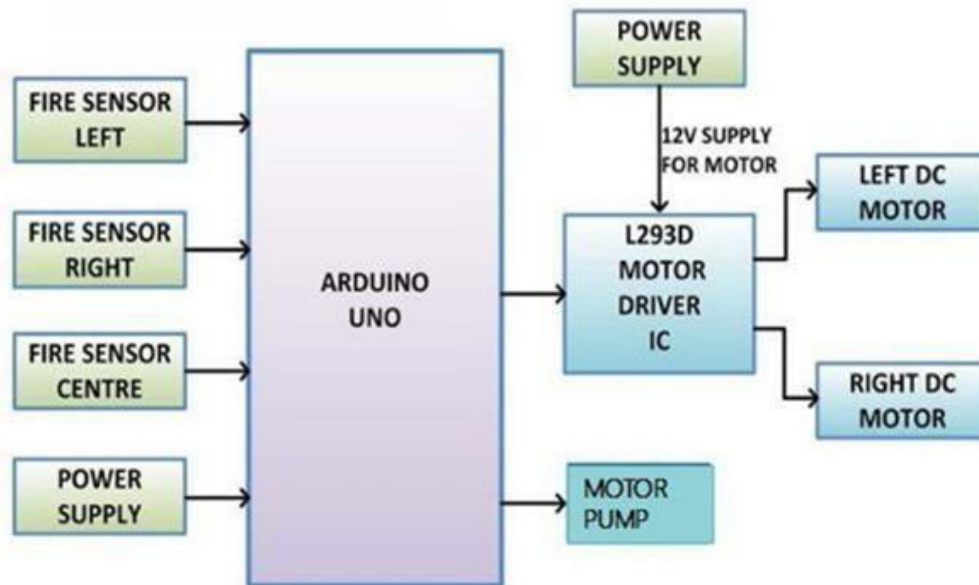
The transfer without a doubt opens (off) or closes (on) the relationship among the 2 terminals at the transfer. while the switch is on, contemporary flows alongside the black twine via the transfer to the mild, and then returns to floor via the white twine to complete the circuit.

## Submersible Water Pump



Submersible Water Pump is ideal for making computerized watering device the usage of Arduino. The water pump is an vital a part of the robotic as it will pump water to extinguish the fire .

## BLOCK DIAGRAM / REPRESENTATION



## PROGRAMMING

The Arduino software stipulates the integrated development environment for programming. The Arduino IDE program is a software program written in Java language and grounded on the Processing. The Arduino IDE is principally a frame erected on top of C and C and collected using avr- gcc and AVR Libc. Arduino IDE makes it easy to write law and upload it to the Arduino Uno for prosecution. It is available for all major desktop platforms i.e., Windows, Mac OS X, and Linux.

## Arduino Fire Fighting Robot Code

```
#include <AFMotor.h>
#include <Servo.h>
AF_DCMotor motor1(1);
AF_DCMotor motor4(4);
AF_DCMotor motor3(3);

Servo myservo;

int pos = 0;
int f1 = A0;
int f2 = A1;
int f3 = A3;
int Flame = 255;
int a,b,c;

void setup()
{
  pinMode(f1, INPUT);  pinMode(f2, INPUT);
  pinMode(f3, INPUT);
  Serial.begin(9600);

  motor1.setSpeed(200);
  motor4.setSpeed(200);
  motor3.setSpeed(200);
  myservo.attach(10);
  myservo.write(90);
}

void put_off_fire(){
  delay (500);
  motor1.run(RELEASE);
  motor4.run(RELEASE);

  for (pos = 50; pos <= 130; pos += 1) {

    myservo.write(pos);

    delay(10);  }
  for (pos = 130; pos >= 50; pos -= 1) {

    myservo.write(pos);

    delay(10);

  }
  motor3.run(FORWARD);
  delay(2000);
  motor3.run(RELEASE);
  myservo.write(90);
  Flame =1;
}

void loop()
{
  Flame=1;

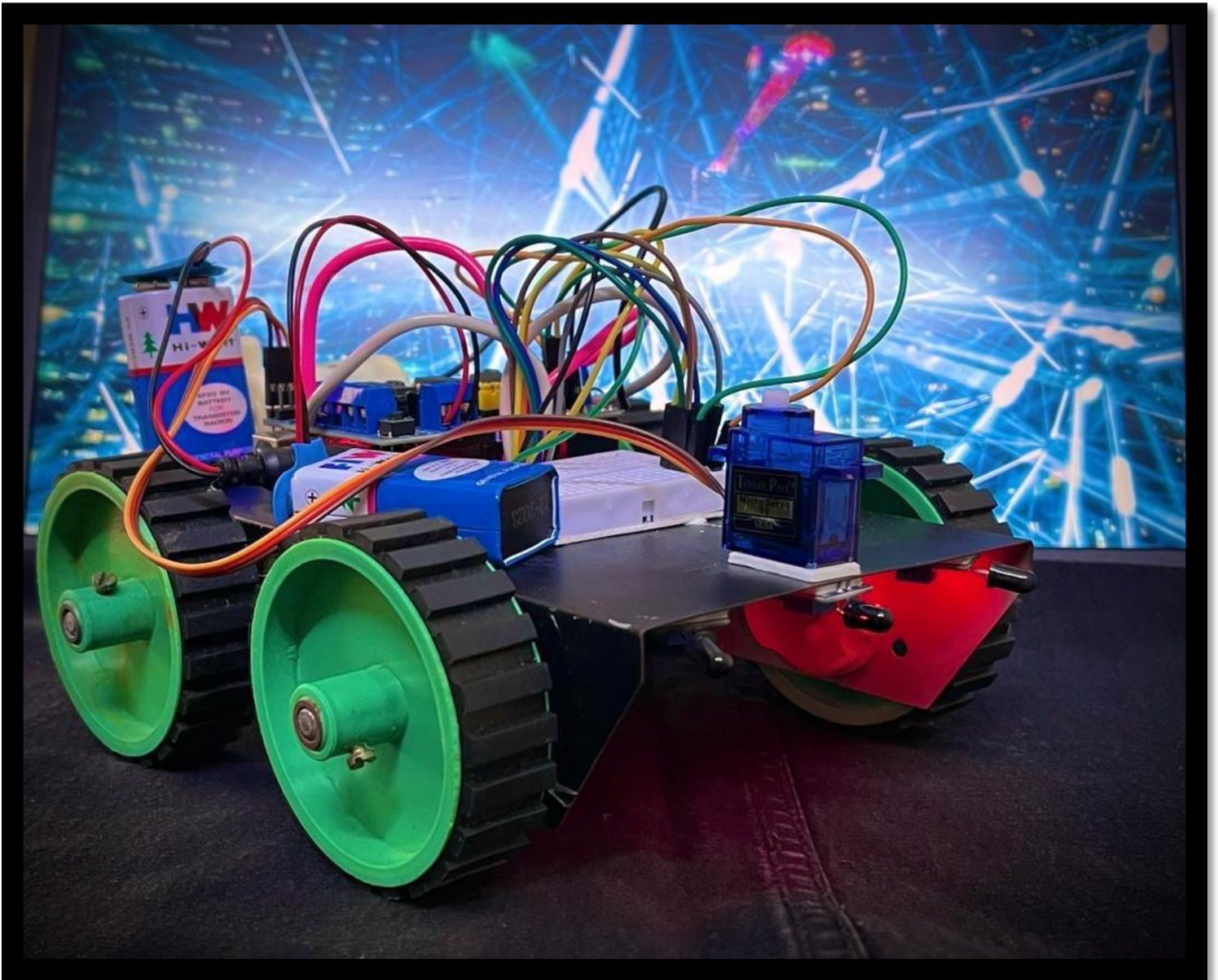
  if (analogRead(f2) <150){
    Serial.println("Fire at 2");
    Serial.println(" ");
    motor1.run(BACKWARD);
    motor4.run(BACKWARD);
```

```
Flame=255;
}
else if (analogRead(f3) <150){
Serial.println("Fire at 3");
Serial.println("  ");
motor1.run(FORWARD);
motor4.run(BACKWARD);
Flame=255;
}
else if (analogRead(f1) <150){
Serial.println("Fire at 1");
Serial.println("  ");
motor4.run(FORWARD);
motor1.run(BACKWARD);
Flame=255;
}
else {
    motor4.run(RELEASE);
motor1.run(RELEASE);
}

delay(300);
while (Flame == 255){

    put_off_fire();
}
}
```

## PICTURE OF OUR PROJECT





## RESULT

Fire Fighting Robot has developed to reduce mortal life lost and to develop such a device that automatically smell fire and extinguish it without mortal intervention. In this the fireplace is detected using the IR honey detectors and are connected to Arduino UNO, which control the movement of Motor drive that helps the robot to move to the location and negate the fire with the help of the pump . In the assiduity if any fire accident occurs, there's a need of person to cover continuously and amend it. In this process if any time detention takes place irrecoverable loss occurs in assiduity. The firefighting robot continuously monitors the girding and helps in extinguishing the fire.

## CONCLUSION

Our Robot helps the officers to eradicate the fire without costing their lives. Our design aims to make a real time firefighting robot which moves in a constant speed, identify the fire and also extinguish it with the help of pumping medium. The discovery and extinguishing was done with the help introductory tackle factors attached with the robot. originally, IR honey detectors are used for the discovery of fire. Secondly, BO Motors and Rubber bus are used to navigate the robot to reach the fireplace. Eventually, the robot extinguishes the fire with the help of submersible water pump and servo motors.

## REFERENCES

- <https://www.learnrobotics.org/blog/fire-extinguishing-robot/>
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- <http://engineering.nyu.edu/gk12/amps-cbri/pdf/ArduinoBooks/Arduino%20Programming%20Notebook.pdf>
- [https://www.researchgate.net/publication/351929726\\_Arduino\\_based\\_firefighting\\_Robot](https://www.researchgate.net/publication/351929726_Arduino_based_firefighting_Robot)
- <https://scienceq.org/wp-content/uploads/2020/08/JAETV8I103.pdf>