

# I K Gujral Punjab Technical University

## Amritsar Campus

Department of Computer Science & Engineering



Batch (2020-2024)

## Project Report On Fire Extinguisher Vehicle

**SUBMITTED BY:**

Manjosh Roy

2023727

B. Tech (CSE)

## **DECLARATION**

We here by declare that the work being presented by me on the project report entitled Arduino Based Fire Extinguisher for partial fulfillment of the award of degree of BTech submitted to the department of Computer Science and Engineering (CSE), I K Gujral Punjab Technical University. No part of this report has been submitted to any College or University for the reward of any degree to the best of my knowledge.

**Head of department:**

Dr. Vipul Sharma

**Project Leader:**

Manjosh Roy

**Team Member:**

Karan Bir

# **CONTENT OF PROJECT**

1. Acknowledgment
2. Abstract
3. Introduction
4. Requirement Analysis
5. System Design
6. Implementation
7. Conclusion
8. Future Scope

## **ACKNOWLEDGMENT**

- We would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.
- We take this opportunity to thank the I.K. Gujral Punjab Technical University for giving me chance to do this project.
- We would also like to express my sincere gratitude towards my project guides Dr. Vipul Sharma whose guidance and care made the project successful.
- I would like to thank my University Library for providing various reference books and magazines related to my project.

## **ABSTRACT**

There is no doubt that firefighting is an important job, but it is also a very dangerous occupation. The absence of human beings in detection of fire usually leads to a huge damage. This project aims to design a fire Extinguisher robot that can operate remotely. The development of Fire Extinguisher Robot consists of two elements i.e., hardware and programming. The prototype robot has four 100 rpm Battery Operated motors for driving system. Additionally, L293D microprocessor also interface with Flame sensor as feedback to the robot. With the assistance of a microcontroller, each guidance for controlling movement is given to the robot, with this assistance the robot can douse the fire.

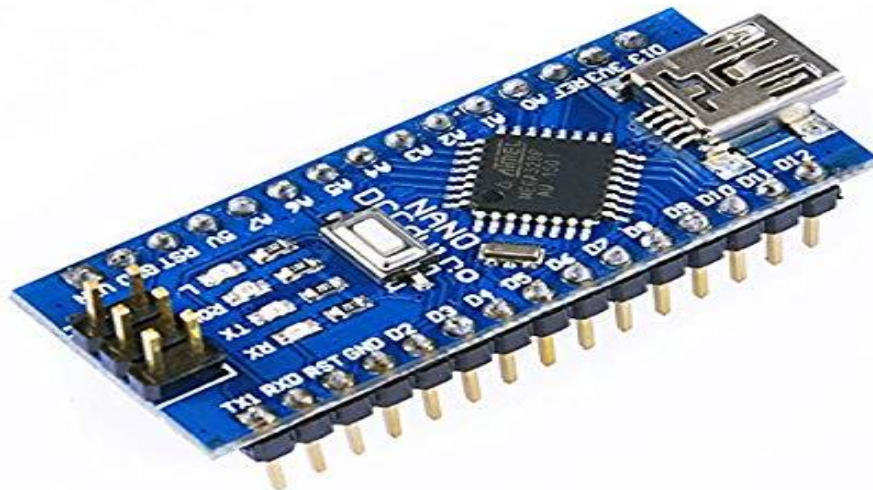
## **INTRODUCTION:**

Fires are among the most important form of problems. Robot industry has a lot of work in this area. So today robot is more commonly used to reduce the human efforts. The need of Fire extinguisher Robot that can detect and extinguish a fire on its own. Robotics is one of the fastest growing engineering fields of today. Robots are designed to remove the human factor from working intensive or dangerous work and also to act in inaccessible environment. With the invention of such a device, lives and property can be saved with minimal damage caused by the fire. As an engineer we have to design a prototype that could autonomously detect the fire and extinguish it. The Fire Extinguisher Robot is designed to search for a fire in the house or industry for extinguish the fire. The main and only work is to deploy the robot in a fire prone area and the robot will automatically work once it detects a fire breakout. This prototype helps in Rescue operations during fire accidents where the entry of service man is very difficult in the fire prone area. There are several existing types of vehicles for firefighting at home and extinguish forest fires. Our proposed robot is designed to be able to work on its own or be controlled remotely. By using such robots, fire identification and rescue activities can be done with higher security without placing fire fighters at high risk and dangerous conditions. A recent trend that has become popular is to use robots instead of humans to handle fire hazards. In our project, we develop a robot that is able to locate and extinguish fire in a given environment. The robot navigates the area and avoids any obstacles it faces in its excursion. Arduino board acts as a brain of the whole control circuitry. This Robot consist sensor that are interfaced in the control circuitry. Sensors are used to detect fire prone area all direction. When the robot reaches fire zone then a pump extinguisher is attached on the robot comes into action to extinguish the fire.

# REQUIREMENT ANALYSIS

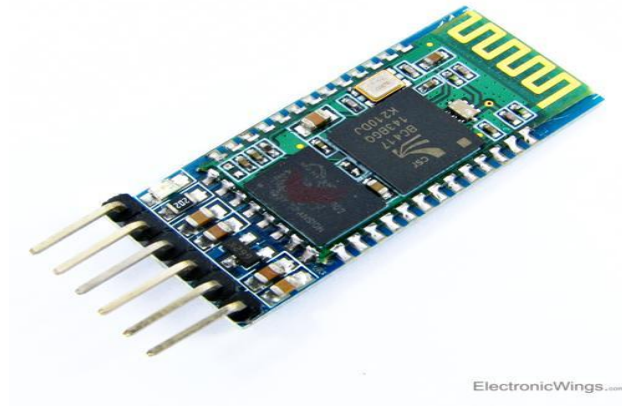
## **1.Arduino Nano:**

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started.



## **2.HC-05 BLUETOOTH MODULE:**

HC-05 module is easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 module -enable us to connect to vehicle. By using this module, we can control the vehicle from phone app. This module works on 3.3V. We can connect 5V supply voltage as well since the module has on board 5 to 3.3 V regulator. The data transfer rate of HC-05 module can vary up to 1Mbps is in the range of 10 meters.



### 3.FLAME SENSOR:

This sensor senses flame. Sources emits a wave length between 760nm and 1100nm. The detection angle would be 60 degree and can be achieved from a distance of 100cm. This sensor's output is either an analog or digital signal. The infrared flame flash method is used by this sensor.

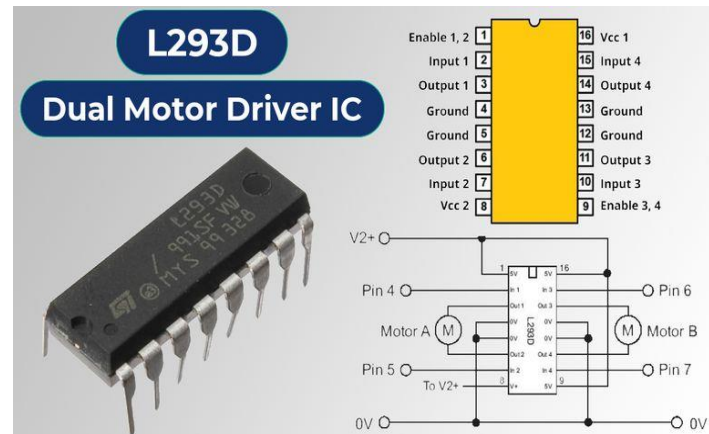


### 4.L293D:

L293D motor Driver IC is an integrated circuit that can drive two motors simultaneously and is usually used to control the motors in an autonomous system. This motor driver IC enables us to drive a DC motor in either direction and also control the speed of the motor. The L293D is a 16-pin Integrated circuit, with eight pins, on each side, dedicated to the controlling

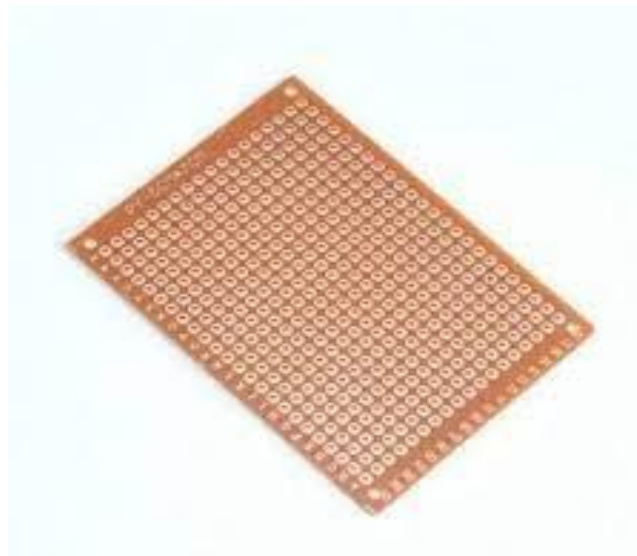


of a motor. There are 2 input pins, 2 output pins and 1 enable pin for each motor.



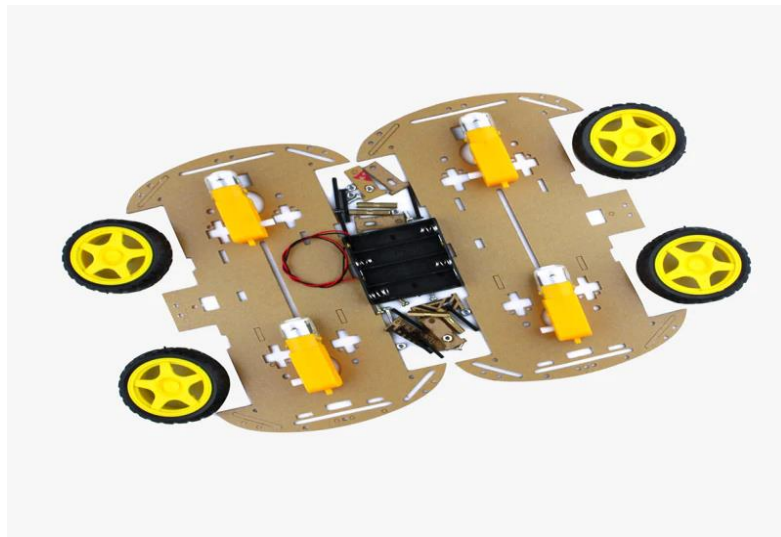
## 5.PCB BOARD:

PCBs require additional design effort to lay out the circuit, but manufacturing and assembly are automated. Electronic computer-aided design software is available to do much of the work of layout. Mass-producing circuits with PCBs are cheaper and faster than with other wiring methods.



## 6.ROBOT CAR KIT:

A 4 Wheels Robot Car Kit is a DIY kit for building a four-wheeled robot car. This type of kit typically includes components such as a microcontroller, wheels, motors, sensors, and battery, just like a 2 Wheels Robot Car Kit. However, the addition of two extra wheels provides stability and allows for a wider range of movements and capabilities. The microcontroller serves as the brain of the robot, controlling the movements of the wheels and processing data from the sensors. The kit is a great way for individuals interested in robotics and electronics to learn about the principles of motion and control while assembling a functional robot car. The finished product can be used for educational purposes, entertainment, or can be programmed to perform tasks such as obstacle avoidance or remote control.



## 7.SERVO MOTOR:

Servo motors or “servos”, as they are known are electronic devices and rotary or linear actuators that rotate and push parts of a machine with precision. Servos are mainly used on angular or linear position and for specific velocity, and acceleration.



## 8. CONNECTING WIRE:

A connecting wire is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a PCB or other prototype or test circuit, internally or with other equipment or components, with soldering. Connecting wires are fitted by soldering their end into the slots provided in a PCB board.



## **9.WATER PUMP 5V:**

The water pump works using water suction method which drain the water through its inlet and released it through the outlet. You can use the water pump as exhaust system for your aquarium and controlled water flow fountain. How to Use: Firstly, simply connect the red wire (+) and black wire (-) to a 3V or 5V DC supply.

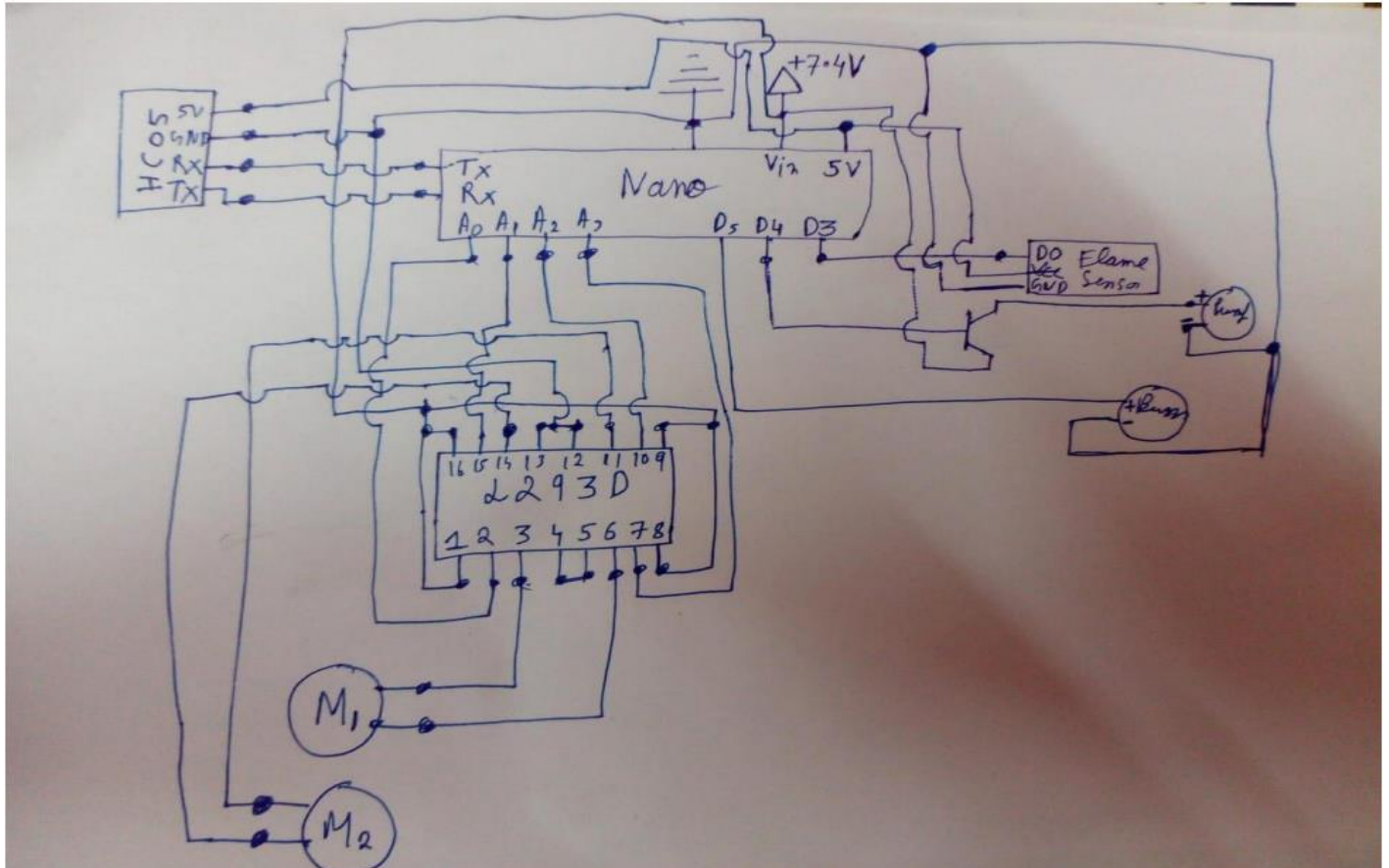


## **10.BUZZER:**

Piezo Buzzer 5V (Wire type) is a loud continues type Piezo Buzzer. It has two wires for connection and can work on 3 to 7 V DC. Just connect with power supply and it will give loud sound. The piezo buzzer produces sound based on reverse of the piezoelectric effect.



# SYSTEM DESIGN



## IMPLEMENTATION

```
#include <Servo.h>
#define flame 3
#define pump 4
#define fireAlarm 5
#define m11 A0
#define m12 A1
#define m21 A2
#define m22 A3
char c='\0';
Servo myServo;
void checkCommand();
void setup()
{
  Serial.begin(9600);
  pinMode(flame,INPUT);
  pinMode(pump,OUTPUT);
  pinMode(fireAlarm,OUTPUT);
  pinMode(m11,OUTPUT);
  pinMode(m12,OUTPUT);
  pinMode(m21,OUTPUT);
  pinMode(m22,OUTPUT);
  digitalWrite(m11,LOW);
  digitalWrite(m12,LOW);
  digitalWrite(m21,LOW);
  digitalWrite(m22,LOW);
  myServo.attach(2);
  myServo.write(45);
```

```
}  
void loop()  
{  
  for(int i=45;i<135;i++)  
  {  
    if(digitalRead(flame)==LOW)  
    {  
      digitalWrite(m11,LOW);  
      digitalWrite(m12,LOW);  
      digitalWrite(m21,LOW);  
      digitalWrite(m22,LOW);  
      digitalWrite(pump,HIGH);  
      digitalWrite(fireAlarm,HIGH);  
      while(digitalRead(flame)==LOW)  
      {  
        delay(10);  
      }  
      digitalWrite(pump,LOW);  
      digitalWrite(fireAlarm,LOW);  
    }  
    checkCommand();  
    myServo.write(i);  
    delay(10);  
  }  
  for(int i=135;i>=45;i--)  
  {  
    if(digitalRead(flame)==LOW)  
    {  
      digitalWrite(m11,LOW);  
      digitalWrite(m12,LOW);  
      digitalWrite(m21,LOW);
```

```
digitalWrite(m22,LOW);
digitalWrite(pump,HIGH);
digitalWrite(fireAlarm,HIGH);
while(digitalRead(flame)==LOW)
{
    delay(10);
}
digitalWrite(pump,LOW);
digitalWrite(fireAlarm,LOW);
}
checkCommand();
myServo.write(i);
delay(10);
}
}
void checkCommand()
{

if(Serial.available()>0)
{
    c=Serial.read();
    if(c=='F')
    {
        digitalWrite(m11,HIGH);
        digitalWrite(m12,LOW);
        digitalWrite(m21,HIGH);
        digitalWrite(m22,LOW);
    }
    else if(c=='B')
    {
        digitalWrite(m11,LOW);
```



```
digitalWrite(m12,HIGH);
digitalWrite(m21,LOW);
digitalWrite(m22,HIGH);
}
else if(c=='L')
{
digitalWrite(m11,LOW);
digitalWrite(m12,HIGH);
digitalWrite(m21,HIGH);
digitalWrite(m22,LOW);
}
else if(c=='R')
{
digitalWrite(m11,HIGH);
digitalWrite(m12,LOW);
digitalWrite(m21,LOW);
digitalWrite(m22,HIGH);
}
else if(c=='S')
{
digitalWrite(m11,LOW);
digitalWrite(m12,LOW);
digitalWrite(m21,LOW);
digitalWrite(m22,LOW);
}
}
}
```

## **CONCLUSION**

The Fire Extinguisher robot is a promising new technology that has the potential to revolutionize the way fire fighters operate. It is capable of navigating through a burning building and locating the source of the fire and extinguishing it quickly and accurately. Its main advantage is that it can be used in hazardous environments where it would be too dangerous for humans to enter. It also has the potential to save lives, as it is capable of responding to fires more quickly than human firefighters. Therefore, the Fire Extinguisher robot is an excellent tool to have in the firefighting arsenal.

## **FUTURE SCOPE**

The future of Fire Extinguisher robots is very promising. In the coming years, it is expected that robots will become increasingly autonomous and will be able to navigate dangerous environments, detect and analyze fires, and take action to extinguish them. Additionally, robots could be used to search and rescue victims, detect hazardous materials, and monitor situations remotely. There is also potential for robots to be equipped with thermal cameras, allowing them to detect hot spots and better direct firefighters on the ground. Furthermore, the development of artificial intelligence and machine learning could allow robots to make decisions and coordinate with each other in more sophisticated ways. Finally, it is likely that robots will be used in more applications to assist firefighters, such as providing medical aid and helping to contain fires.