



## **PES University, Bangalore**

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**UE21CS251B Microprocessor and Computer Architecture**

# **FIRE EXTINGUISHING ROBOT**

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**Branch : CSE**

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<b>Sl No.</b>	<b>Name of the Student</b>	<b>SRN</b>
1.	SINCHANA S	PES1UG21CS596
2.	Shreya R	PES1UG21CS577
3.	SINDHU V	PES1UG21CS597
4.	SHREEYA	PES1UG21CS565

**Name of the Course Instructor : Prof. Chandravva Hebbi**

**Signature of the Course Instructor**

**(with Date) : \_\_\_\_\_**

## **PROBLEM STATEMENT:**

"Fire accidents can cause significant damage to property and endanger the lives of people. In many cases, fire accidents occur in small areas where it is challenging for firefighters to reach quickly. Hence, there is a need for a robot that can detect and extinguish fires in small areas autonomously. The objective of this project is to design and implement a fire extinguishing robot that can detect and extinguish fires in a small area using sensors and a fire extinguishing mechanism. The robot should be cost-effective, efficient, and easy to operate."

## **IMPLEMENTATION:**

The first step in implementing the fire extinguishing robot is to assemble the hardware components. The motors and wheels will be connected to the motor driver L293D and the Arduino Uno board. The flame sensor will be connected to an analog input of the Arduino board. The servo motor will be connected to a PWM output of the Arduino board. Finally, the fire extinguishing mechanism will be attached to the servo motor.

The next step is to write the software code for the robot. The code will consist of two parts: the fire detection and the fire extinguishing mechanisms. In the fire detection mechanism, the flame sensor will be used to detect any fire in the vicinity. If a fire is detected, the robot will move towards it using the DC motors and wheels.

Once the robot reaches the fire, the fire extinguishing mechanism will be activated. The servo motor will move the fire extinguishing mechanism towards the fire, and the spray mechanism will be activated to extinguish the fire.

## **DESCRIPTION OF THE COMPONENTS USED:**

**Arduino Uno board:** It is a microcontroller board based on the ATmega328P processor. The board has several input/output pins that can be used to connect and control various electronic components such as sensors, motors, and servos.

**Motor driver L293D:** It is a motor driver module that allows the Arduino board to control the speed and direction of DC motors. The L293D module can control two DC motors simultaneously.

**Flame sensor:** It is a sensor that can detect the presence of flames or fire. The sensor works by detecting the infrared radiation emitted by flames.

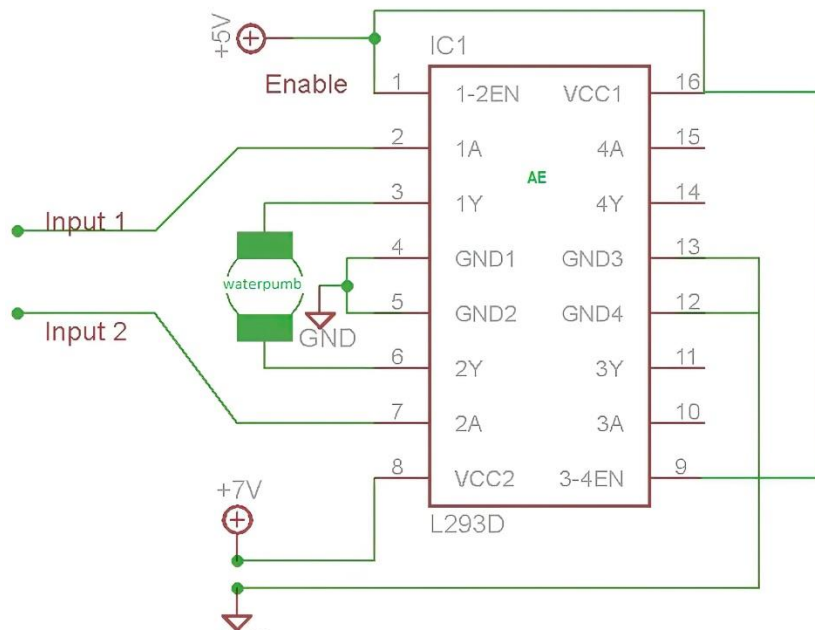
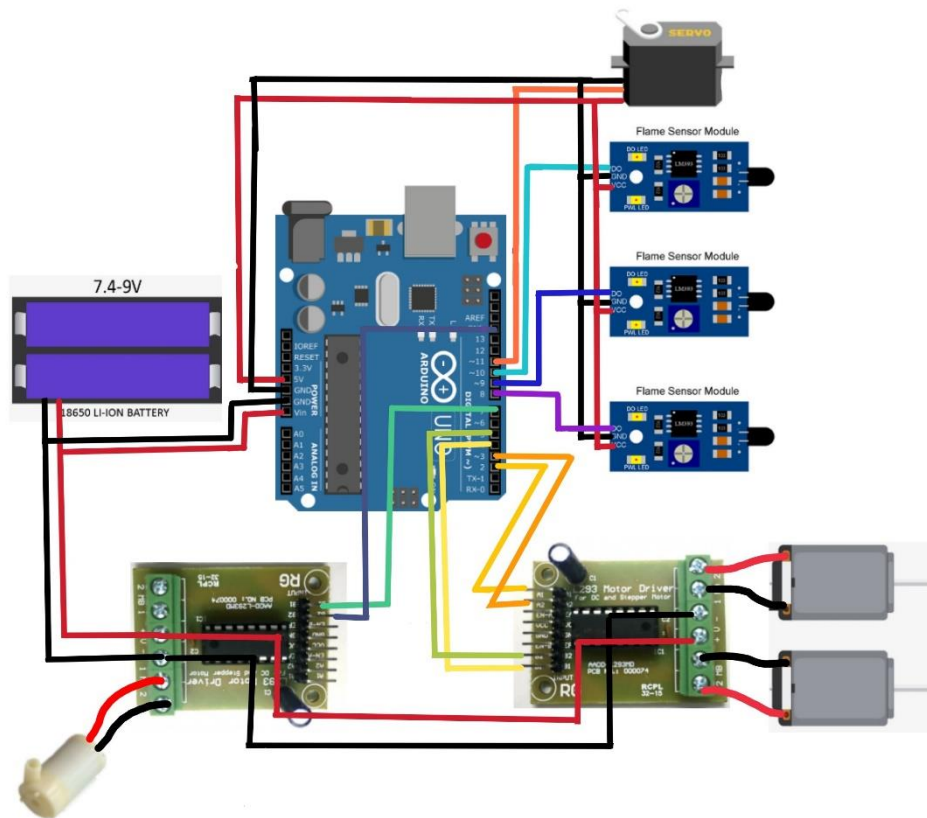
Servo motor: It is a motor that can rotate to a specific angle. The servo motor can be used to control the position of objects such as the fire extinguishing mechanism.

DC motors and wheels: They are used to provide the robot with locomotion. The DC motors rotate the wheels, which move the robot forward or backward.

Battery: It provides power to the Arduino board, motor driver, and motors.

Fire extinguishing mechanism: Pump along with small water container is used to extinguish the fire

## CIRCUIT DIAGRAM:



## **CODE:**

```
#include <Servo.h> +

Servo myservo;

int pos = 0;

boolean fire = false;

#define Left 9    // left sensor
#define Right 10  // right sensor
#define Forward 8 //front sensor

#define LM1 2     // left motor
#define LM2 3     // left motor
#define RM1 4     // right motor
#define RM2 5     // right motor
#define pump 7    // modified from 6 to 7

void setup()
{
    //Serial.begin(9600);
    pinMode(Left, INPUT);
    pinMode(Right, INPUT);
    pinMode(Forward, INPUT);
    pinMode(LM1, OUTPUT);
    pinMode(LM2, OUTPUT);
    pinMode(RM1, OUTPUT);
    pinMode(RM2, OUTPUT);
    pinMode(pump, OUTPUT);
```

```

myservo.attach(11);
myservo.write(120);
}

void put_off_fire()
{
// Serial.print("put off fire.. ");
//delay (500);

// brake all wheels and stop vehicle
digitalWrite(LM1, HIGH);
digitalWrite(LM2, HIGH);
digitalWrite(RM1, HIGH);
digitalWrite(RM2, HIGH);

delay(500);

digitalWrite(pump, HIGH); // start water flow
delay(100);
digitalWrite(pump,LOW); // turn off water pump
digitalWrite(pump,LOW);
// turn jet left to right
for (pos = 50; pos <= 130; pos += 1) {
myservo.write(pos);
delay(20);
}
// turn jet right to left

```

```

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

// digitalWrite(pump,LOW); // turn off water pump
delay(50);
myservo.write(90); // bring jet to centre

fire=false;
}

void loop()
{
// Serial.print("\n\ninLoop \n");

int l = digitalRead(Left);
int r = digitalRead(Right);
int m = digitalRead(Forward);

// Serial.println(l);
// Serial.println(r);
// Serial.println(m);

if(r == 0) // fire
{
// Serial.println("FIRE DETECTED!!\n");

```

```
// move vehicle forward 1,0,1,0
digitalWrite(LM1, HIGH);
digitalWrite(LM2, LOW);
digitalWrite(RM1, HIGH);
digitalWrite(RM2, LOW);
delay(3000);

put_off_fire();

}
else // no fire. stop vehicle
{
//Serial.println("NO FIRE\n");

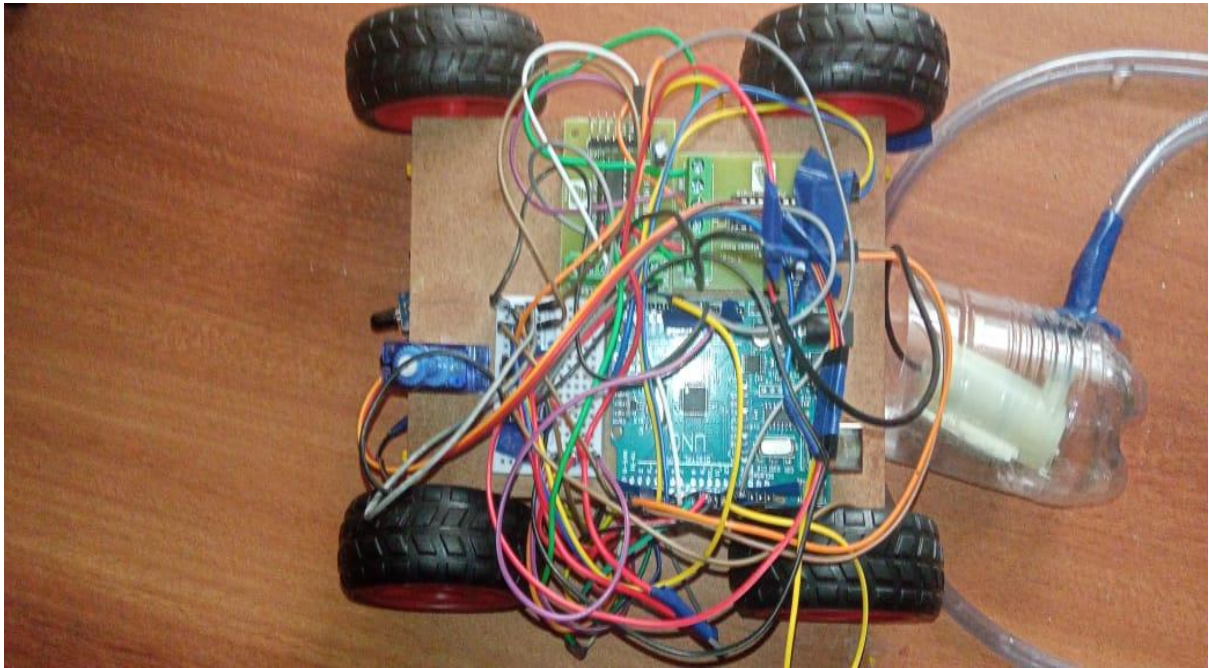
digitalWrite(LM1, HIGH);
digitalWrite(LM2, HIGH);
digitalWrite(RM1, HIGH);
digitalWrite(RM2, HIGH);

}
delay(500);//change this value to increase the distance

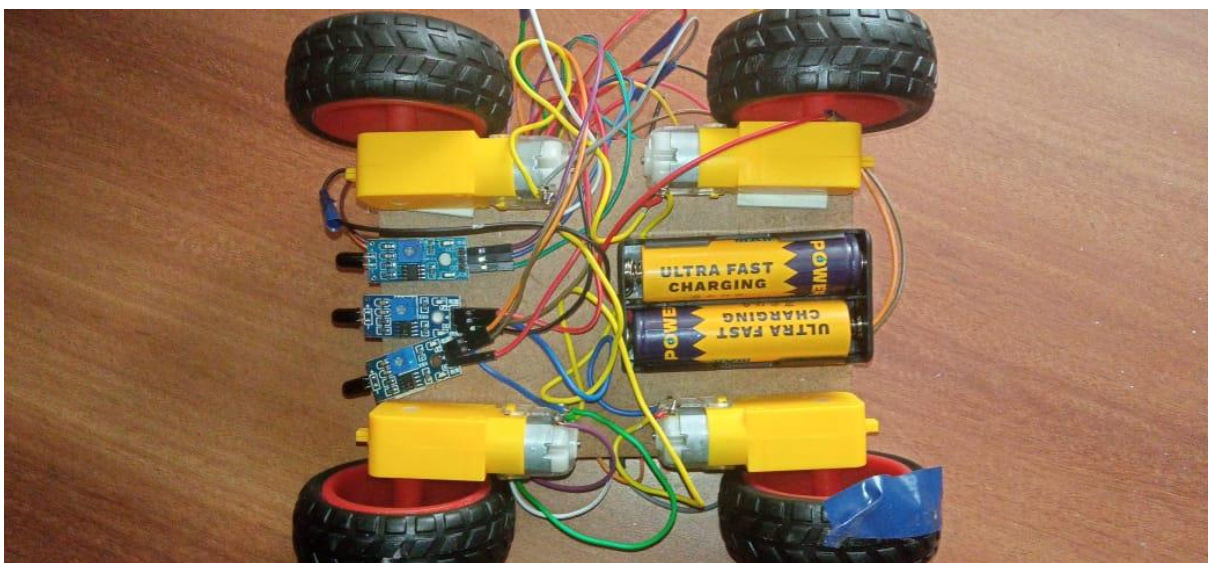
}
```



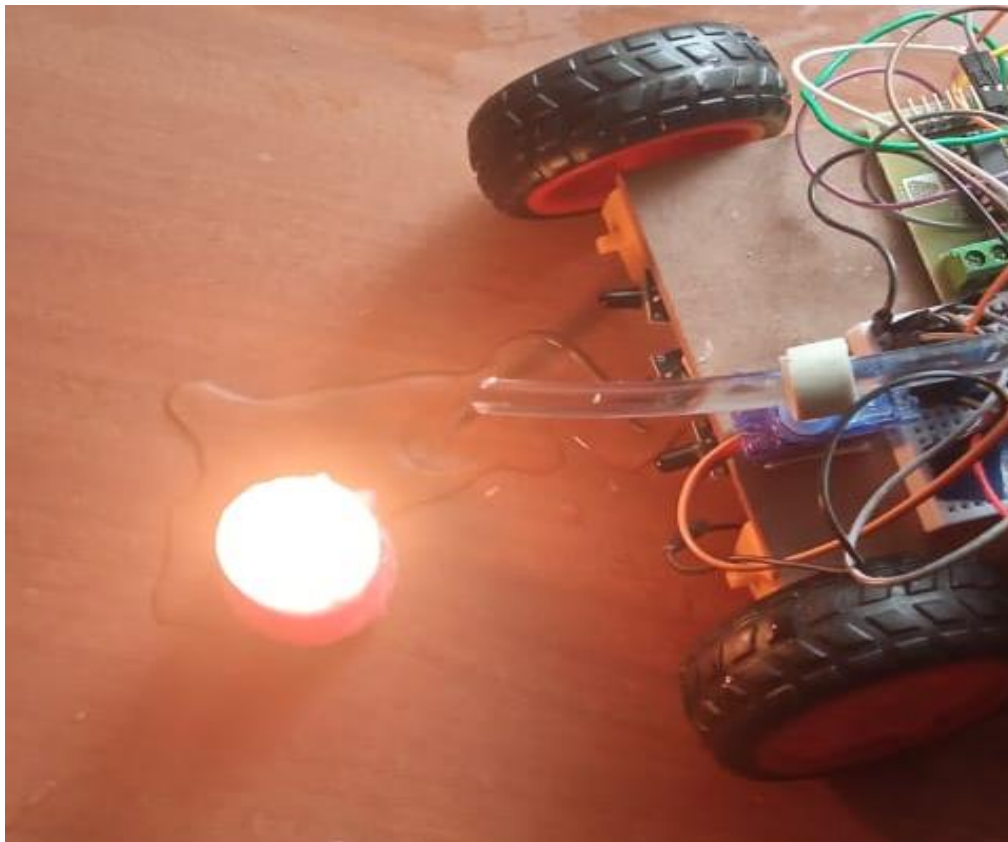
## SCREENSHOTS:



**TOP VIEW OF FIRE EXTINGUISHING ROBOT**



**BOTTOM VIEW OF FIRE EXTINGUISHING ROBOT**



**WHEN THE ROBOT DETECTS FIRE WITH FLAME SENSORS AND EXTINGUISHES FIRE**