Ahsanullah University of Science and Technology
Department of Electrical and Electronic Engineering

Project on
Fire Fighting Robot

Course No: **EEE 3210**
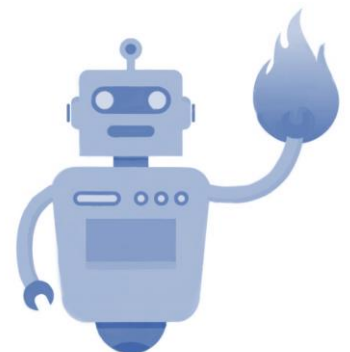Course Title: **Microprocessor, Interfacing and System Design Lab.**

Year/Semester: Third Year Second Semester
Section: **A |** Lab Group: **A1 |** Group: **03**

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Introduction

The Fire Fighter 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. When the robot reaches fire zone then a pump extinguisher is attached on the robot comes into action to extinguish the fire.

- It detect the exact direction of fire source and reduce human efforts .
- Reliable and economical and capability of sensing accurately with increased flexibility.

Aim to build the system

Fire incident is a disaster that can potentially cause the loss of life, property damage and permanent disability to the affected victim. Fires are among the most important form of problems. Robot industry has a lot of work in this area.

Aim to develop microcontroller based fire fighting robot.

- A robot that detects the fire.
- And that has an immediate extinguish system.
- Should work automatically and detect the flame.
- A good replacement of fireman in dangerous places.

Equipment

- **Arduino Uno**

- **IR Flame sensor / Fire sensor**

- **L298N motor driver module**

- **Resistor (220 ohm)**

- **Servo Motor**

- **DC Pumping Motor**

Equipment

- **Battery 1500 MAH**
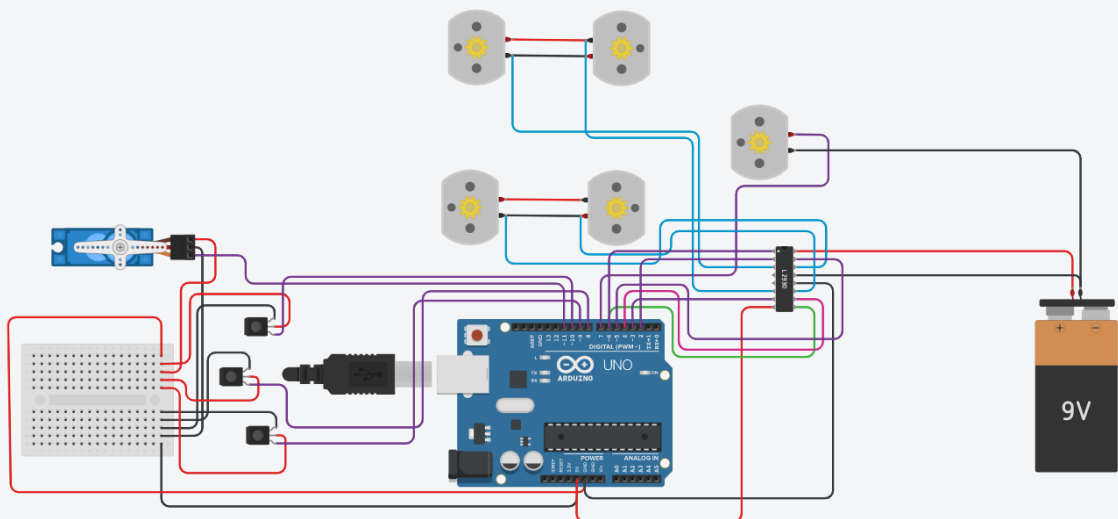

- **Jumper Wires**

- **Breadboard**

- **Buck Converter**
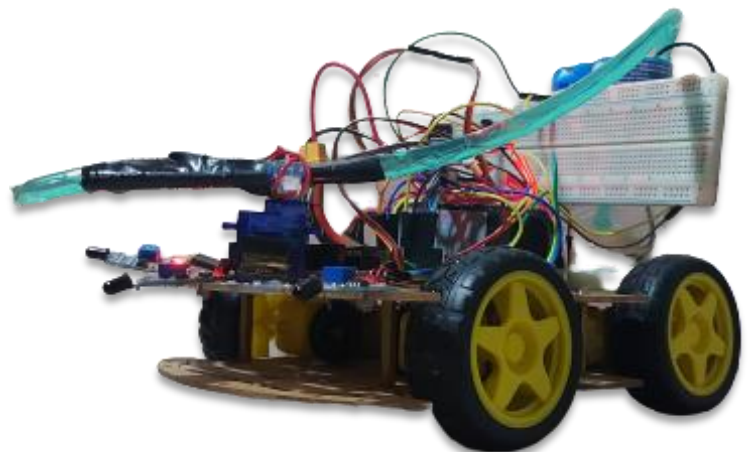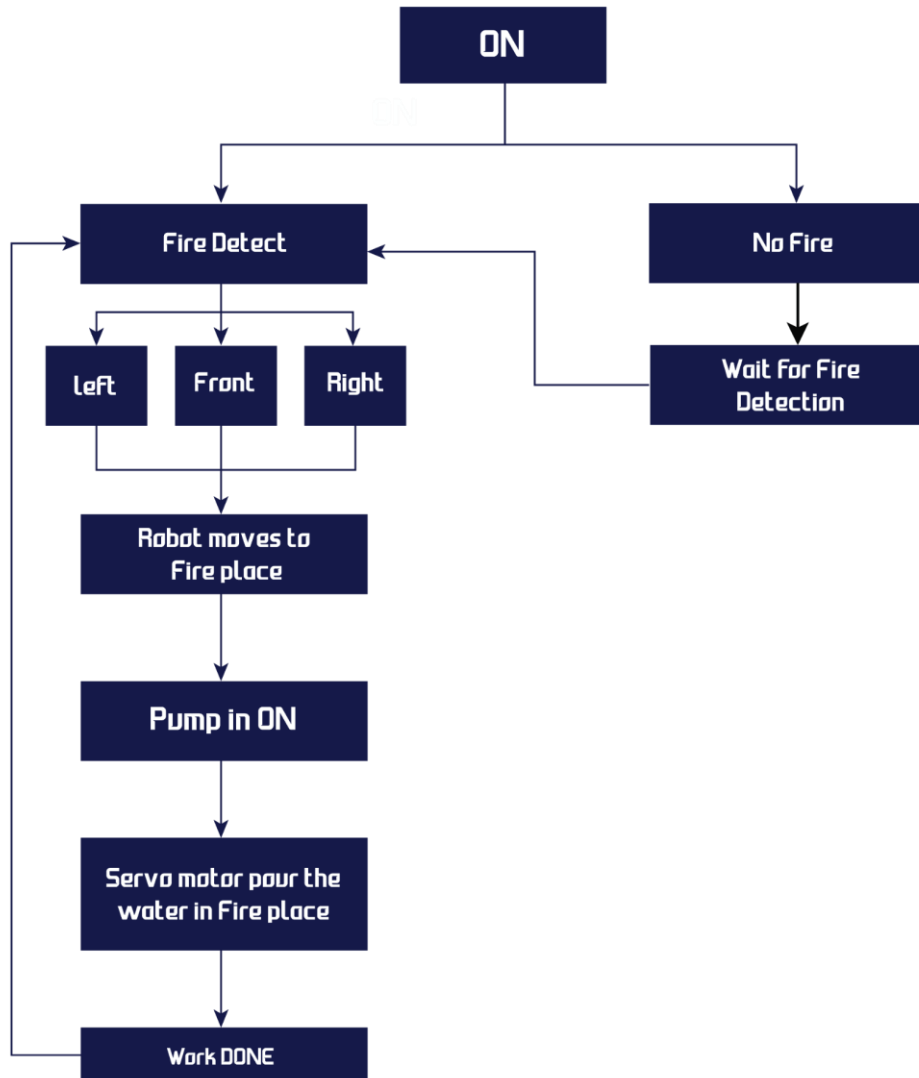

- **Robot Chassis with 4-motors and 4-wheels**

Circuit Diagram through Tinker CAD

Working Principle

```
                    ┌──────────┐
                    │    ON    │
                    └──────────┘
              ┌──────────┴──────────────┐
              ▼                          ▼
      ┌──────────────┐          ┌──────────────┐
      │  Fire Detect │◄───┐     │    No Fire   │
      └──────────────┘    │     └──────────────┘
       ┌─────┬──────┬─────┐           │
       ▼     ▼      ▼     │           ▼
   ┌──────┐┌──────┐┌──────┐   ┌──────────────┐
   │ Left ││Front ││Right │   │ Wait for Fire│
   └──────┘└──────┘└──────┘   │   Detection  │
              ▼               └──────────────┘
      ┌──────────────┐
      │ Robot moves to│
      │  Fire place   │
      └──────────────┘
              ▼
      ┌──────────────┐
      │  Pump in ON  │
      └──────────────┘
              ▼
      ┌──────────────┐
      │Servo motor pour the│
      │ water in Fire place│
      └──────────────┘
              ▼
      ┌──────────────┐
      │  Work DONE   │
      └──────────────┘
```

ON

Fire Detect

No Fire

Left   Front   Right

Wait for Fire Detection

Robot moves to Fire place

Pump in ON

Servo motor pour the water in Fire place

Work DONE

Arduino Codes

```
//Project Name:  Fire Fighting Robot
//Year/Semester: Third Year Second Semester
//Section: A | Lab Group: A1  | Group: 03

#include<Servo.h>
Servo project;
int pos = 0;
boolean fire = false;

//defining inputs
#define Forward_S 8 //Forward sensor
#define Left_S 9    //Left sensor
#define Right_S 10  //Right sensor

//defining outputs
#define LM1 2  //left motor
#define LM2 3  //left motor
#define RM1 4  //right motor
#define RM2 5  //right motor
#define pump 7

void setup()
{
  Serial.begin(9600);
  pinMode (Left_S, INPUT);
  pinMode (Right_S, INPUT);
  pinMode (Forward_S, INPUT);
  pinMode (LM1, OUTPUT);
  pinMode (LM2, OUTPUT);
  pinMode (RM1, OUTPUT);
  pinMode (RM2, OUTPUT);
  pinMode (pump, OUTPUT);
  pinMode (6, OUTPUT);
  project.attach(11);
  project.write(50);
}

void put_off_fire()
{
  digitalWrite(LM1, HIGH);
  digitalWrite(LM2, HIGH);
  digitalWrite(RM1, HIGH);
  digitalWrite(RM2, HIGH);
  digitalWrite(pump, HIGH);
  delay(500);
```

Arduino Codes

```
for (pos = 50; pos <= 130; pos += 1)
 {
   project.write(pos);
   Serial.println("Servo running");
   delay(10);
 }
 for (pos = 130; pos >= 50; pos -= 1) {
   project.write(pos);
   delay(10);
 }
 digitalWrite(pump, LOW);
 project.write(50);
 fire = false;
}
void loop() {
 project.write(90);

 if (digitalRead(Left_S) == 1 && digitalRead(Right_S) == 1 && digitalRead(Forward_S) == 1)
 {
   //Do not move the robot
   digitalWrite(LM1, HIGH);
   digitalWrite(LM2, HIGH);
   digitalWrite(RM1, HIGH);
   digitalWrite(RM2, HIGH);
   Serial.println("Stopped");

 }

 else if (digitalRead(Forward_S) == 0) //Fire ahead
 {
   digitalWrite(6, 65);

   //For Moving Forward
   digitalWrite(LM1, HIGH);
   digitalWrite(LM2, LOW);
   digitalWrite(RM1, HIGH);
   digitalWrite(RM2, LOW);
   Serial.println("Going forward");
   fire = true;
 }
```

Arduino Codes

```
  else if (digitalRead(Left_S) == 0)   //Fire Left
 {
  digitalWrite (6, 130);

  //For Moving Left
  digitalWrite(LM1, HIGH);
  digitalWrite(LM2, LOW);
  digitalWrite(RM1, LOW);
  digitalWrite(RM2, HIGH);
  Serial.println("Going left");
 }

 else if (digitalRead(Right_S) == 0)   //Fire Right
 {
  digitalWrite(6, 1300);

  //For Moving Right
  digitalWrite(LM1, LOW);
  digitalWrite(LM2, HIGH);
  digitalWrite(RM1, HIGH);
  digitalWrite(RM2, LOW);
  Serial.println("Going right");
 }
 delay(250);

 while (fire == true)
 {
  put_off_fire();
 }
}
```

Developed Fire Fighting Robot

The real-time firefighting robot is described in this project. It moves at a constant speed, detects fires, and then puts them out using a pumping mechanism. In addition to having a small body and a light structure, it includes advantageous features such as the capacity to detect the position of fire automatically. The robot's diminutive form allows it to be deployed in places with narrow entrances and cramped areas. The method may help support firefighters and halt an outbreak. Additionally, the operator can put out fires remotely and at a greater distance. According to the findings of the experiments, the robot can quickly and reliably detect fire.

Advantages & Disadvantages

The Robot has advantageous features such as;

- The ability to detect the source of fire.
- Reduce human effort.
- Reliable and Economical.
- It has an immediate Extinguish system.
- It reduces the time delay in reaching fire affected area.
- Not sensitive to weather conditions
- Increase the knowledge about fire behavior from the incident area.
- Easier access to the to the limited space of a fire scene.
- It reduces the errors and the limitations that are faced by human firefighters.

The Robot has also some disadvantages:

- It has a limitation in the range of fire detection. In term of long range, the flame sensor couldn't detect the fire.
- There are No flame sensor at the behind of Robot. So that, it couldn't detect fire from behind. But it can be developed by adding an extra flame sensor behind.
- No remote control system is developed for the robotic movement.
- It is not used to put out large fires.

Future scope of Fire fighting robot

- The firefighting robot will have a future scope that can work with firefighters, significantly reducing the danger of injury to victims.
- It is an innovative work in the field of robotics that operates towards sensible and obtainable access to save lives and presents the danger to property.
- The future of firefighting will see more and more automation, including drones, robots, and systems that operate automatically to protect building occupants and the fire service.
- Technologies also provide more information about a fire scene faster, thus facilitating more efficient use of resources

Acknowledgment