



# University of Asia Pacific

Department of Computer Science and Engineering

## CSE 437: Robotics Lab

### LAB REPORT

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**Experiment Number: 02**

**Experiment Title: Design and Implementation of a Simple Arduino Fire Fighting Robot**

**Submitted by:**

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## **1. Experiment Name**

Mini Project: Designing and Implementing a Fire Fighting Robot using Arduino Uno

## **2. Objective**

The objective of this experiment is to design and implement a fire fighting robot using Arduino Uno that can detect fire using flame sensors and extinguish it automatically using a water pump.

## **3. Apparatus / Hardware & Software Requirements**

Hardware Components :

- Arduino Uno
- LDR
- Motor Driver Module (L298N or L293D)
- DC Motors (2 or 4 motors for robot movement)
- Water Pump Module
- Relay Module (for pump control)
- Battery (9V or Li-ion battery pack)
- Robot Chassis
- Jumper Wires
- Breadboard
- Water Tank or Bottle
- Wheels
- Software Requirements
- Arduino IDE
- Tinkercad / WOKWI (for simulation)

## 4. Circuit Diagram / Schematic

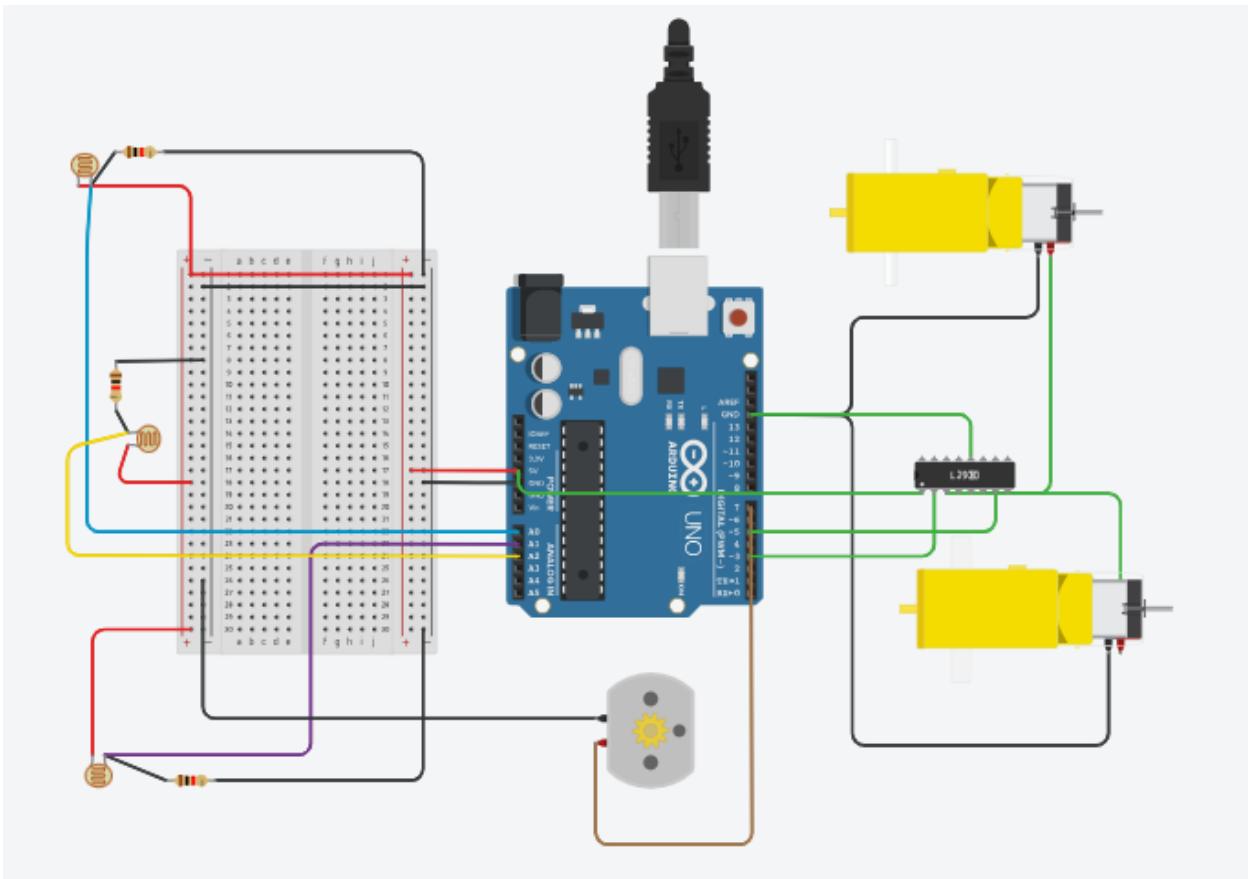


Fig : 01 - Fire Fighting Robot Circuit Diagram

## 4. Code / Assembly Program

```
// C++ code for Fire Fighting Robot

int L = 0;
int R = 0;
int F = 0;

void setup()
{
    pinMode(3, OUTPUT);
    
```

```

pinMode(5, OUTPUT);
pinMode(7, OUTPUT);
pinMode(A0, INPUT);
pinMode(A1, INPUT);
pinMode(A2, INPUT);
Serial.begin(9600);
}

void loop()
{
L = analogRead(A0);
R = analogRead(A1);
F = analogRead(A2);

Serial.print("Left: "); Serial.print(L);
Serial.print(" Right: "); Serial.print(R);
Serial.print(" Front: "); Serial.println(F);
if (F > 400)
{
  Serial.println("Fire Detected! Car is going near the fire...");
  digitalWrite(7, HIGH);
  digitalWrite(3, LOW);
  digitalWrite(5, LOW);
  Serial.println("Water Pump is ON");
  delay(3000); // spray water
  digitalWrite(7, LOW);
}

```

```
Serial.println("Water Pump is OFF");

delay(100);

}

else

{

digitalWrite(7, LOW); // Pump OFF

t

if (L > 400 && R > 400)

{

Serial.println("Robot Moving Forward");

digitalWrite(5, HIGH);

digitalWrite(3, HIGH);

}

else if (L > 400 && R < 400)

{

Serial.println("Turning Right");

digitalWrite(5, HIGH);

digitalWrite(3, LOW);

}

else if (L < 400 && R > 400)

{

Serial.println("Turning Left");

digitalWrite(5, LOW);

digitalWrite(3, HIGH);
```

```

    }

else

{
    Serial.println("Robot Stopped");

    digitalWrite(5, LOW);

    digitalWrite(3, LOW);

}

delay(100);

}
}
```

## 5. Output / Observations

### System Behavior Observations -

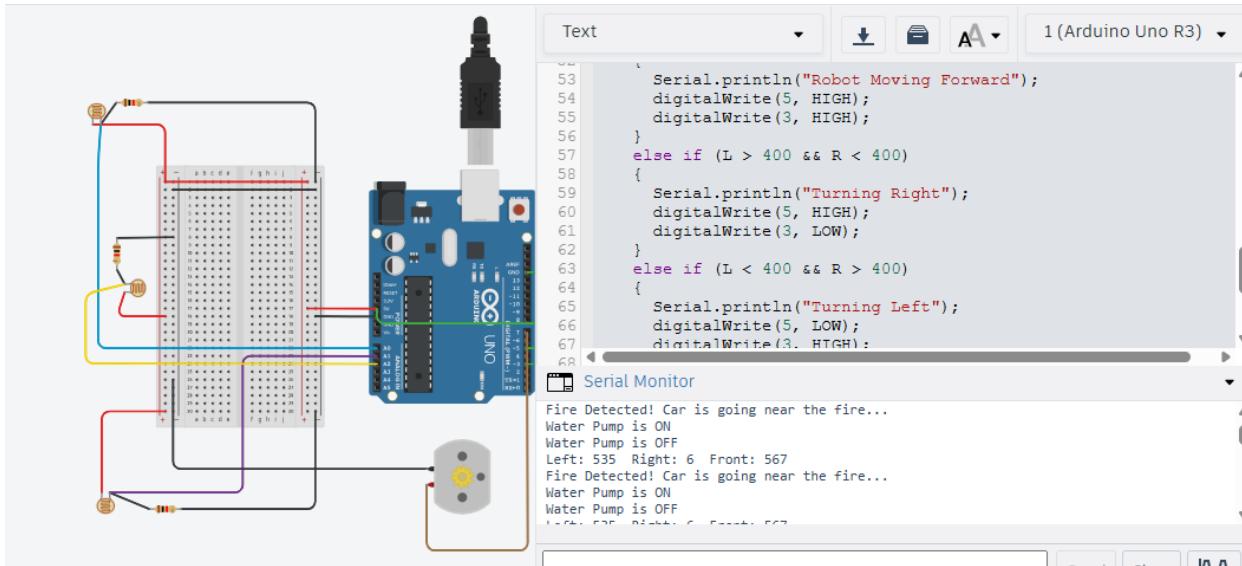
When no fire is detected, the robot moves forward searching for a fire source.

When the flame sensor detects fire, the robot stops automatically.

The water pump turns ON and sprays water to extinguish the fire.

After a few seconds, the pump turns OFF, and the robot resumes searching.

Sl No.	Flame Sensor Reading	Fire Detected	Robot Action	Pump Status
1	> 500	No	Robot moves forward	OFF
2	400 – 500	Weak flame	Robot slows/stops	OFF
3	< 300	Yes (Strong fire)	Robot stops	ON
4	After 3 seconds	Fire reduced	Robot resumes	OFF



## 6. Result

The fire fighting robot was successfully designed and implemented.

The robot could detect fire using a flame sensor and extinguish it using a water pump.

Therefore, the experiment objective was successfully achieved.

## 8. Conclusion

In this experiment, we learned how to design an autonomous fire fighting robot using Arduino Uno. We understood the working of flame sensors, motor drivers, and relay modules. This project demonstrates the practical application of embedded systems and robotics in safety and disaster management.