FIRE-EX ROBOT

Introduction:

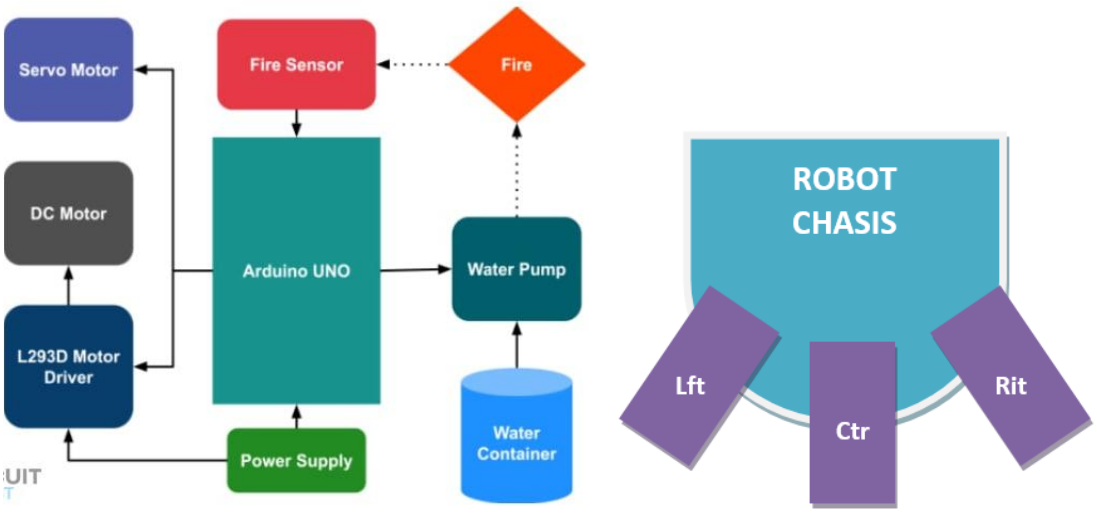
In places like homes and industries, there's always a risk of sudden fire accidents. If no one is around to respond quickly, it can lead to serious damage. We wanted to build something that could act immediately in such situations — without human help.

So, we designed an **autonomous robot** using **Arduino** that can detect fire using an **IR flame sensor**, figure out the direction of the flame, and move towards it. Once it's close enough, it turns on a **mini water pump** to spray water and put out the fire.

Components used:

1. Arduino UNO
2. Fire sensor or Flame sensor (3 Nos)
3. Servo Motor (SG90)
4. L293D motor Driver module
5. Mini DC Submersible Pump
6. Small Breadboard
7. Robot chassis with motors (2) and wheels(2) (any type)
8. A small can
9. Connecting wires

Block Diagram:



Working Principle:

The Fire-Ex Robot works by automatically detecting fire using **flame sensors** and then moving toward the fire to put it out.

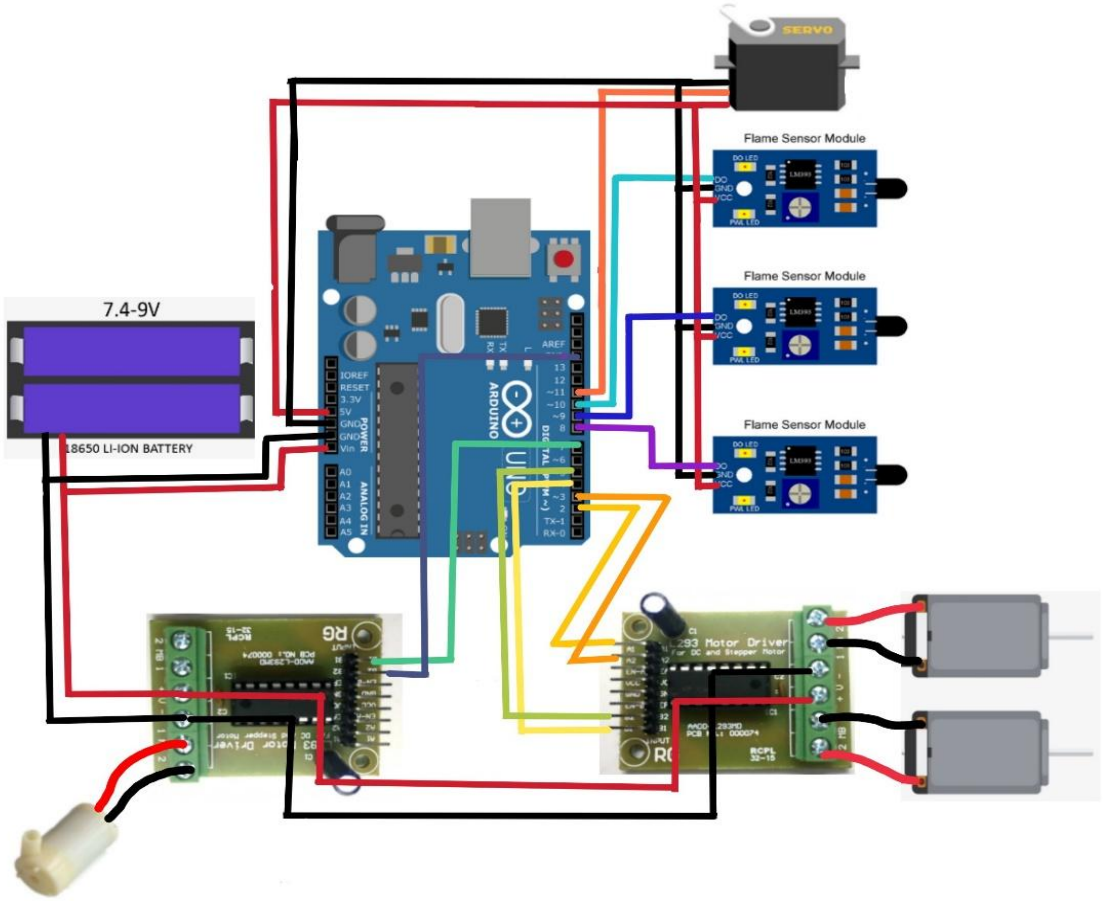
Here's how it works step by step:

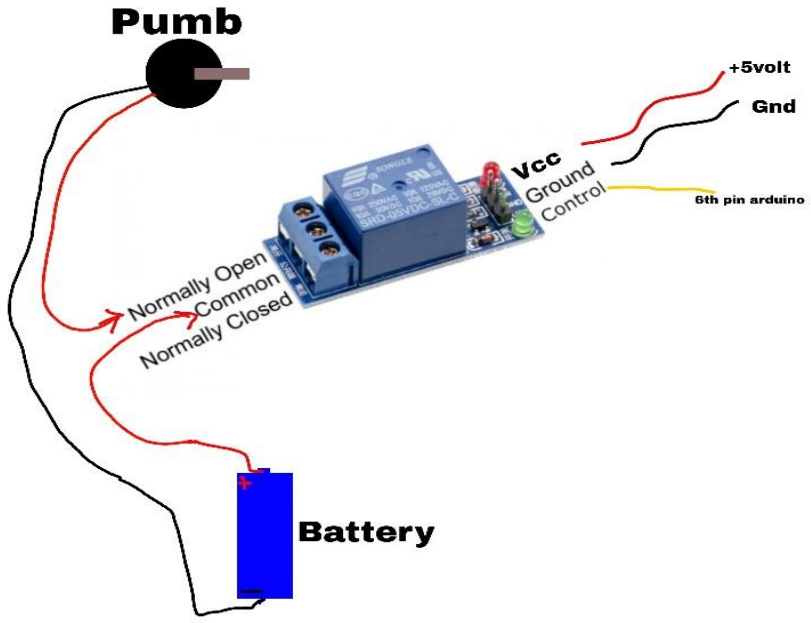
1. **Fire Detection**
   The robot has **three flame sensors** — one in front, one on the left, and one on the right. These sensors keep scanning for fire.
2. **Finding the Direction**
   When a fire is detected, the Arduino checks which sensor is detecting it. This helps the robot know whether the fire is in front, on the left, or on the right.
3. **Moving Toward Fire**
   Based on the sensor data, the robot turns and moves toward the fire using **DC motors** controlled by the **L293D motor driver module**.
4. **Spraying Water**
   When the robot gets close to the fire, it activates a **mini water pump** to spray water. A **servo motor** moves the water nozzle side to side, covering a wider area while spraying.
5. **Extinguishing Fire**
   After spraying, the robot stops the pump and returns to normal scanning mode, ready to detect the next fire if needed.

The entire system works automatically without any remote or manual control. It's powered by a battery and can be used indoors or in controlled environments.

Images of the Robot:

Circuit Diagram:





Applications:

At Home
The robot can help put out small fires in the kitchen or near electrical appliances before they get worse — especially if no one is around.

In Factories or Shops
It can move and act quickly in case a fire starts when workers are away, like at night or during breaks.

In Computer Rooms
It can protect expensive computers or servers by detecting and stopping fires early.

In Hospitals or Labs
Useful in areas where flammable items are kept and where fast action is important for safety.**In**

Remote Areas
Places like power stations or store rooms that are far away or not always watched can use this robot for basic fire protection.

For Students and Learning
It's a great mini-project for learning robotics, Arduino, and how technology can solve real-life problems.

Future scope:

Obstacle Avoidance
Right now, the robot moves in a straight path. In the future, we can add sensors like ultrasonic or IR to help it avoid walls and objects while moving toward the fire.

Smoke and Temperature Detection
Along with flame sensors, we can add smoke and temperature sensors to detect fire more accurately.

Remote Alerts
The robot can be connected to Wi-Fi or Bluetooth to send alerts to your phone if it detects fire, even when you're not nearby.

Rechargeable Battery System
Adding a smart battery with auto-charging can make the robot more reliable and long-lasting.

Camera and AI
A small camera can be added for live video monitoring, and AI can help the robot decide the best path and identify fire more smartly.

Bigger Water Tank and Range
The robot can be upgraded with a larger water tank and longer-range movement to cover bigger areas like warehouses.

App or Voice Control
A simple mobile app or voice commands (using Google Assistant/Alexa) can be used to control or check robot status.

Conclusion:

The **Fire-Ex Robot** is a small but powerful solution for detecting and extinguishing small fires without needing human help. It uses flame sensors to detect fire, moves toward the flame, and automatically sprays water to put it out.

This project shows how we can combine simple electronics like Arduino, sensors, and motors to solve real-world problems. While it's designed for basic fire safety, it has the potential to be improved and used in bigger or more complex situations.

Overall, the Fire-Ex Robot is a great step toward building smart, low-cost safety systems that can act quickly in emergencies.