



Princess Sumaya  
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# FireFighter Car using PIC16F877A

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## Introduction

Conventional firefighting methods face challenges in accessing confined spaces, pinpointing fire sources, and deploying resources effectively. These techniques are resource-heavy and pose risks to firefighters, especially in extreme situations. To tackle these issues, we have created a fire-detecting and extinguishing robot. Despite its small size, it features advanced flame and ultrasonic sensors, intelligent motor controls, and an automated fire suppression system. The robot can autonomously navigate, detect fires, and take immediate action, reducing human exposure to danger.

## Design

The firefighting robot is designed for self-directed navigation, fire detection, and suppression. It uses an ultrasonic sensor to detect obstacles and maintain safe movement, while three flame sensors monitor the environment for fire. Upon detecting a fire, the microcontroller processes the sensor data to pinpoint its location and directs a servo motor to aim the nozzle precisely. The water pump, controlled by a relay, is then activated to extinguish the fire. The robot's movement is powered by two DC motors controlled via an H-Bridge circuit, ensuring smooth navigation in various environments. The updated flowchart illustrates the robot's operational process.

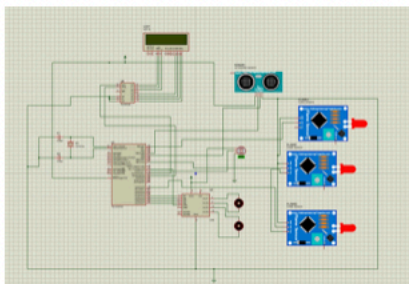


Figure 1: Electrical Design



Figure 2: Flow Diagram

## Results

The firefighting robot successfully detected and extinguished fires during testing. It accurately located fires using flame sensors, aimed the nozzle with the servo motor, and extinguished flames with the water pump. The ultrasonic sensor ensured smooth movement and obstacle avoidance. Despite the limited range of the flame sensors, the robot performed reliably and met the project's goals.

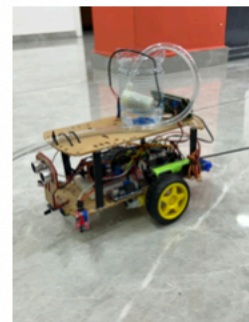
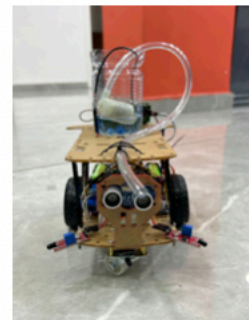
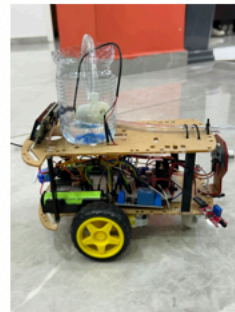
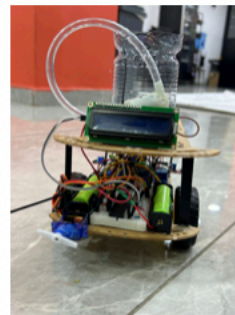


Figure 3: Fire Fighter Car

## Conclusion

The firefighting robot successfully detected and extinguished fires while autonomously navigating its environment, demonstrating the potential of automated systems to enhance safety in hazardous situations. Despite facing some minor challenges, it met its objectives effectively, proving that robotics can play a crucial role in firefighting. This project paves the way for further advancements in robotic safety systems, offering opportunities for more refined, reliable, and efficient solutions in the future.