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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CS8611-MINI PROJECT

**UTILIZATION OF WATER AND AUTOMATION
IN FIRE FIGHTING ROBOT**

GUIDE

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INTRODUCTION

The aim of our project is to automate firefighting robots to reduce the risk to human firefighters by handling hazardous fire environments. Which focuses on the design and implementation of a ground-based firefighting robot equipped with specialized sensors and actuators.

OBJECTIVE

The objective of our project is to develop a microcontroller-based fire-controlling robot that senses the flame in the environment using a flame sensor mounted on the robot and operates a water pump mechanism to extinguish the fire.

LITERATURE REVIEW

| YEAR | TITLE | ADVANTAGES | DISADVANTAGES |
|------|---|---|--|
| 2021 | Cooperative Multi-Robot System for Firefighting in Complex Structures | Multiple robots collab workload distribution | Complexity in co- ordinating actions Increased cost and maintenance |
| 2020 | Autonomous Firefighting Robot for Indoor Environments | Obstacle avoidance Autonomous capabilities | Challenges in accurately Limited ability |
| 2019 | Aerial Firefighting Robot with Flame Detection and Suppression | Accuracy Aerial robot | Limited payload Challenges in maintaining stability |
| 2018 | Firefighting Robot Using Image Processing and Path Planning | Real-time Path planning | Detection may result in false positives |

PROBLEM STATEMENT

Problem statement 01:

To automate the navigation of the robot without any human intervention in the target area.

Problem statement 02:

To utilize the water in a fire-fighting robot that can automatically deliver the water to extinguish the fire.

PROPOSED SYSTEM

Automated mode, the robot is completely automated to search for the presence of possible flames and to navigate to the target area then extinguish the utilized water.

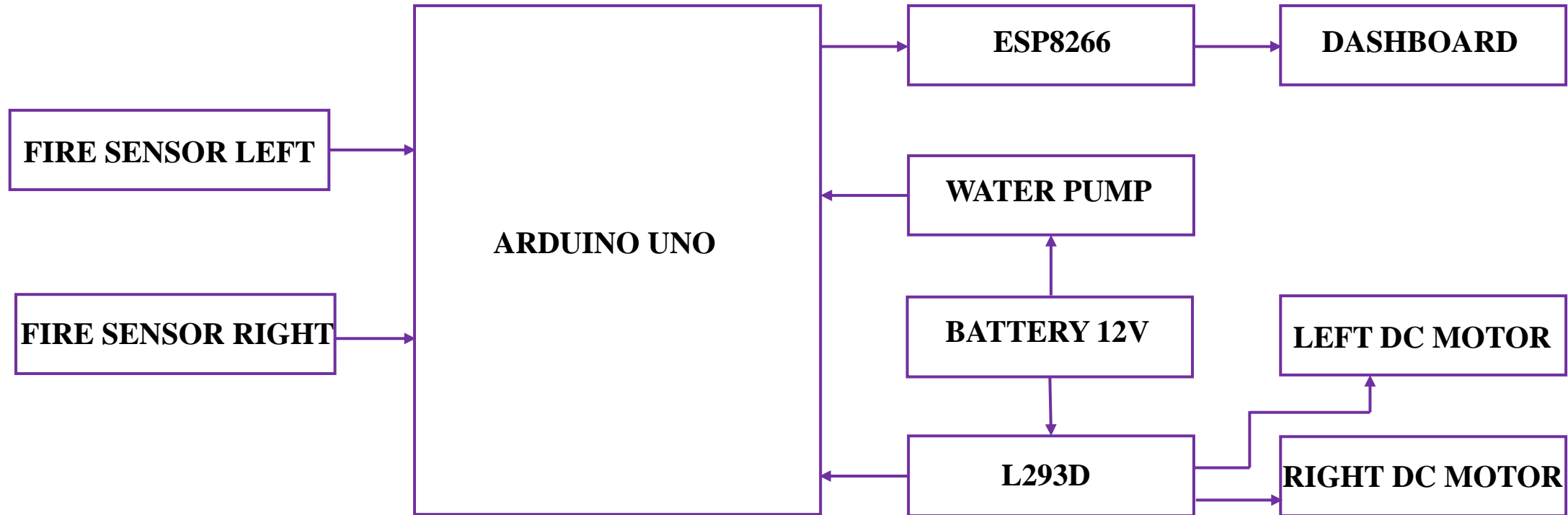
FUNCTIONAL REQUIREMENTS

| No | Functional Requirements | Tasks |
|----|-------------------------|---|
| 1. | Autonomous Navigation | The robot should be able to navigate through a fire-affected area independently |
| 2. | Fire Detection | The robot should be equipped with sensors or detectors to identify the presence and location of fires accurately. |
| 3. | Fire Suppression | The robot should be capable of suppressing fires by spraying water. |
| 4. | Real-time Monitoring | The robot should be capable of monitoring and assessing fire dynamics, environmental conditions, and the effectiveness of fire suppression measures continuously. |

NON-FUNCTIONAL REQUIREMENTS

| No | Non-Functional Requirements | Tasks |
|----|-----------------------------|--|
| 1. | Reliability | The robot should demonstrate high reliability in terms of its performance, accuracy, and consistency under challenging fire conditions. |
| 2. | Safety | The robot should adhere to strict safety standards to ensure the well-being of both humans and the robot itself during firefighting operations. |
| 3. | Robustness | The robot should be designed to withstand physical impacts, vibrations, and environmental factors commonly encountered during firefighting operations. |
| 4. | Maintainability | The robot should have a design that facilitates maintenance, repairs, and upgrades, ensuring its long-term functionality and usability. |

SYSTEM ARCHITECTURE



MODULE DESCRIPTION

1. FIRE DETECTION

To detect fire sensor is mounded on right and left side of the robot.

2. AUTONOMOUS NAVIGATION

Embedded C is utilized for autonomous navigation along with the motor driver and DC motor.

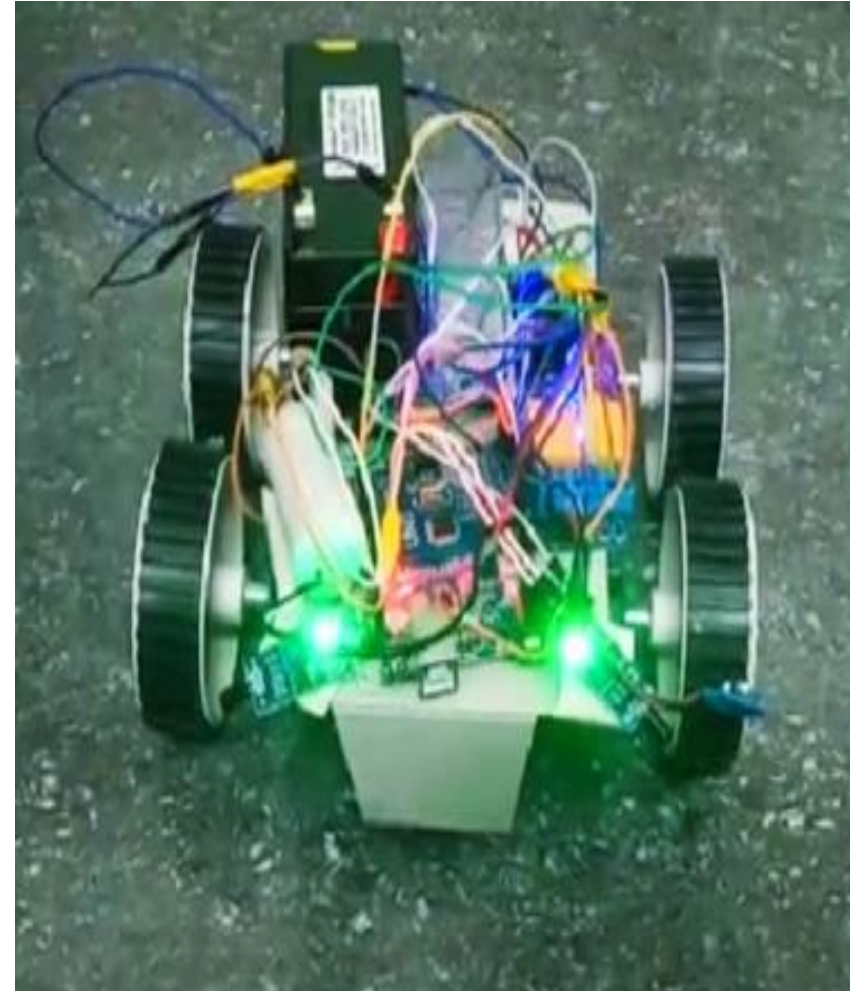
3. SPRAYING WATER

Water pump motor and relay are used for spraying water.

4. ALERT MESSAGE

ESP8266 is utilized along with cloud services

RESULT SNAPSHOTS



APPLICATIONS

- Residential fires
- Industrial Fires
- Wildfires
- Hazardous Environments
- Confined Spaces
- Unmanned Locations
- Training and Simulation

CONCLUSION

Fire fighting robots have the potential to revolutionize firefighting operations, improving the safety of firefighters and the effectiveness of fire suppression efforts.

FUTURE WORK

- To automate the switching of extinguishers based on the material
- To utilize the amount of water used by distribution reinforcement algorithms.

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THANKYOU!!