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FIRE FIGHTING ROBOT

Prekshitha S[1], Varsha B C[2], Vishwanath B S[3], Vikas Gowda B S[4], Mrs Rekha N[5]

Undergraduate, Department of Electronics and Communication Engineering, K S Institute of Technology, Bengaluru, Karnataka, India[1,2,3,4]

Assistant Professor, Department of Electronics and Communication Engineering, K S Institute of Technology, Bengaluru, Karnataka, India[5]

Abstract: The development of a fire-fighting robot aims to enhance the efficiency and safety of fire response operations. This robot is designed to autonomously detect, locate, and extinguish fires in hazardous or hard-to-reach areas, reducing the risk to human firefighters. Equipped with sensors for fire detection, temperature monitoring, and real-time environmental analysis, the robot can navigate through smoke-filled or unstable environments. It is typically outfitted with an onboard fire suppression system, such as water hoses or fire retardants, to combat flames directly. The robot's design incorporates robust mobility features, such as wheels or tracks, enabling it to maneuver across various terrains..

Keywords: flame sensor,L298N motor drive**.**

I. INTRODUCTION

A firefighting robot is a specialized autonomous or remotely operated machine designed to assist in the detection, suppression, and management of fires, particularly in hazardous or difficult-to-reach environments. These robots are equipped with advanced technologies such as sensors, cameras, thermal imaging, and firefighting systems like water hoses, foam dispensers, or fire extinguishing agents. Firefighting robots are engineered to perform tasks that are too dangerous, complex, or physically demanding for humans, offering significant advantages in terms of safety, efficiency, and speed.

The use of firefighting robots has grown in response to the increasing need for advanced firefighting solutions in various sectors, including industrial plants, urban buildings, forests, and disaster-stricken areas. These robots are designed to handle high-risk situations, such as fires involving hazardous materials, extreme temperatures, or areas with limited access. They can operate in environments where human presence would be either impossible or too dangerous, thus improving the overall effectiveness of fire management efforts while reducing the risk to human firefighters. With continuous advancements in robotics, AI, and sensor technologies, firefighting robots are becoming an essential tool in modern fire safety and disaster response.

II. LITERATURE SURVEY

[1**] The Automatic Fire Extinguisher Robot** is a hardware-based device designed to move in the direction of fire power. The robot's shield is made of calcium silicate boards that can withstand temperatures up to 300 ° C. The ends of the thermocouple are heated to a reduced temperature when the robot begins to respond to fire. The robot is used in rescue efforts during a fire when there is little chance that the military will be able to reach the affected areas.

[2] **IoT-based robot** is designed to support firefighters in critical situations. A fire sensor is used to detect the presence of a fireplace. The presence of flammable gases is detected by a gas sensor. Human presence is verified by the Passive Infrared Sensor. Temperature sensor transmits temperature and humidity.

[3]**The video streaming robot** is designed to manage the robot on a web page and is able to monitor different web server settings. The video streaming robot will continue to take pictures with the Android phone camera. The temperature sensor will be used by a temperature monitor to monitor the temperature. In addition to rising temperatures, fires are detected using a smoke sensor.

[4] **A fire engine** was created to help firefighters in real-time emergencies. The robot can extinguish the flames with water and carbon dioxide sprays and protect itself from heat using fog sprays. The study culminated in the successful development of a robot that can function as a fire extinguisher and remotely control a wireless communication channel. For guidance, the robot has a lot of control, control, and weight with a lot of torque. Several tests were performed to test the mechanical design and adequacy and performance of the robotic software.

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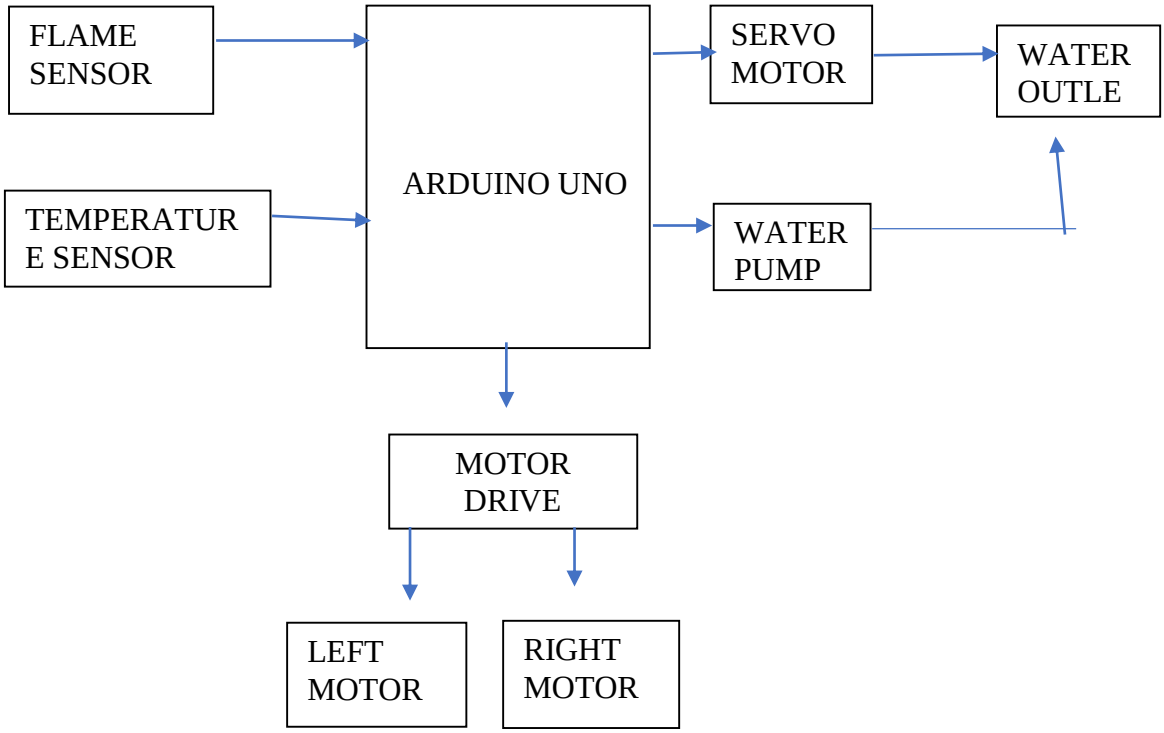
[5] **A fire robot** uses a layout algorithm to get to the fireplace, performs firefighting tasks, and transmits the video feed to the fire station to the control center. A fire-fighting robot cooperates with fire by detecting, extinguishing, and alerting. The robot also connects to the outside world via live video and map view via Bluetooth. The disadvantage of this project is that the robot does not behave intelligently after reaching a certain destination. Incorporating computer vision and machine learning into robot intelligence will help identify the main fireplace.

III. METHODOLOGY



A. Block Diagram

Figure 1 represents the block diagram of the block diagram of Fire Fighting Robot we have used the component like sensors, motor drive, servo motor.

B. Working

The working of a firefighting robot involves a combination of advanced sensors, navigation systems, and firefighting mechanisms designed to detect, suppress, and manage fires in hazardous environments. Equipped with thermal cameras, smoke detectors, and gas sensors, the robot can locate the source of a fire, assess heat levels, and identify potential risks like toxic gases.

Using autonomous navigation systems, the robot can maneuver through complex or dangerous areas, avoiding obstacles and reaching fire hotspots without human intervention. Once at the fire location, the robot deploys water, foam, or other fire-suppressing agents through specialized nozzles, adjusting pressure and direction based on the fire's intensity. Real-time data, such as thermal imaging or video feeds, is transmitted back to human operators, allowing for remote monitoring and decision-making.

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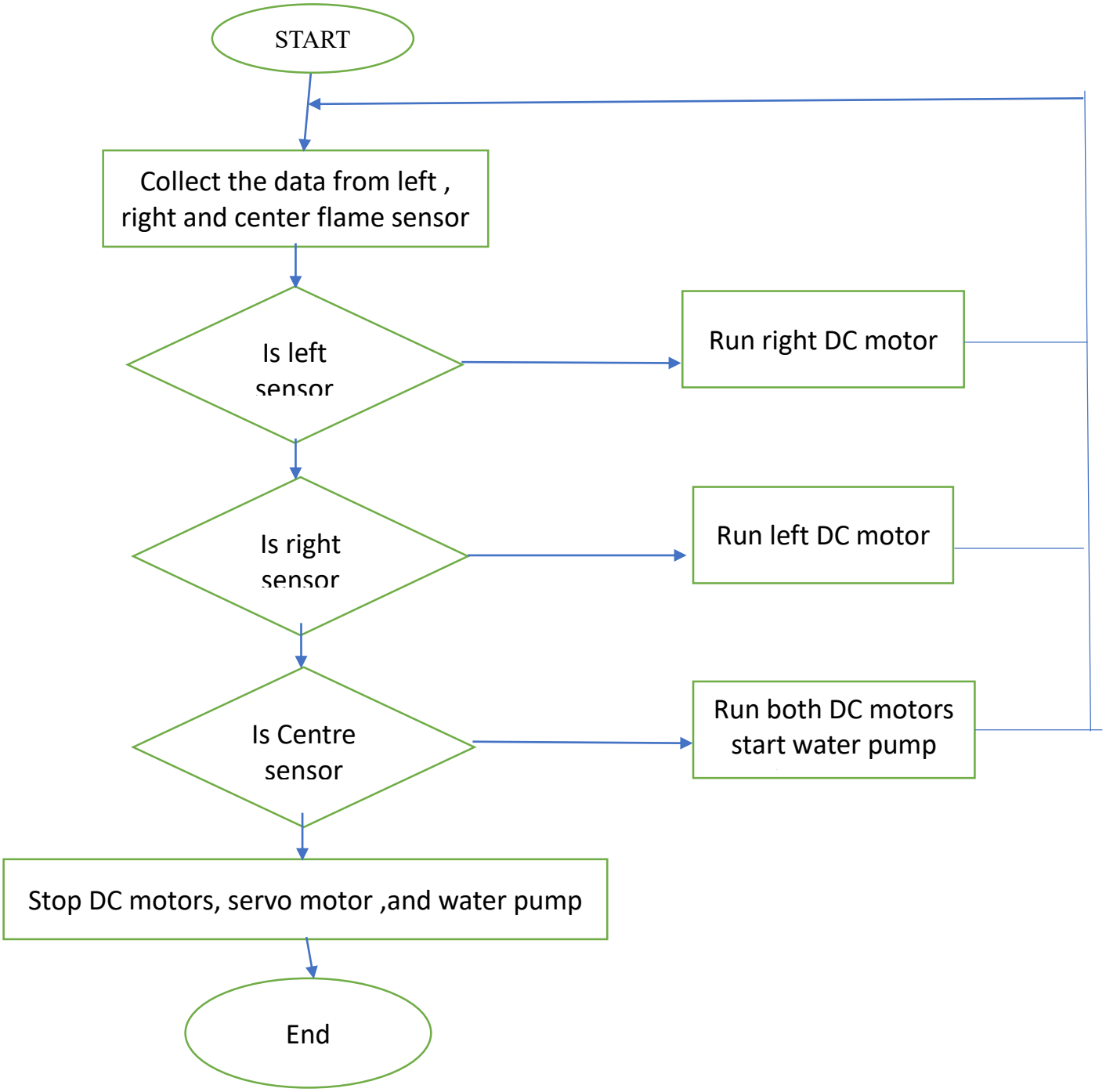
C. Flowchart



IV. CONCLUSION

Firefighting robots represent a significant advancement in the field of fire safety and emergency response. These robots enhance firefighting capabilities by allowing for faster, safer, and more efficient fire suppression in a variety of challenging environments, such as industrial plants, urban skyscrapers, hazardous disaster zones, and remote areas like forests and mines. They minimize the risks to human life, especially in dangerous conditions like extreme heat, toxic gases, or radioactive environments, while also improving operational effectiveness.

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V. RESULTS

APPLICATIONS

- **Factories and Refineries**: In industrial settings, firefighting robots can navigate through hazardous areas, such as chemical plants, oil refineries, or power plants, where traditional human intervention might be too dangerous. They can handle flammable substances, toxic gases, or high-heat conditions.

- **Hazardous Materials Fires**: Robots equipped with sensors can detect the presence of hazardous materials and fight fires without putting human lives at risk.

- **Nuclear Plants**: In nuclear power plants or facilities with radioactive materials, robots can assist in firefighting without exposing humans to radiation risks.

- **Space Missions**: Robots may be deployed in space stations or on spacecraft to handle fires in environments where human response would be complicated or impossible.

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