IOT BASED DUAL PURPOSE FLAMETHROWER AND EXTINGUISHER RC ROBOT

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Keywords:

IoT-based Robotics, Dual-Purpose Fire System, Remote Controlled Operations, Fire Safety Technology, Smart Flame Management

Introduction:

Industrial pipeline and hazardous environment inspections often involve high risks, especially in the presence of fire or flammable materials. Traditional methods require human intervention, which can be unsafe and inefficient. To address this, our project introduces an IoT-based Dual Purpose Flame Thrower and Extinguisher RC Robot. This innovative system integrates remote control, sensor feedback, and IoT technology to both ignite and extinguish fire remotely. It is particularly useful for controlled fire tests, material resistance studies, and emergency fire response in unreachable zones. The robot enhances safety, automation, and real-time monitoring, marking a significant step in modern fire management and disaster response technology.

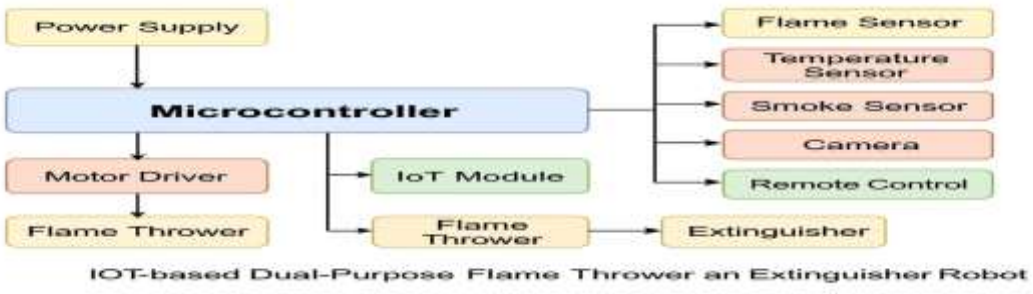

Figure 1: Block Diagram of the IoT-based Dual Purpose FlameThrower and Extinguisher RC Robot

Objectives:

- Design and develop a remote-controlled, IoT-enabled robot.
- Implement dual functional modules for flame ignition and fire extinguishing.
- Ensure remote operation capabilities for hazardous environments.
- Integrate safety features and smart control systems.
- Incorporate sensor modules for real-time monitoring and response.
- Optimize the robot for mobility and stability across varied terrains.
- Test and demonstrate practical use cases in industrial and rescue scenarios.
- Evaluate performance, reliability, and usability in real-world conditions.

Methodology:

The development of the Dual-Purpose Flamethrower and Extinguisher RC Robot involves a systematic approach combining mechanical design, electronics integration, and remote-control communication. The robot chassis is constructed using lightweight but durable materials such as aluminum or acrylic to ensure both mobility and structural integrity. A set of DC or geared motors is used to drive the wheels, controlled via a motor driver connected to a microcontroller such as an Arduino or Raspberry Pi. For the flamethrower module, a butane or propane gas canister is connected to a solenoid valve and ignition system, allowing controlled flame projection. For the extinguisher system, a small CO_2 or dry chemical fire extinguisher is mounted, triggered by a servo or pump mechanism. Both modules are operated remotely using RF modules or Bluetooth via a custom-built controller or smartphone interface. Sensors such as flame detectors, temperature sensors, and gas sensors are integrated to provide real-time feedback and improve safety and autonomy. The robot's control system processes input signals and executes appropriate actions while ensuring that both the ignition and suppression functions are never triggered simultaneously. A basic circuit diagram and a 3D model of the robot layout are used to guide the assembly and integration process, ensuring accurate placement of components and clear functional flow.

Result and Conclusion:

The Dual-Purpose Flamethrower and Extinguisher RC Robot performed effectively during testing. The flamethrower module successfully generated a controlled flame, while the extinguisher system, powered by a CO_2 canister, efficiently suppressed fire in a contained environment. The robot's flame and temperature sensors provided accurate real-time feedback, enhancing its responsiveness. Remote operation was smooth and stable, allowing safe control from a distance without exposing users to risk. Overall, the system demonstrated reliable performance across all intended functions.

In conclusion, the project achieved its main goal of creating a multifunctional, remote-controlled robot capable of both fire ignition and suppression. The successful integration of both systems into a single mobile platform proves its potential for practical applications. It offers a safer alternative for fire management in hazardous or hard-to-reach environments. With further development—such as improved automation, enhanced sensor precision, and AI-based fire detection—the robot could be utilized in firefighting drills, industrial fire response, and emergency scenarios, making it a valuable innovation in fire control technology.

Future Scope:

The future scope of this project includes:

1. Integration of AI and Computer Vision
2. Enhanced Automation
3. Real-Time Monitoring and Alerts
4. Improved Fire Suppression Systems
5. Collaboration with Emergency Services