Automatic Fire Fighting Robot With Sms & Call Alert

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Abstract: Fire accidents are one of the most critical emergencies that require immediate attention to prevent loss of life and property. This project proposes the development of an Automatic Fire Fighting Robot equipped with real-time fire detection, extinguishing capabilities, and advanced alert systems using SMS and call notifications.

The robot is designed with fire sensors (e.g., flame sensors or temperature sensors) to detect fire in its surroundings. Upon detection, it autonomously navigates toward the source using obstacle-avoidance algorithms and deploys a fire suppression mechanism, such as a water spray or fire extinguishing gas. The system is powered by a microcontroller (e.g., Arduino or Raspberry Pi) for efficient control and operation.

INTRODUCTION

Fire-Fighting is an extremely dangerous task but still often being carried out by human operators, thus putting human life, invaluable as it is, in a very precarious situation. In Industry oil and many other inflammable materials are used for production and other industrial purposes.Under such conditions the chance of fire accidents are more. So a suitable protective measure to extinguish the fire in case of fire accidents within the workplace should be employed. The types of Fire that may occur in an industry can be classified as under: A: Class (Caused due to wood and wooden material) B:Class (Caused due to oil) C:Class (Caused due to fuel stored in tanks). In industry, the unfinished metal products are ground polished in the grinding section. More chances are there for the occurrences of fire accidents in the section, due to the fire sparkles produced while grinding of metals, especially when the temperature of the sparkles exceeds 87OC. The cables used in the electrical section also cause more dangerous fire due to the faults in the cables or in the power line.

When a fire hazard takes place inside the industry, the heat and temperature gradually increase and reach a peak which is very high enough to cause a severe damage. It is also dangerous for human beings to go near such a high temperature. The harmful gases such as carbon dioxide and carbon monoxide have tendency to affect even a healthy man. Under such circumstances robot can be used in a better manner to extinguish fire and to monitor the hazardous places.

Fire fighting and rescue activity are considered as very dangerous missions. Injured fire-fighters and civilians inside hazard buildings are risky to rescue and evacuate. Sometimes, fire-fighters face serious challenges to get in the hazard building to extinguish fire, and locate the civilians, because in most cases, firefighters do not have a prior knowledge about the hazard building infrastructure. Fire-fighters face serious risks on the job, where they face flames, heat, high level of CO or CO2 , and physical and mental stress, A large number of fire fighters have been injured during practicing their duties, including extinguishing fire, and rescuing civilians

PROBLEM STATEMENT

1. **Real-Time Fire Detection:** Ensuring the robot can detect fire accurately using sensors such as flame sensors or temperature sensors.
2. **Autonomous Navigation:** Developing a system for the robot to move independently and locate the fire source while avoiding obstacles.
3. **Fire Extinguishing Mechanism:** Implementing a mechanism (e.g., water spray, CO2 gas, or fire retardant) that is effective and safe for extinguishing fire.
4. **Emergency Notifications:** Incorporating GSM technology to send SMS and make calls to alert authorities or designated contacts during fire incidents.
5. **Power Efficiency:** Ensuring the robot operates efficiently over extended periods without failure.
6. **Robustness:** Building a durable system that can withstand high temperatures and challenging environments.
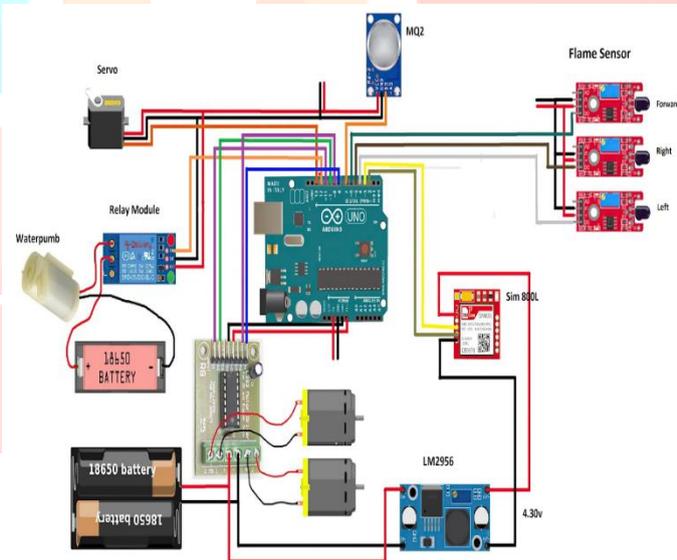
METHODLOGY

Figure: Block diadram of Automatic Fire Fighting Robot With Sms & Call Alert

SYSTEM ARCHITECTURE
The proposed system consists of:
1. System Motor Drivers and Actuators
2. Microcontroller (e.g., Arduino): Acts as the central processing unit.
3. L293 Motor Driver: Provides both direction and speed control.

4. SIM800L is a miniature cellular module.

HARDWARE COMPONENTS
1. MQ2 Sensor:Detecting smoke in a room or environment.
2. Flame Sensor: detect flame by sensing infrared radiation in flame.
3. Uno: Controls the L293 Motar driver and IoT module.
4. SIM800L is a miniature cellular module: which allows for GPRS transmission

5. Mini water pump: For Fountain Garden Mini water circulation System
6. Servo Motor: The main motor that provides rotational motion.

SOFTWARE COMPONENTS
. 1.Embedded C: Used for programming the microcontroller.

WORKFLOW
1. Intilization: The robot is powered up, and the microcontroller
2. Fire Detection: The sensors (flame, gas, and temperature) continuously monitor the environment.
3. Alert Notification: As soon as the fire is detected, the GSM module is activated.
4. Fire Extinguishing: Once the robot reaches the fire, it uses the water pump or fire extinguisher to suppress the fire.
5. Emergency Alerts & Monitoring: Throughout the process, the robot continues to send updates via SMS and call alerts

IMPLEMENTATION
The system was implemented using the following steps:
1. Hardware Setup: Connecting the Servo Motor, Arduino, and . SIM800L is a cellular module
2. Software Development: Writing and uploading the embedded code to the Arduino.
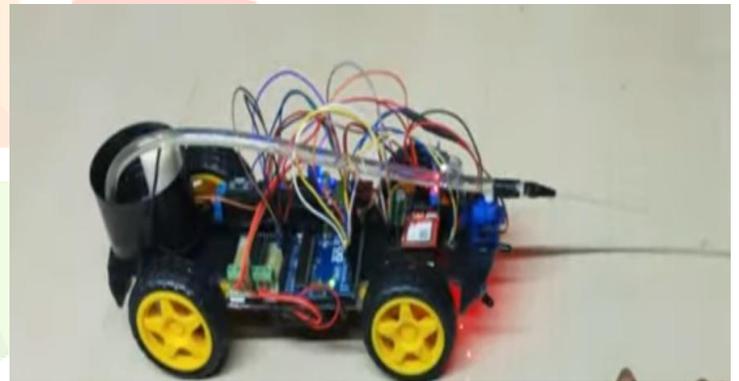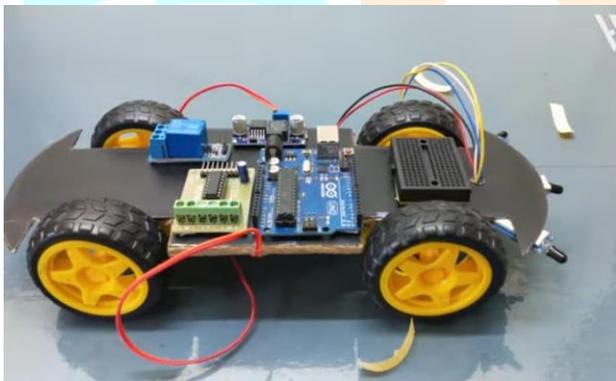3. Testing: Deploying the system in a controlled environment

Fig5.1.1: Initial Step of Hardware Implementation

RESULTS
Automatic Fire Fighting Robot with SMS and Call Alert is a fully autonomous system designed to detect, respond to, and suppress fires while alerting the user or emergency contact. Fire Fighting Robot using SIM800L. Robot detects the flame at sitewhere the robot exists. The movement of this robot vehicle is controlled by Arduino as per the program.

Figure: Automatic Fire Fighting Robot With SMS & Call Alert

KEY RESULTS:
- Fire Detection and Response.
- SMS and Call Alert System .
- Coverage and Navigation.
- Efficiency and Resource Usage.
- User Interface and Customization.

ADVANTAGES:

1.Smart home devices : Smart home devices are the most common consumer IoT products.

2.Industrial sensors :Industrial IoT (IIoT) supports use cases in automation.

3. Industrial robots :Industrial organizations also use IoT technology in robots.

4.Healthcare devices :In healthcare facilities, IoT devices are crucial to patient care

CONCLUSION

Here we successfully developed the Fire Fighting Robot using SIM800L. Robot detects the flame at sitewhere the robot exists. The movement of this robot vehicle is controlled by Arduino as per the program. This robot is help full in those areas where natural calamity and bomb explosions where occurred. If fire is detected with the help of sensors, Arduino operates the water pump mechanism through relay circuit. Through this we can conclude that a robot can be used in place of humans reducing the risk of life of the fire fighters. We can use them in our homes,labs,offices etc. They provide us greater efficiency to detect the flame and it can be extinguished before it become uncontrollable and threat to life. Hence, this robot can play a crucial role

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