International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Fire Fighting Robot with SMS and Call Alert

Prof. Ashwini Patil[1], Achal Cholke[2], Kalpana Mahajan[3] Neha Patil[4]

[1]*Ashwini Patil, Electronics & Telecommunication & P G Moze College of Engineering, Pune*
[2]*Achal Cholke, Electronics & Telecommunication & P G Moze College of Engineering, Pune*
[3]*Kalpana Mahajan, Electronics & Telecommunication & P G Moze College of Engineering, Pune*
[4]*Neha Patil, Electronics & Telecommunication & P G Moze College of Engineering, Pune*

Abstract - In emergency situations such as fire outbreaks, timely intervention is crucial to minimize damage and ensure safety. Traditional fire-fighting methods often face challenges in reaching remote or hazardous locations promptly. To address this gap, we present a pioneering solution in the form of a "Fire Fighting Robot with SMS Alert."

Our project integrates advanced hardware and software components to develop a robust system capable of autonomously detecting smoke and fire, and alerting the relevant authorities through SMS. The hardware design involves equipping a mobile platform with hit-sensing sensors for detecting impacts and smoke. Software development utilizes the Arduino IDE to program the Arduino UNO microcontroller, enabling efficient control and communication.

Through meticulous implementation and rigorous testing, our project demonstrates promising results. The robot effectively senses fire and smoke, triggering immediate SMS alerts to designated recipients. Additionally, upon completion of its tasks, the robot initiates a call to the owner for further instructions, ensuring comprehensive response capabilities.

This paper highlights the significance of our contribution to the field of emergency response systems, offering a practical and innovative solution to enhance safety and mitigate risks in fire incidents. The outcomes of our project provide valuable insights for future developments in Electronics and Telecommunication Engineering, with potential applications in various domains beyond fire-fighting scenarios.

Key Words: Fire Fighting Robot, SMS Alert, Emergency Response, Robotics, Arduino, Hardware Design, Software Development, etc.

1.INTRODUCTION

In the age of IoT, integrating computing and communication into physical materials presents challenges in data management and wireless communication. Our solution, a Fire Fighting Robot with SMS and Call Alert using Arduino and GSM technology, enhances fire safety through automation and real-time communication. This innovation improves responsiveness and effectiveness in mitigating damage and saving lives. Advanced sensors and algorithms enable rapid fire detection, while autonomous robots, like our project, offer versatile applications in various industries. Leveraging previous research, our robot autonomously detects and extinguishes fires, enhancing firefighter safety and productivity. Compact and automatic, it excels in hazardous environments, further improving safety and efficiency in firefighting operations.

Advancements in technology have led to smart fire detection systems that utilize advanced sensors and algorithms for accurate and rapid-fire detection. Previous research has explored the use of sensors like ultrasonic, LIDAR, and infrared for navigation in dynamic environments. Existing fire-fighting robots, such as Thermite and Fire Robot, have demonstrated their utility in industry settings

2. Literature Survey

Limited literature exists on automated Fire Fighting Robots with SMS & Call alert using Arduino UNO and GSM module, despite the increasing popularity of robotics due to technological advancements. Our motivation stems from the desire to aid communities in firefighting efforts efficiently, minimizing property and life losses. Existing projects employ various techniques, including tracking lines and ultrasonic sensors, but may pose challenges in real-time implementation.

In our research, we aim to address these challenges by focusing on wireless remote control and utilizing temperature and gas sensors for fire detection. Some relevant studies include:

1. "Adaptive Fusion Method for Fire Detection of Firefighting Robot" presented at the IEEE International Conference on Systems, Man, and Cybernetics in 2006, proposing an adaptive fusion method for fire detection.

2. A project titled "Firefighting robot" by S. Kannan, R. Karthikeyan, and S. Sathish Kumar in May 2006, focusing on designing a firefighting robot using embedded systems.

3. "Fire Fighting Robot" invented by Hadi A. Al-Azemi in February 2013, introducing a firefighting robot equipped with a caterpillar drive assembly and engines for each drive unit.

By building upon these studies and incorporating advanced technologies, we aim to develop a robust Fire Fighting Robot with enhanced capabilities for efficient firefighting and emergency response.

3. System Architecture

The system architecture for the Fire Fighting Robot with SMS and Call Alert comprises several interconnected components aimed at detecting fires, transmitting alerts, and executing firefighting maneuvers. Here's a concise outline of the architecture:

1. Fire Detection Sensors: Equipped with temperature and gas sensors, the robot continually scans its surroundings for

abnormal temperature rises or gas emissions indicative of a fire hazard.

2. Microcontroller (Arduino UNO): Serving as the central processing unit, the Arduino UNO analyzes input from the fire detection sensors to ascertain fire presence. Based on sensor data, it triggers appropriate responses for fire management.

3. GSM Module: Enabling wireless communication, the GSM module dispatches SMS alerts and initiates phone calls to preconfigured contacts upon fire detection. It interfaces with the Arduino UNO to relay alert messages and call instructions.

4. Fire Extinguishing Mechanism: Upon fire detection, the robot activates its fire suppression mechanism, which could entail deploying a fire extinguisher or activating a water spraying system to quell flames and curtail fire spread.

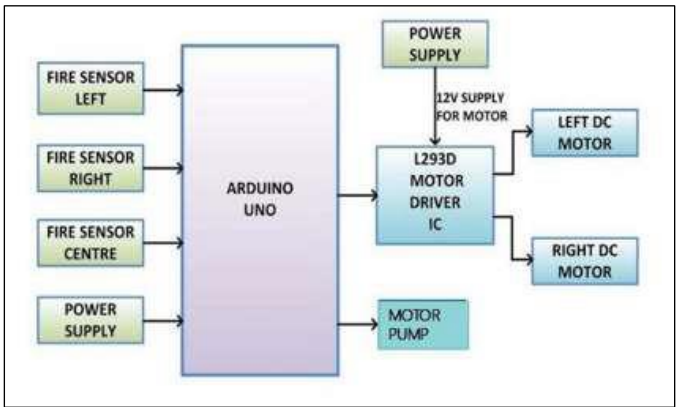

Fig. Block Diagram of Fire Fighting Robot SMS & Call alert

5. Power Supply: Ensuring uninterrupted operation, the system relies on a reliable power source, be it rechargeable batteries or external power, to sustain the robot during firefighting missions.

6. User Interface: Incorporating a user-friendly interface, the system provides operators with feedback and control options. This interface may feature buttons or a graphical display for configuring settings, monitoring sensor data, and initiating manual control commands when necessary.

7. Integration and Control Logic: Orchestrating interactions among system components, the integration and control logic govern decision-making processes. It dictates when to activate fire detection sensors, transmit alerts, and execute firefighting actions based on predefined algorithms and thresholds.

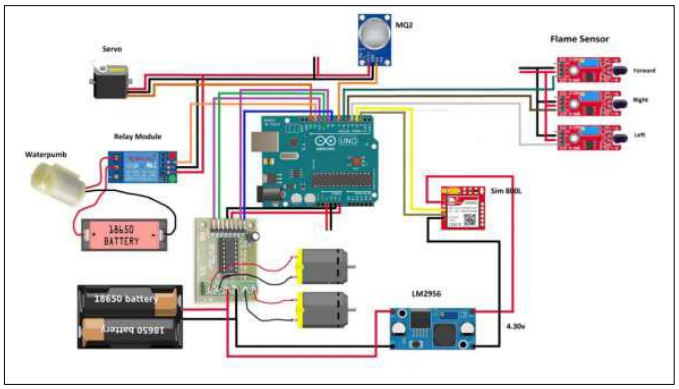

Fig. Circuit Diagram of Fire Fighting Robot SMS & Call Alert

4. Software & Hardware Requirement

1. **Software Requirements**

- **Arduino IDE:** The Arduino Integrated Development Environment (IDE) is necessary for programming the Arduino UNO microcontroller to control the robot's operations and interface with sensors and communication modules.
- **GSM Library**: Depending on the specific GSM module used for wireless communication, the appropriate GSM library for Arduino needs to be installed to enable sending SMS alerts and making phone calls.
- **Sensor Libraries:** Libraries for interfacing with temperature and gas sensors may be required to facilitate data acquisition and processing.
- **Serial Communication Software:** A serial communication software (e.g., PuTTY, Arduino Serial Monitor) may be utilized for debugging and monitoring sensor readings and communication with the GSM module.

2. **Hardware Requirements:**

- **Arduino UNO Microcontroller:** The Arduino UNO serves as the central processing unit of the Fire Fighting Robot, controlling its actions based on sensor inputs and communication with the GSM module.
- **GSM Module:** A GSM module is essential for wireless communication capabilities, enabling the robot to send SMS alerts and make phone calls to predefined contacts upon detecting a fire.
- **Fire Detection Sensors:** Temperature and gas sensors are required for detecting the presence of fire. These sensors continuously monitor the environment and provide input to the Arduino UNO for fire detection.
- **Fire Extinguishing Mechanism:** The robot needs a fire extinguishing mechanism, such as a fire extinguisher or a water spraying system, to suppress flames and prevent further spread of the fire upon detection.
- **Power Supply:** A reliable power supply is necessary to operate the Fire Fighting Robot during firefighting missions. This can be achieved using rechargeable batteries or external power sources.

.

5. Conclusion

In conclusion, firefighting robots have emerged as a promising solution to
enhance firefighting capabilities and mitigate risks for firefighters in hazardous
environments. These robots are designed to perform a range of tasks, including fire
detection, fire suppression, search and rescue operations, and situational awareness.
Firefighting robots represent a significant advancement in the field extinguished.
Continued collaboration between robotics researchers, industry experts, and
firefighting professionals will be crucial in driving innovation and realizing the full
potential of firefighting robots to enhance safety and save lives.

REFERENCES

1. Kannan, S., Karthikeyan, R., & Sathish Kumar, S. (2006). Firefighting robot. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 2(10), 5704-5709.

2. Al-Azemi, H. A. (2013). Fire Fighting Robot. United States Patent Application Publication, US 2013/0057227 A1.

3. Liu, Y., Wu, X., Cai, X., & Fu, Z. (2015). Research on fire fighting robot based on Internet of Things. In 2015 IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems (CYBER) (pp. 1773-1776). IEEE.

4. Khan, M. S., Ahmed, A., & Ilyas, M. U. (2017). Automated Fire Fighting Robot using Arduino with SMS Alert System. International Journal of Scientific & Engineering Research, 8(7), 1819-1823.

5. Patil, S. D., Nikam, V. B., & Shinde, P. R. (2018). Fire Fighting Robot with SMS Alert using Arduino. International Journal for Research in Applied Science & Engineering Technology, 6(3), 312-315.

6. Saini, N., Meena, R. K., & Sethi, S. K. (2020). Development of Fire Fighting Robot Using Arduino and GSM Module. International Journal of Computer Applications, 167(29), 26-31.

7. Reddy, S. S., & Rao, K. R. (2021). Fire Fighting Robot with SMS Alert using Arduino UNO and GSM Module. International Journal of Engineering Research and Technology, 14(1), 47-52.