

FIRE EXTINGUISHER VEHICLE, USING AN ARDUINO-NANO WITH SMOKE & GAS SENSOR

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ABSTRACT

Fire accidents have been occurring frequently these days, with or without the intervention of humans. A fire incident is a disaster that can potentially cause the loss of life, property damage, and permanent disability to the affected victims. Fire fighters are primarily tasked to handle fire incidents, but they are often exposed to higher risks when extinguishing the fire, especially in hazardous environments such as nuclear power plants, petroleum refineries, gas tanks, etc.

They also face other problems, especially if a fire breaks out in a small, cramped area, as they need to explore the ruins of buildings and obstacles to extinguish the fire and save the victim. In the case of high barriers and risks in fire fighting activities, innovation can be used to assist the fire brigade. With the use of current technology, we have developed a fire-fighting robot.

This fire fighting robot uses ARDUINO NANO, and Micro Controller, Different sensors fire sensors, smoke sensors, temperature sensors, etc. When the Robot detects a fire, it gives a message to the ARDUINO. Then ARDUINO sends the signal to the motor driver and thus water is sprayed in the direction of the fire. It assists fire fighters in extinguishing the fire. And it will perform its operation where fire fighters can't reach. This will save the risk of fire fighters' life and avoid any further damage.

Keywords: ARDUINO UNO, Atmega328p, Servomotors, Smoke Sensor, Flame Sensor, Relay, BO Motor, Motor Driver, Bluetooth 5.0.

I. INTRODUCTION

Our project that is being presented is focused on Fire fighting robotic vehicle using Arduino UNO. Nowadays Fire fighting robotic vehicles are becoming popular due to their advanced technology. Fire fighting robots are doing their tasks in more accurate and more efficient manner. Across Earth's ecosystems, wildfires and fire accidents are growing in intensity and spreading in range. From Australia to Canada, the United States to China, across Europe and the Amazon, wildfires are wreaking havoc on the environment, wildlife, human health, and infrastructure [1]. And those frontline fire fighters, risking their lives to fight fires need to be supported and be well prepared. So in this situation, the best way from risking fire fighters life, we use the Fire fighting robotic vehicles.

This robot's main purpose is to serve as an unmanned support vehicle that can hunt for and extinguish fires. There are several existing types of vehicles for Fire fighting at home and extinguish forest fires [2]. Because the number of incidents that occur during the fire extinguishing process is uncountable, a fire-fighter robot was created by humans to protect human lives. This robots main function is to detect fire and move towards the fire automatically to extinguish it from a safe distance using water sprinkler. This robot's movement and behaviour will be fully controlled by Arduino microcontroller. This vehicle-shaped robot will detect and extinguish fires by moving right, left, front, and rear. The paper discusses a prototype of a robot that can move and put out fires with water. Implementation of this robot is with high fire temperature to assess the affectability of distinguishing, after that cancels the fire by utilizing water instrument, Robot will screen the work done by performing arbitrary developments; it as an elective medium utilized by people, particularly the fire fighter to battle fire.

II. LITERATURE SURVEY

A fire incident is a tragedy that may result in human casualties, property loss, and lifelong injury. Fire fighters are generally responsible for responding to fire emergencies, but they frequently face more dangers when putting out fires, especially in hazardous environments like oil refineries and gasoline tanks. In order to put out the fire and save the sufferer, they must also overcome additional barriers. This is especially tough if the fire breaks out in a confined space. This paper depicts the creation of a fire fighting robot that can put out a fire without exposing fire crews to unnecessary risk. The robot is made to be smaller than other types of traditional fire-fighting robots in order to make it simpler to enter a small area and expand the reach of fire protection there. The robot also has an IR sensor to keep it from colliding with any nearby objects or obstacles and a flame detector to detect fires. As a result, a robot was created that has the ability to remotely put out fires at particular distances and autonomously locate fire places. The robot is trained to locate the fire and halt no closer than 40 CM from it.

1. "Implementation of an intelligent fire fighting robot using Node MCU" The robot is equipped with a flame sensor, temperature sensor, and water pump, and can detect and extinguish fires autonomously.
2. S. S. Gupta and M. B. Kurhade's "An Automated Fire Fighting Robot Using the Node MCU and Android Device" (2019): The design and development of an automated fire fighting robot using the Node MCU and Bluetooth are discussed in this paper. The robot has a flame sensor, a temperature sensor, and a water pump, and it can be operated remotely via an Android app.
3. V. K. Gupta and A. R. Pathak's "Development of a Fire Fighting Robot Using the Internet of Things and Node MCU" (2019): The development and design of a fire fighting robot using Node MCU and IoT are discussed in this study. The robot has a flame sensor, temperature sensor, and water pump, and it has a web interface for remote operation.
4. A. K. Mishra and S. K. Sahoo's "Design and Development of a Fire Fighting Robot Using Node MCU and Internet" (2020): The development and design of a fire fighting robot using Node MCU and the Internet of Things are discussed in this study. The robot has a flame sensor, temperature sensor, and water pump, and it has a web interface for remote operation. The application of machine learning methods for fire detection and classification is also covered in the study.

These papers give an excellent summary of the current research and development being done on Node MCU-based automated fire fighting robots. They show how this technology has the potential to boost the effectiveness and security of fire fighting operations.

III. METHODOLOGY

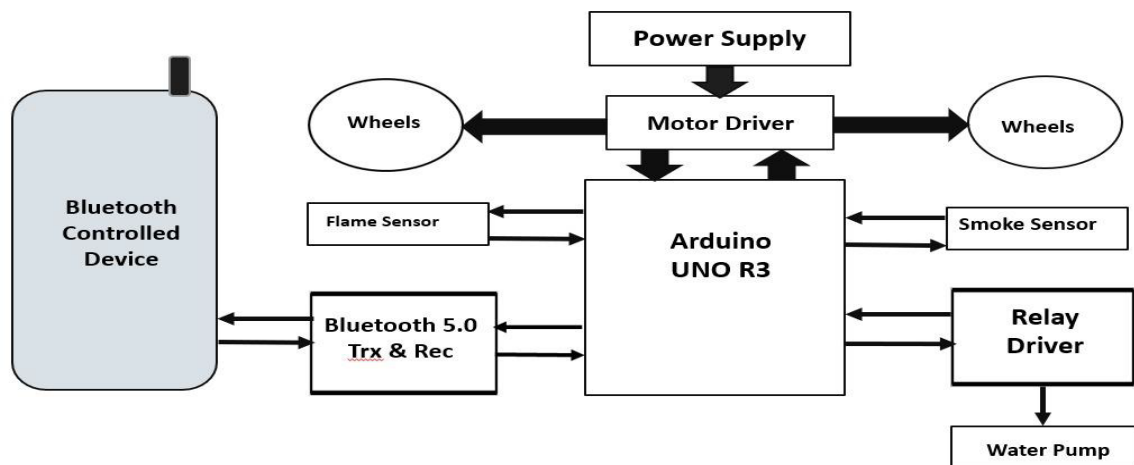
Our project that is being presented is focused on Fire fighting robotic vehicle with night vision camera. Fire fighting robots are doing their tasks in more accurate and more efficient manner. This robot's main purpose is to serve as an unmanned support vehicle that can hunt for and extinguish fires. There are several existing types of vehicles for Fire fighting at home and extinguishing forest fires. Because the number of incidents that occur during the fire extinguishing process is uncountable, fire fighter robot was created by humans to protect human lives. This robot's main function is to detect fire and move towards the fire automatically to extinguish it from a safe distance using a water sprinkler. This robot's movement and behaviour will be fully controlled by the Arduino microcontroller. This vehicle-shaped robot will detect and extinguish fires by moving right, left, front, and rear. The paper discusses a prototype of a robot that can move and put out fires with water. Implementation of this robot is with high fire temperature to assess the affectability of distinguishing, after that cancels the fire by utilizing water instrument, Robot will screen the work done by performing arbitrary developments; it as an elective medium utilized by people, particularly the fire fighter to battle fire.

The vehicle comprises of a water tank alongside a siphon which and can toss water when required. A smoke sensor is used to detect the presence of a fire in the immediate vicinity. Actually, when a fire is detected, a smoke sensor is attached to a circuit that produces an analogue output. As an interrupt signal, this analogue output is connected to the Arduino pin. When the sensor output is high, the interrupt service function executes a motor driven programme or a portion of one (interrupt signal to Arduino). When a fire is detected by the

sensor, a water sprinkler mechanism is attached to the shaft of the dc motor, which will sprinkle the water and extinguish the fire.

IV. MODELING AND ANALYSIS

BLOCK DIAGRAM



V. ADVANTAGE OF PROPOSED SYSTEM

1. The robot will be used at place where it dangerous for human to enter
2. Reduce human effort.
3. Reliable and economical.
4. Capability of sensing accurately.
5. It reduces the time delay in reaching fire affected area.

VI. WORKING PRINCIPAL

This robots main function is to detect fire and move towards the fire automatically to extinguish it from a safe distance using water sprinkler. This robot’s movement and behaviour will be fully controlled by Arduino microcontroller. This vehicle-shaped robot will detect and extinguish fires by moving right, left, front, and rear. The project goals are to develop a Fire Fighter Robot using Arduino that can be used to extinguish fire automatically, and works with Bluetooth. The paper discusses a prototype of a robot that can move and put out fires with water. Implementation of this robot is with high fire temperature to assess the affectability of distinguishing after that cancels the fire by utilizing water instrument, Robot will screen the work done by performing arbitrary developments; it as an elective medium utilized by people, particularly the fire fighter to battle fire.

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VII. APPLICATIONS OF PROPOSED SYSTEM

- Industrial Fire fighting: Automated fire fighting robots are also useful in industrial settings, such as factories and refineries, where fires can be particularly hazardous due to the presence of hazardous materials. These robots can detect and extinguish fires in areas where it may be too dangerous for human fire fighters to enter.
- Forest Fire fighting: In the case of forest fires, automated fire fighting robots can be used to contain and extinguish fires in areas that are difficult to access. They can work for extended periods without the need for breaks, allowing them to continue fire fighting operations for longer periods.

- Search and Rescue Operations: Automated fire fighting robots can be equipped with sensors and cameras, making them ideal for search and rescue operations in disaster zones. They can detect and locate victims in rubble and debris, reducing the risk to human rescuers.
- Hazardous Material Detection: These robots can be equipped with sensors to detect hazardous materials, such as chemicals and radioactive materials. They can locate and contain the source of the hazard, reducing the risk of harm to human responders

VIII. CONCLUSION

The Automated Fire Fighting Robot using Node MCU is an innovative project that demonstrates the potential of using technology to fight fires more effectively and efficiently. The project provides a safer environment for fire fighters and helps reduce the risks associated with fire fighting. The project can be further improved by incorporating advanced sensors and actuators to enhance the robot's capabilities. Through this project, we have shown that it is possible to create an automated fire fighting robot that can detect and respond to fire in a timely and efficient manner. The use of Node MCU, an open-source microcontroller, has made the project cost-effective and accessible to a wide range of users. Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies etc. By making it GPS enabled, robot can be controlled from remote station also. A CO2 booster can be attached to make it powerful extinguisher. It can be further expanded with voice interactive system facility.

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