



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 7, July 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com

Fire Fighting Robot

Mr. Kumar N Krishna Murthy¹, Akshatha Raju², Harshitha M K³, Harshitha P Karle⁴, Nithin N⁵

¹ Assistant Professor, Department of Electronics and Communication Engineering PES College of Engineering, Mandya, India

UG Scholar, Department of Electronics and Communication Engineering PES College of Engineering, Mandya, India²⁻⁵

ABSTRACT: A gadget that can identify and extinguish a blaze on its own is desperately needed. Many house fires start while an individual has fallen asleep or is not at home. Fires can happen at any time and cause significant damage. Firefighters are frequently unable to reach the source of the fire owing to structure damage, very high temperatures, or the existence of explosive chemicals. With such limits and considerable danger in firefighting, a technical innovation that can aid in firefighting is required. To lessen the danger, our article advocated the deployment of robots to put out fires that can be regulated from a predetermined distance. This article covers an intelligent fire fighter robot created for a defense surveillance system, complete with an RF component a Wi-Fi module, and wireless transmission via a microprocessor. The robot can wirelessly broadcast real-time footage from a camera with nighttime vision skills, and it can be operated remotely from an Android phone.

KEYWORDS: Firefighter, Robot, RF component, Wi-Fi module, Wireless transmission, Microprocessor.

I. INTRODUCTION

A robot is a multipurpose, reprogrammable device that can do a variety of difficult activities. One can define robots. Robots are machines that resemble humans yet are capable of carrying out complex tasks. Robots can be a great help in dangerous tasks like firefighting. A fireman must save the victims and put out the fire as quickly as possible in the game of firefighting. Technology is advancing at an evergrowing rate, and advances are developing in response to circumstances that endanger human life. The most significant of these issues is fire. New high-speed technology opened opportunities for new robot operations and the implementation of novel control theory techniques. Because of this technological advancement and the requirement for efficient robots, new robot control gadgets, new drivers, and sophisticated control algorithms were used to develop quicker, better-performing, and more intelligent machines. This study outlines a novel, cost-effective approach to robot control systems. The goal of developing an apparatus that can identify fire and take necessary action without the involvement of a human led to the development of the proposed robot control system, which may be utilized for a variety of complex robotic applications. Wide-ranging fire accidents frequently start with a little fire that sparks a lot more vandalism. In the shape of a human, it performs activities traditionally described to people. Due to physical constraints and bad conditions during fire accidents, fire suppression is a difficult undertaking for humans. Fire robots can be utilized for such high-risk tasks as fire extinguishment. Several fire robots have been built in recent years, but only a handful of them can be commanded wirelessly by humans. Some of the suggested robots are computercontrolled robots that use sensors to search for and extinguish fires. However, looking for fire takes time, and robots are not sophisticated enough to recognize flames that tend to spread fire. Risky scenarios are a necessary component of working as a fire fighter when putting out flames and saving casualties. Instead, since a robot may work independently or be remotely controlled, firefighting and rescue operations might be carried out without putting the lives of fire fighters in danger. In other words, the use of robots reduces the need for firefighters to enter risky situations. When there is a blaze in an underpass or an industrial, this robot offers fire protection, which eliminates the need for human labor and makes it easier to put out the fire. The goal of this project is to create a fire extinguisherequipped robot that can be operated from a distance by connecting to a smartphone over wireless Internet connections.

II. LITERATURE REVIEW

A review of the literature that includes works that have been published. The IEEE Explorer, journals, and works cited in the listed papers were all used in the search.

A family's firefighting robot was created with STM32F103ZET6 as its core to address the demands of avoiding fires and rescue for households with high levels and no one around at the time. Operationally, the robot put out fires. Robots have a lot of power. To track each easy fire location in real-time, the one-to-many communication approach is used. The top-of-the-line NRF24L01 module is used for data transmission. With the surveillance device and the wireless



network module linked to the Internet, controlling it remotely is possible. The experimental findings demonstrate reliable operation of the robotic device via the WIFI wireless module, delivering the anticipated extinguishing agent injection effect, decreasing the burden of firefighters to a certain amount, and successfully lowering the danger of domestic fires.

When it is too risky or impossible for firefighters to access, fire-fighting robots can be beneficial. A firefighting concept incorporates modular architecture based on proximity, vision, and IR sensors. To put out a blaze, the robot shoots water from its manipulator. Monitoring, prevention of obstacles, flame recognition, and movement algorithms are all included in the software. Through examination, it is feasible to identify and put out the flame in a lab simulation of an actual setting. Video may be sent from a robot to a distant place.

Recently, extreme temperatures or the existence of flammable substances have made it occasionally difficult for firefighters to reach the scene of a fire, even when the fire results in substantial damage to property and injuries to people. Firefighting machines can be helpful in such settings for putting out a blaze, and they ought to be managed remotely. In this work, wireless picture communication technologies have been examined in order to assist a remote operator who is situated distant from the fire-fighting robot. The created system transmits visuals that depict the view from a fire-fighting robot through a HighSpeed Downlink Packet Access (HSDPA) network. Industrial computers are included into the fire-fighting machines and distant controllers, and numerous protocols are used by image-transmitting and image-receiving software to enable interaction among the robots and controllers.

The virtual model technology was utilized to undertake indepth study on tiny crawler fire-fighting robots because of the unique working environment and personal security concerns faced by firefighters in homes, buildings, and other fire situations. The suggested overall design for the firefighting robot includes the creation of a separate suspension system with effective stress absorption. The development of the unique fire-fighting robot's explosionproof waterproof casing makes it possible for the robot's eyesight and temperature identification to accurately identify the temperature and hazardous objects present at the fire scene. According to research, the tiny crawler fire-fighting machine has strong structural dependability and detecting intelligence, both of which are crucial for the fire-fighting activities.

The creation of remote-controlled robots that can battle fires and handle emergencies is being considered. The robot is based on a compact, multi-purpose crawler hydraulic excavator in terms of design. The robot's construction and guiding concept are introduced. A new system for remote control is put in place after modifications are made to the existing crawler hydraulic excavator. The robot can walk, turn, stride over roadblocks, and perform many other tasks thanks to remote-control technology. The robot's performance evaluation demonstrates that it is capable of meeting the necessary standards.

III. METHODOLOGY

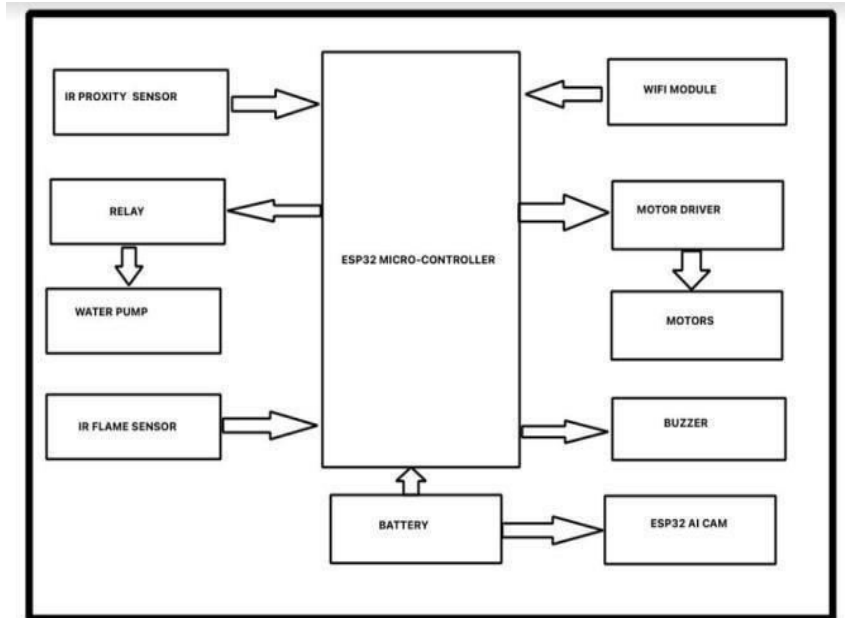


Figure. 1

A fire mishap in an industrial setting would be extremely costly and dangerous to people's lives. Early fire detection and smallstep firefighting procedures can save significant loss and preserve lives. Most fire mishaps won't result in significant loss if firefighting activity is initiated promptly. To undertake early firefighting actions, the autonomous firefighting mobile robot is proposed to be integrated into the established Internet of Things (IoT) fire safety system in this study. If a fire is found, an IOT system alerts the fire safety authorities and starts a mobile robot to act. Using a path routing algorithm, the firefighting robot locates the fire, puts out the flames, and then feeds the command center a video stream of the scene. Early firefighting efforts both notify the fire safety officials and stop the fire from expanding. Fire protection officials can improve their plans for handling the fire mishap in the meantime by studying the footage that the firefighting robot delivered. Organizations with a high risk of fire accidents may combine their current fire alerting equipment with a mobile firefighting robot.

The wireless control of an advanced firefighting robot is possible. The smartphone, the camera, and ultrasonic detectors were used as input for the robot, which will aid in directing the fire-fighting robot. A special software program was created for cellphones that featured buttons that represented orders for regulating the robot's activity, including moving ahead, moving backward, turning right or left, and turning on the water dispenser pump. These instructions were transmitted from a smartphone across a WiFi network to the robot, specifically to the microcontroller that controls it. To assist users in controlling the robot, a camera installed on it recorded the scene in front of it and then exhibited it on cellphones. Obstacles around the robot were found using ultrasonic sensors that were mounted on it. Ultrasonic waves were fired by the sensor, which then used the echo to calculate how far away the obstructions in front of it are. The ultrasonic sensor activates automatically as the robot moves backward, detecting any obstacles in its path. The Wi-fi unit on the robot receives the orders given by smartphones via the Wifi network. The microcontroller will then receive the command signals and translate them into robot movement. The microprocessor changed the instructions from the cell phone into DC current, which powers the robot's water pump and DC motor. Employing a Wi-fi module and a Wi-fi connection that linked the robot and cell phone, an image captured by the robot's camera was delivered straight to the smartphone screen. The ultrasonic detectors on the robot provided input that was delivered to the microcontroller for processing as an indicator of movement. If the distance between the obstacle and the robot was below 15 cm, the robot halted. The three primary components of the fire-fighting robot were a mobile device that could project photos taken by the robot's camera in front of the robot, a smartphone application that controlled the robot's movement, and a smartphone that could turn on or off the water pump.

IV. RESULTS

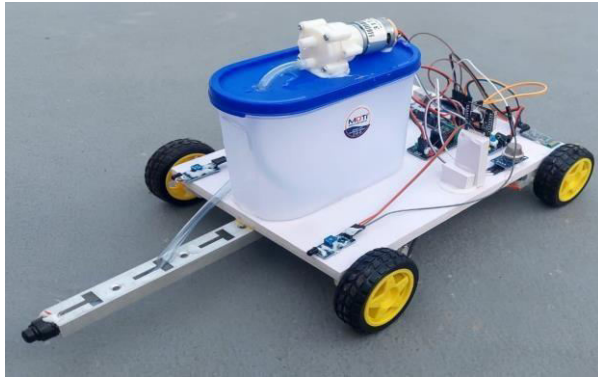


Figure 2 . Project Prototype

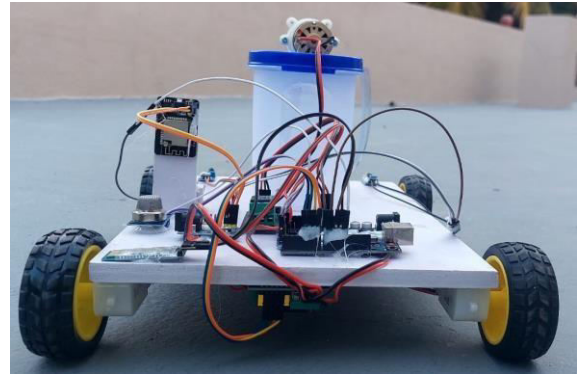


Figure 3. Front View

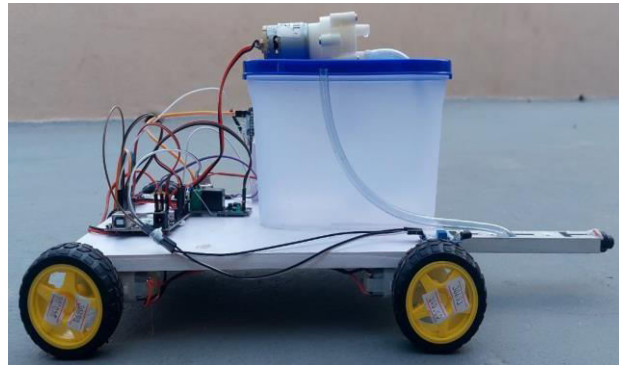


Figure 4. Side View



Figure 5. Running The Fire Program and Argument Results

V. FUTURE SCOPE

Robotic firefighting has a very bright future. Robots are anticipated to grow more autonomous in the upcoming years and will eventually be able to traverse hazardous areas, identify and assess fires, and take measures to put them out. Robots might also be used to remotely monitor conditions, find dangerous items, and seek and rescue individuals. Thermal cameras might also be added to robots, enabling them to identify hotspots and better direct ground-based firefighters.

Furthermore, the advancement of machine learning and artificial intelligence may enable robots to collaborate and make decisions in increasingly complex ways. Last but not least, it's conceivable that robots could be utilized in other applications that benefit firefighters, such offering medical assistance and assisting with fire containment.

VI. CONCLUSION

We may create firefighting robotic devices in this project with specific duties in consideration. This involves analyzing and finding flames, carrying out search and rescue operations, and performing the main duty of controlling and suppressing fires. Additionally, we have been effective in designing and developing a system for smart fire extinguisher vehicles. Additionally, we have planned to integrate a wireless video camera into the fire extinguisher truck system to give live pictures feedback capability. to equip the fire extinguisher truck with obstacle recognition and night vision capabilities for improved performance.

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