IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, May 2024

Flame Fighter: GPS-Enabled Robot with GSM Communication for Fire Extinguishing

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Abstract: *One of the biggest issues our society is currently dealing with is fire accidents. To reduce the likelihood of fire accidents, efficient fire detection and extinguishment procedures should be followed. Fire rescue personnel are currently providing services to put out fires. But occasionally, it might result in firefighters losing their lives. This study suggests utilizing an Arm processor to create a smart, miniature firefighting robot. Without assistance from a human, the suggested robot will autonomously detect and put out fires. An GSM and GPS models can be used to manually control the robot and put out fires. Additionally, the GSM uses alert messages to notify the user of the fire outbreak. Therefore, our method may be utilized to efficiently identify and put out fires in instances when they are starting*

Keywords: Flame Fighter, GSM Communications, GPS, Fire Management

I. INTRODUCTION

Technological improvements are crucial in improving operational efficiency and guaranteeing the safety of citizens and responders in the field of firefighting and disaster management. The "Flame Fighter" is one of thesebreakthroughs; it's a state-of-the-art robot with GPS and GSM communication capabilities that's been specifically created for use in fire management situations. In-depth analysis of the Flame Fighter system's features, construction, and possible uses in lessening the effects of wildfires and other fire crises are presented in this study. Flame Fighter seeks to transform conventional firefighting techniques by utilizing robotics and wireless communication to provide emergency responders with data-driven decision-making, remote operation, and real- time monitoring capabilities. In this paper, we explore theFlame Fighter system's technological details, its input on the way catastrophe response technologies are developing and analysed. Firefighting robots represent a significant advancement in emergency response technology, enhancing the capabilities of human firefighters and increasing safety in hazardous environments. Integrating GPS (Global Positioning System) and GSM (Global System for Mobile Communications) navigation systems further augments these robots, allowing for precise location tracking, real-time communication, and improved operational efficiency.

II. LITERATURE SURVEY

A method for creating robots that fight fires has been created by author Ratnesh Malik et al. The robot is built and created with the ability to put out fires. The robot is self-sufficient in every way. It puts into practice ideas like proportionate motor control and environmental sense and awareness. The robot interprets data from its hardware components and sensors. Visible, infrared, and ultraviolet light are utilized to identify the elements in the surroundings. The robot can combat industrial fires, tunnel fires, and is developed and built for military use. To find fire, ultraviolet sensors are employed. Robot alerts us to the presence of fire. Subsequently, This article describes a robot that uses sensors, microcontrollers, and other electronic components to autonomously detect fire and quickly put it out. The robot is utilized in high-risk areas where human lives are at risk. It also releases water sprinklerson the flame.

The paper [1] An intelligent firefighting tank robot has been built by authors Kristi Kokasih et al. Iron, acrylic, plastic, and aluminum make up the tank robot. Two servo motors, two DC motors, a sound activation circuit, a micro switch

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sensor, a flame detector, a thermal array sensor, a compass sensor, an ultrasonic sensor, and a white detector (IR and photo transistor) are the robot's component parts. Searching a certain area, locating and extinguishing the flame for various flame positions, and disrupting the room arrangement are the goals. By using a DTMF transmitter and receiver, the robot is activated.

The paper [2] An Independent Industrial Firefighting System Singh et al. are developing Mobile Robot. The building and design of a mobile firefighting robot are described in the study. Two D.C. motors that are optically isolated are part of the system. Robot converts data from analog to digital form using infrared sensors. There are five infrared sensors employed. The robots' motion is managedby two sensors, while three are used to detect flames. A water container and a D.C. water pump make up the extinguisher. The primary focus of the paper is identifying fire and putting it out.

An infrared sensor is utilized as an input sensor to detect infrared radiation emanating from the fire. It is the microcontroller that governs the extinguishing mechanism

The paper [3] The company Swati Deshmukh et al. is developing a wireless firefighting robot. It is made up of a gadget that can both detect and put out fire. The firefighting robot is capable of traveling in both forward and backward motion, as well as left and right turns. As a result, firefighters may control the robot from a great distance, and they don't need to be close to the fire. Fire detection systemsuse resistors that are dependent on light. Due to their extreme sensitivity, these resistors can detect even the smallest fires. Security is provided by the robot in homes, offices, factories, and laboratories. It is a multimodal intelligent security system that includes a firefightingsystem for everyday use.

The paper [4] A firefighting robot model was proposed by Tawfiqur Rakib and M. A. Rashid Sarkar. It comprises a base platform composed of "Kerosene wood," an LM35 sensor for temperature detection, flame sensors for fire detection, and a one-liter water container made of sturdy cardboard that is water resistant. The robot can move on two wheels.

The paper [5] A fire extinguishing robot was proposed by Nagesh MS, Deepika T V, Stafford Michahial, and Dr. M Shivakumar. It uses DTMF (Dual Tone Multi Frequency Tones) technology for navigation and a flame sensor for fire detection that can detect flames with wavelengths ranging from 760 to 1100 nm and sensitivity varying from 10cm to 1.5feet.

The paper [6] Hossain et al.'s [8] proposal is for an autonomous fire extinguisher robot, a hardware-based apparatus that can travel in the direction of a detected fire. The calcium silicate used in robot shields has a temperature tolerance of up to 573 o K. The robot or truck can get to some fire sites where the military is unable to provide assistance. The robot is capable of opening on its own when it detects fire. Temperature and fire sensors are utilized in place of thermocouples. IC741 is used to pump water for the amplifier and simulator. Robot mobility is facilitated by sensors and barriers. MATLAB is also used to capture the photos.

III. PROPOSED SYSTEM

3.1 NAVIGATION ROBOT IMPLEMENTATION

The three primary modules of the navigation robot are the GPS, GSM, and driver modules. The GPS module is utilized to track the robot's present location. There will be adriver module and a GSM module on the robot side. The robot and DC motors are controlled by the driver module, while the GSM module is utilized for alarm messaging.

The Arm processor, Microcontroller, Motor Driver, GPS Receiver, Temp Sensor, Power Supply, Water Sprinkler, and LCD display are the primary components of the robot side. The robot side will have a microprocessor that will be in charge of the GPS and GSM modules. Additionally, we are providing a power source for the robot's side. In addition, we use a water sprinkler for main fire extinguishment. An LCD can show how a robot operates.

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3.1. BLOCK DIAGRAM

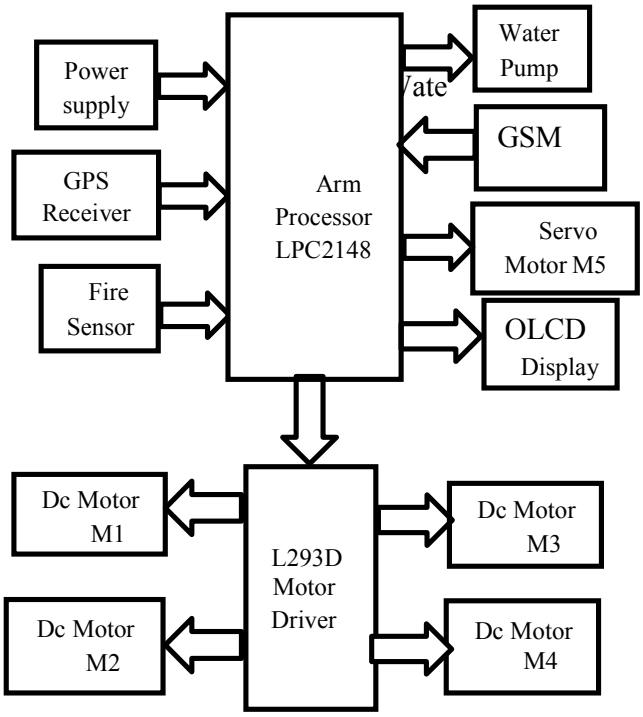

Figure 1. Block diagram

3.2 SENSORING TECHNOLOGY

The Global System for Mobile Communications (GSM),Global Positioning System (GPS), and temperature sensor are the primary censorship technologies used in robots. The European Telecommunications Standards Institute (ETSI) created the GSM standard, which is utilized for mobile communication.

The robot system uses GSM for emergency messaging.

The goal of developing the GSM standard was to replace the1G mobile networks. The technology uses GPS to navigate and track the robot's present position. GPS is a satellitenavigation system that operates in space and gives users access to time and position data. The GPS system offers vital features to users in the military, government, and business sectors. It is free to access with a GPS receiver and is maintained by the US government. These sensors, working in concert, enable firefighting robots to detect fires with high accuracy, navigate through hazardous environments, and effectively perform firefighting tasks. The integration of these technologies allows the robots to operate autonomously or semi-autonomously, reducing the risk to human firefighters and improving the efficiency of firefighting operations

IV. RESULT ANALYSIS

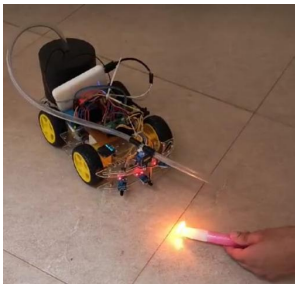

Figure 2. Hardware Connection Final Output

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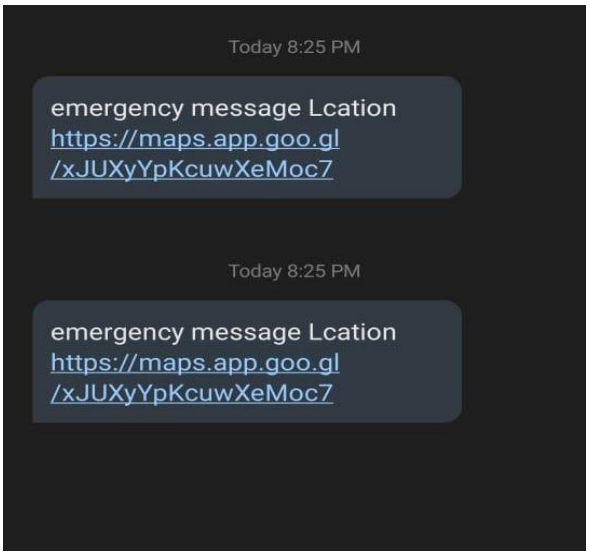

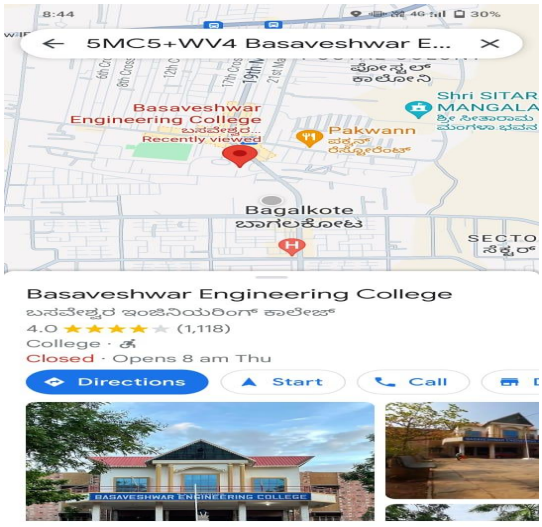

Figure 3. Output image

GPS-enabled robots with GSM communication are being explored and tested in various fire extinguishing applications, demonstrating promising results in enhancing firefighting capabilities. These robots integrate several technologies to autonomously detect and extinguish fires while providing real-time updates via GSM modules.

One such robot design includes using multiple sensors for fire detection, such as flame, temperature, and smoke sensors, combined with GPS for navigation and GSM for communication. These robots can autonomously navigate to the fire location, avoiding obstacles, and extinguish the fire using built-in mechanisms like water pumps or extinguishing agents

the integration of GPS and GSM in fire-extinguishing robots enhances their capability to autonomously detect, navigate to, and suppress fires while maintaining communication with human operators. These advancements contribute significantly to reducing response times and improving the safety and efficiency of firefighting operations.

We are excited to present the culmination of our latest engineering endeavor: the Fire-Fighting Robot Project. Combining cutting-edge technology with innovative design, we have developed a versatile and reliable robotic solution for tackling fire emergencies. Below is a comprehensive breakdown of the project, including its key components, functionalities, and testing process.

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V. APPLICATION AND ADVANTAGE

The benefits of GPS include ease of navigation—it indicates which route to take at each turn and how long to take to get to your destination. GPS operates in all weather conditions, so unlike other navigating systems, you don't have to worry about the weather. The cost of the GPS is extremely low when compared to other navigational aids. This system's complete coverage of the earth is its most alluring feature. It is quite helpful when moving to a new place and also aids in searching for local eateries, lodging facilities, and convenience stores. It is particularly simple to integrate into other technologies, like as cell phones, because of its inexpensive cost. The US government updates the system frequently, making it highly sophisticated.

This passage describes the multifunctional capabilities of a robot, particularly in the context of navigation, temperature detection, and emergency response. The robot utilizes GPS for navigation, temperature sensors for fire detection, and a GSM module with a SIM card for sending emergency alerts to firefighters. It essentially serves as a versatile tool for assisting people in unfamiliar environments and addressing emergency situations, such as fire outbreaks, by leveraging various technologies and functionalities

VI. CONCLUSION

After extensive development and testing, we are proud to present a fully functional fire-fighting robot capable of detecting and suppressing fires autonomously. Our innovative solution combines advanced technology with practical functionality, offering a reliable and efficient means of addressing fire emergencies. We are confident that our fire-fighting robot will make a significant contribution to enhancing safety and mitigating fire risks in various environments. The conclusion of a fire fighting robot project would typically summarize its effectiveness in extinguishing fires, its ability to navigate various environments, any limitations or areas for improvement, and potential future developments or applications.

REFERENCES

[1] W. Budiharto, Membuat Robot Cerdas, Jakarta: Gramedia, 2006.
[2] Ratnesh Malik, “Fire Fighting Robot : An Approach” , Indian Streams Research Journal Vol.2,Issue.II/March; 12pp.1-4
[3] Kristi Kosasih, E. Merry Sartika, M. Jimmy Hasugian, danMuliady, “The Intelligent Fire Fighting Tank Robot” , Electrical Engineering Journal Vol. 1, No. 1, October 2010
[4] H. P. Singh, Akanshu Mahajan, N. Sukavanam, VeenaBudhraja ,”Control Of An Autonomous Industrial Fire Fighting Mobile Robot”, DU Journal of Undergraduate Research and Innovation
[5] Swati A. Deshmukh, Karishma A. Matte and Rashmi A. Pandhare, “Wireless Fire Fighting Robot”, International Journal For Research In Emerging Science and Technology
[6] Lakshay Arora, Prof.AmolJoglekar, “Cell Phone Controlled Robot with Fire Detection Sensors”, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (3) , 2015, 2954-2958
[7] Arpit Sharma, ReeteshVerma, Saurabh Gupta and Sukhdeep Kaur Bhatia, “Android Phone Controlled Robot Using Bluetooth”, International Journal of Electronic and Electrical Engineering.ISSN 0974- 2174, Volume 7, Number 5 (2014), pp. 443-448
[8] Saravanan P, “Design and Development of Integrated Semi - Autonomous Fire Fighting Mobile Robot”, International Journal of Engineering
[9] W. Budiharto, Membuat Robot Cerdas, Jakarta: Gramedia, 2006.
[10] Ratnesh Malik, “Fire Fighting Robot : An Approach” , Indian Streams Research Journal Vol.2,Issue.II/March; 12pp.1-4
[11] Kristi Kosasih, E. Merry Sartika, M. Jimmy Hasugian, danMuliady, “The Intelligent Fire Fighting Tank Robot” , Electrical Engineering Journal Vol. 1, No. 1, October 2010
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[13] Swati A. Deshmukh, Karishma A. Matte and Rashmi A. Pandhare, “Wireless Fire Fighting Robot”, International Journal For Research In Emerging Science and Technology

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[15] Arpit Sharma, ReeteshVerma, Saurabh Gupta and Sukhdeep Kaur Bhatia, "Android Phone Controlled Robot Using Bluetooth", International Journal of Electronic and Electrical Engineering.ISSN 0974- 2174, Volume 7, Number 5 (2014), pp. 443-448
[16] Saravanan P, "Design and Development of Integrated Semi - Autonomous Fire Fighting Mobile Robot", International Journal of Engineering