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# Automated Sensor based Fire Extinguisher Mounted on AGV

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**ABSTRACT:** The development of an automatic fire extinguishing robot represents a significant advancement in fire safety technology. This project aims to design and implement a small robot equipped with sensors and actuators capable of autonomously detecting and extinguishing fires. The robot incorporates three infrared (IR) fire sensors positioned strategically to detect flames in different directions. When a fire is detected, the robot moves towards it, guided by the sensor that triggered the detection. Upon reaching the source of the fire, the robot activates a motorized mechanism that sprays a fire extinguishing agent, effectively suppressing the flames. This abstract provides an overview of the project's objectives, methodology, and outcomes. The implementation of the automatic fire extinguishing robot involves the integration of hardware components such as a motor, motor driver, battery, and Arduino microcontroller. Additionally, software development is crucial for programming the Arduino to interpret sensor inputs and control the robot's movements and fire extinguishing mechanism. The success of this project will contribute to enhancing fire safety measures by introducing an autonomous firefighting solution that can be deployed in various environments.

## I. INTRODUCTION

Fire accidents pose significant threats to life, property, and the environment, necessitating the development of innovative fire fighting solutions to mitigate their impact. Traditional fire fighting methods often rely on human intervention, which can be risky, especially in hazardous or inaccessible environments. To address this challenge, the integration of robotics and automation technologies offers promising opportunities to enhance fire safety measures. The concept of an automatic fire extinguishing AGV combines AGV, sensor technology, and fire suppression mechanisms to create a versatile and efficient firefighting tool. This project focuses on designing and implementing a small-scale prototype of such AGV, capable of autonomously detecting and extinguishing fires in a controlled environment. The AGV design incorporates three infrared (IR) fire sensors strategically positioned to detect flames in different directions. These sensors serve as the primary means of fire detection, enabling the AGV to identify the location and intensity of the fire accurately.

## II. LITERATURE REVIEW

1. "Implementation methods of firefighting robot" Author - Mrs. Bhavna K. Pancholi, Miss. Kena Patel. The robot resented here is an embedded device in real time. C language is the software used to implement this type of robots.
2. "Intelligent firefighting tank robot" Author - E. Merry Sartika, Kristi Kosasih, Dan Muliady, M. Jimmy Hasugian. The tank robot is made of a mixture of acrylic, plastic, aluminum and iron. There are two servo motors for each wheel, two DC motors for two flame extinguishing fans, there are many other sensors like ultrasonic, compass, flame thermal array and many other.
3. "Fire Extinguishing Robot using Arduino" Author -Abdülkadir ÇAKIR, Nyan Farooq Ezzulddın EZZULDDIN. In this analysis, the aim of the mobile firefighting robot application is to search for a fire created in some way with a flow chart in the labyrinth, and to extinguish the fire when a fire is found with the help of a fan.
4. "Fire Extinguishing Robot using Arduino"Author - Abdülkadir ÇAKIR , Nyan Farooq Ezzulddın EZZULDDIN. In this analysis, the aim of the mobile firefighting robot application is to search for a fire created in some way with a flow chart in the labyrinth, and to extinguish the fire when a fire is found with the help of a fan. A number of mechanical and electronic components were provided for this purpose, and a mobile robot was assembled. In order to perform the intended functions, the constructed robot was eventually programmed. Touch video is being used (such

as a camera, etc.).

5. Robot Based on DTMF, Bluetooth and GSM Technology with Multiple Mode of Operation"Author - MD. Fahim Newaz Iftekhar Uddin Ahmed, Aasim Ullah , Humayun Rashid.Using DTMF and Bluetooth remote control, as well as GSM and GPS technology, the built fire extinguisher robot can be controlled in multiple modes. Both the DTMF remote control and the Android smart phone can be used to control the robot and can be controlled in three different modes.

6. "Fire Extinguishing Robot using IoT" Author - Prof. Sankalp Mehta , Sujata Tupale , Shilpa Kappalguddi, Sangharsha Madvanna , Rakshanda Patil .The fire extinguishing robot that detects fire based on IoT. The purpose of the system proposed is to control the robot through an android application. The robot will patrol the prescribed area. The firefighting robot is wirelessly connected with the Node MCU. If a node senses fire, it will alert the Central Node MCU which will give information to fire safety officers and activate robots to perform firefighting actions and start the pump to extinguish the fire.

## III. METHODOLOGY OF PROPOSED SURVEY

The above Fig.1 shows the detailed methodology. The theme of this paper is to automatically sense the environmental fire and extinguish it without human intervention. The methodology is divided into three parts. The first part is on the design structure, followed by hardware description and the finally on the programming design. All these three parts were assembled together and experiments were then performed to build a system that can extinguish the fire that was carried out. Design Structure In this section, the prototype of AGV system is presented, in which it consists of IR flame sensors, servo motors, submersible water pump, motor driver, mini breadboard, BO motors, rubber wheels, processor, and communication module for exchanging data between the fire-fighting AGV and Arduino software. The AGV carries four main functions: First, it initializes itself i.e. its sensors gets initializes as the power is supplied. Second, AGV sense the surrounding environment (for instance for the level of temperature) and identify the fireplace. Third, AGV sends the navigating information and starts to navigate itself towards the fireplace. Fourth, finally the AGV starts to extinguish the fire with the help of servo motors and submersible water pump.
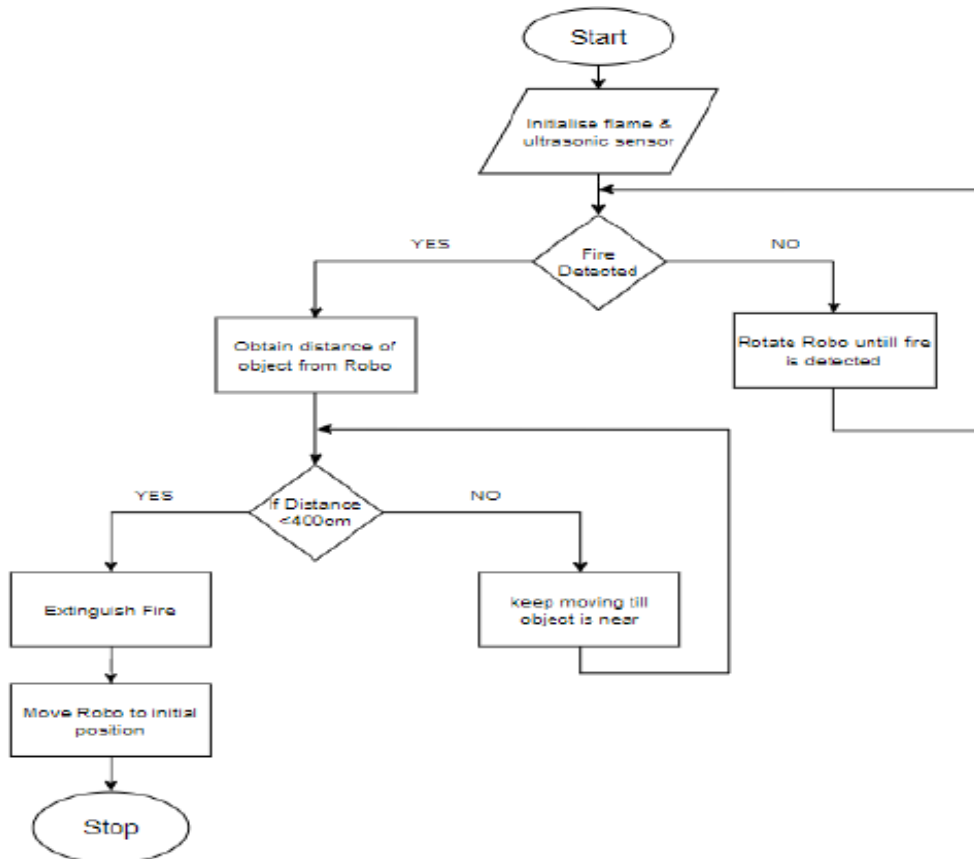


**Figure 1: Methodology**

### IV. EXPERIMENTAL RESULTS

In this project, an automated sensor-based fire extinguisher mounted on AGV has been implemented (shown in fig 2)which is capable of detecting flames and extinguishing them successfully. This AGV can move forward, move left & right flawlessly. Fig.3. shows the motors and Arduino code work together to control the movement of the AGV. If any of the flame sensors or   smoke sensor are triggered, then buzzer will start to buzz & warning about the danger environment will be displayed on the Virtual Terminal & safe environment will be shown in case of no such detection. The motor will start to rotate & move the AGV to the danger point upon receiving a signal about the danger environment & start to pump the water with the help of servo motor.

This process will be continued until the fire has been extinguished completely. Then it will display about the safe environment. After successfully building the project, the simulation was run and the desired output was obtained. Proper snapshots of the results were attached. Thus, an automated sensor-based fire extinguisher mounted on AGV has been built to achieve the objectives of this project successfully.



**Fig2. Automated Sensor Based Fire Extinguisher Mounted On AGV**

### V. CONCLUSION AND FUTURE WORK

The development of an automatic fire extinguishing robot represents a significant advancement in fire safety technology, offering a proactive and efficient solution for detecting and suppressing fires autonomously. By integrating hardware components such as Arduino microcontrollers, IR fire sensors, motors, and fire extinguishers, along with software development for intelligent decision-making and control, the proposed system demonstrates the feasibility of automated firefighting operations. Through rigorous testing and validation, the automatic fire extinguishing robot has

been shown to effectively detect fires, navigate towards them, and suppress them with minimal human intervention. The system's scalability, adaptability, and robustness make it suitable for deployment in various environments, including industrial facilities, warehouses, commercial buildings, and residential areas. In conclusion, the automatic fire extinguishing robot offers numerous advantages, including enhanced safety, quick response times, scalability, and cost-effectiveness, making it a valuable addition to existing firefighting systems.

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