

Advanced Fire Suppression with Alert Integration

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Abstract—Fire mishaps have been happening regularly nowadays, regardless of the intervention of people. Various misfortunes would happen as property, land, people, and creatures as well. Before the fire gets broad, we need to repress it in the underlying stages. With the utilization of current innovation, we have fostered a robot. In our work, we will give data about the plan and development of it. GSM technology is used by this robot for fighting fires. At the point when the robot identifies a fire, it gives a message to the user by the utilization of GSM. This module additionally gives messages to the local group of fire-fighters through the GSM module consequently making it workable for the local group of fire-fighters to make vital moves.

Keywords — fire, robot, GSM technology, message.

I. INTRODUCTION

One of the most necessary parameter in hearth catastrophe is life, i.e. lives misplaced in saving anyone else life. It is now and again not possible for fire-fighters personnel to get admission to the web site of a fireplace due to the fact of explosive materials, smoke, and excessive temperatures. A quick response to become aware of the hearth can keep away from many disastrous things. Not solely lives of industrial humans however additionally the lives of domestic humans is at chance due to the fact of negative fireplace administration system. Fire can take many lives to and can injure many humans for their lifestyles time. But it can be averted the usage of desirable hearth controlling methods. For such environments, fire-fighting robot is proposed. In today's era a lot of robots are proposed and designed to dispose of the human element from hazardous and lethal work. The use of robots is becoming very frequent that safely completes the intensive or lethal work for human beings. A Fire Extinguishing Robot is based totally on IOT Technology. In Fire Extinguishing robot, we intend to construct a machine that ought to extinguish a small flame through sensing and shifting to the vicinity itself. It will robotically realize the furnace with the assist of flame sensors. Once it detects the hearth breakout location, it navigates itself therefore to attain the hearth supply and extinguishes the fireplace through the use of built-in hearth extinguishing system. For fireplace detection it is the use of three flame sensors as 1st one for the left direction, 2nd one for the ahead course and 3rd one for the proper direction. Fire extinguishing device will get activated when hearth detection gadget detects fire. It then reaches the breakout factor and water pump will begin ejecting the water when it detects fire. The key facet of is to furnish surveillance of hearth so that foremost fireplace accidents can be avoided and loss of human lives receives minimized.

STATISTICS

Fire catastrophe is one of the risky problems that can lead to heavy loss each financially and through taking lives. Sometimes it will become tough for warring parties to get admission to the website of a furnace due to the fact of explosive materials, smoke, and excessive temperatures. Such conditions hazard the lives of hearth warring parties too. There are many probabilities a hearth can begin in an enterprise or in any far flung area. For instance, in cotton mills, garments, gasoline storage, etc., electric powered leakages can lead to big damage. Also, it's a worst-case scenario, inflicting heavy losses now not solely financially however additionally destroying the areas surrounding it. In such environments, fire-fighting robots will be useful. A hearth branch responds to a hearth each 23 seconds. One domestic shape hearth used to be suggested each and every ninety three seconds. One domestic fire-related damage takes place each and every forty seven minutes. One domestic fire-related dying happens each and every three hours and eight minutes. In 2021, India lamentably recorded 1.6 million fireplace accidents, with 27,027 harmless lives lost. In Fire Extinguishing Robot, we intend to gather a laptop that can additionally desire to extinguish a small flame by means of sensing and transferring to the neighborhood itself. Sometimes prolong in the arrival of furnace warring parties leads to several consequences. The Fire Extinguishing robot constantly video display units the surroundings and extinguishes it barring delay.

II.ROBOTIC SYSTEM

Robotics is the rising answer to guard human lives and their wealth and surroundings. A robotic successful of war a simulated family hearth will be designed and built. It should be in a position to autonomously navigate via a modeled flooring design whilst actively scanning for a flame. The robotic can even act as a direction guider in everyday instances and as a fireplace extinguisher in an emergency. Robots designed to discover a fire, previously than it rages out of control, can one day work with firefighters drastically lowering the threat of damage to victims. The mission will assist generate activity as nicely as improvements in the fields of robotics whilst working towards a realistic and attainable answer to store lives and mitigate the chance of property damage. Actuation of the robotic gadget such as robots is primarily based on two main

III. PROPOSED SYSTEM AND WORKING METHODOLOGY

The proposed model is in a position to observe presence of fireplace the use of flame sensor. It includes gear motors and motor driver to manage the motion of robot. When it detects flame it communicates with microcontroller (Arduino) and the robotic will go in the direction of the fireplace affected area. The fire extinguisher is established on the robotic vehicle. If any of the sensor will discover it, then the robot will flip and start strolling towards the fire. The flame will be extinguished the usage of the mini water pump. The GSM module sends message to the consumer and additionally signals the fire branch with suited area details. The major advantages of our proposed system are:

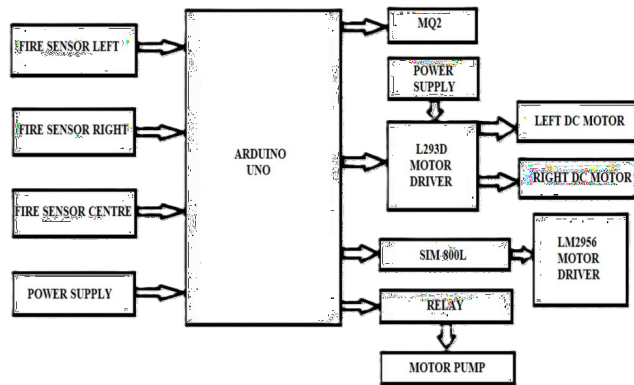


Figure 1: Block diagram of proposed system

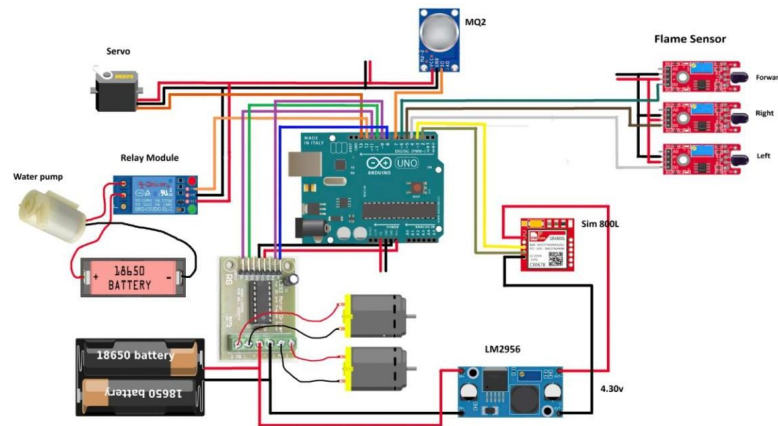


Figure 2: Circuit diagram of proposed system

ARDUINO UNO

Arduino Uno is a broadly used microcontroller board primarily based totally at the ATmega328P. It features digital and analog input/output pins, making it suitable for a variety of projects. Its versatility, ease of use, and large community support make it a popular choice for beginners and experienced makers alike. With its

programmability and ample connectivity options, the Arduino Uno serves as the brain of many DIY electronics projects, ranging from simple LED blinking to complex robotic systems.



Figure 3: Arduino Uno

IR FLAME SENSOR

The IR Flame Sensor is a module that detects infrared radiation emitted by flames. It is commonly used in fire detection systems to sense the presence of flames. The sensor typically consists of an infrared receiver and a signal processing circuit. When a flame is detected, the sensor outputs a digital signal, making it suitable for integration with microcontrollers like the Arduino Uno.



Figure 4: IR Flame Sensor

L293D MOTOR DRIVER

The L293D Motor Driver is a dual H-bridge motor driver IC that allows the Arduino Uno to control the direction and speed of DC motors. It can drive two motors simultaneously and provides bidirectional control, making it ideal for robotics and motor control applications. The L293D can handle a wide range of motor voltages and currents, making it versatile for the various motor types and sizes.



Figure 5: L293D Motor Driver

LM2956 MOTOR DRIVER

The LM2956 Motor Driver is a voltage regulator specifically designed to provide power to motors in robotics and other applications. It accepts a wide input voltage range and delivers a stable output voltage to the connected motors. With built-in protection features such as thermal shutdown and current limiting, the LM2956 ensures reliable operation of the motors under various conditions.



Figure 6: LM2956 Motor driver

SERVO MOTOR

A Servo motor is a rotary actuator that allows precise control of angular position. It is commonly used in robotics, remote-controlled vehicles, and the various other applications where accurate and controlled movement is required. Servo motors operate based on PWM (Pulse Width Modulation) signals, making them compatible with microcontrollers like the Arduino Uno.



Figure 7: Servo Motor

BO MOTOR

A BO (Brushed DC) Motor is a type of electric motor that operates using direct current (DC) and features a rotor with brushes and a commutator. BO motors are widely used in robotics, automotive applications, and consumer electronics due to their simplicity, reliability, and controllability. They can be easily controlled using motor drivers like the L293D or LM2956 when integrated with the Arduino Uno.



Figure 8: BO Motor

MINI WATER PUMP

A Mini water pump is a small, electric pump used for moving water or other liquids in various applications such as aquariums, water dispensers, and irrigation systems. It typically operates on low voltage and can be controlled using devices like the Arduino Uno through motor drivers or relay modules.



Figure 9: Mini Water Pump

SIM 800L MODULE

The SIM800L is a compact and versatile GSM module that enables communication capabilities in Arduino-based projects. It allows for sending and receiving SMS messages, making phone calls, and connecting to the internet via GPRS. With its small form factor and low power consumption, the SIM800L is suitable for applications such as remote monitoring, asset tracking, and IoT devices.



Figure 10: Sim 800L Module

MQ2 SENSOR

The MQ2 sensor is a gas sensor module capable of detecting various gases such as methane, propane, carbon monoxide, and alcohol vapour. It is commonly used in gas leak detection systems, air quality monitors, and safety alarms. The MQ2 sensor outputs an analog voltage proportional to the concentration of the detected gas, making it compatible with microcontrollers like the Arduino Uno for data processing and control.



Figure 11: MQ2 Sensor

RELAY MODULE

A Relay is an electrically operated switch used to control the flow of current in circuits. It consists of a coil and one or more sets of contacts that open or close when the coil is energized. Relays are commonly used in home automation, industrial control systems, and automotive applications to control high-power devices using low-power signals from microcontrollers like the Arduino Uno. They provide isolation between the control circuit and the load, enhancing safety and reliability.



Figure 12: Relay module

POWER SUPPLY

A Power supply is a device that converts electrical power from a source into usable power for electronic devices. It provides the necessary voltage and current to power components like microcontrollers, sensors, motors, and other peripherals. Power supplies for Arduino projects typically accept input from AC mains or batteries and output regulated DC voltage suitable for the connected components. Choosing the right power supply is crucial to ensure stable and reliable operation of the entire system.

SOFTWARE – ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a software platform used for writing, compiling, and uploading code to Arduino microcontroller boards. It provides a user-friendly interface that simplifies the process of developing embedded systems and electronics projects. The Arduino IDE is open-source and available for Windows, macOS, and Linux, making it accessible to a wide range of users. One of the key features of the Arduino IDE is its simplicity. Even those with minimal programming experience can quickly get started thanks to its intuitive interface and beginner-friendly documentation. The IDE includes a built-in text editor with features like syntax highlighting, auto-completion, and code formatting, which streamline the coding process and help catch errors early. Another advantage of the Arduino IDE is its extensive library of pre-written code, known as libraries. These libraries cover a wide range of functionalities, from controlling LEDs and motors to interfacing with sensors and communication modules. Users can easily incorporate these libraries into their projects, saving time and effort in writing code from scratch. Additionally, the Arduino IDE supports a variety of Arduino boards, including the popular Arduino Uno, Nano, Mega, and many others. It also allows users to work with third-party boards and custom hardware configurations by adding board definitions and drivers. Overall, the Arduino IDE provides a powerful yet accessible platform for developing embedded systems and electronic projects, empowering users to bring their ideas to life with ease.



Figure 13: Arduino IDE

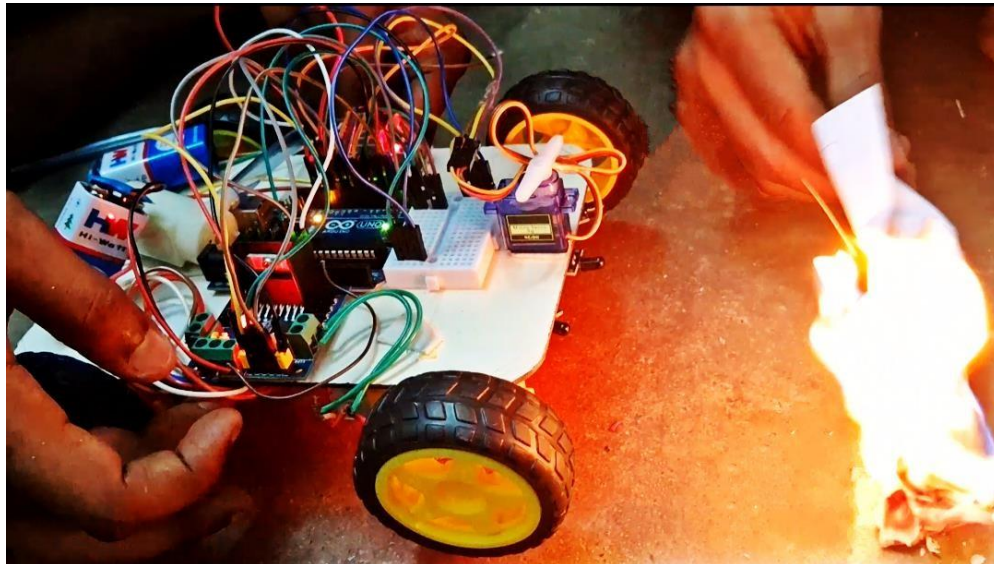


Figure 14: Output of the proposed system

6. CONCLUSION

In conclusion, the implementation of advanced fire suppression systems integrated with alert technologies represents a significant stride towards enhancing fire safety measures. By combining cutting-edge suppression techniques with real-time alert integration, this project ensures a swift and effective response to fire incidents, minimizing potential damage and safeguarding lives. The incorporation of advanced fire suppression methods such as mist systems, inert gas flooding, and aerosol fire extinguishing agents offers a multi-layered defense against fire outbreaks. These systems not only suppress flames rapidly but also mitigate risks associated with traditional water-based suppression methods, such as water damage and electrical hazards. Moreover, the integration of alert technologies ensures prompt notification of fire incidents to relevant authorities and building occupants. Whether through smart sensors, IoT devices, or automated alarm systems, the ability to detect fires early and communicate alerts instantly is paramount in preventing escalation and facilitating timely evacuation. Overall, this project signifies a proactive approach to fire safety, leveraging technological advancements to mitigate the devastating impacts of fire emergencies. By investing in advanced suppression and alert systems, we can better protect our communities, infrastructure, and environment from the destructive forces of fire.

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