Automatic Fire Extinguisher

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ABSTRACT

Fire extinguishers are essential tools for fire prevention and suppression in various settings, ranging from residential to industrial environments. This paper provides a comprehensive overview of fire extinguishers, encompassing their types, mechanisms, and applications. The document evaluates emerging trends and innovations in fire extinguisher technology, such as eco-friendly extinguishing agents and smart fire extinguisher systems equipped with sensors and IoT connectivity. Overall, this review serves as a comprehensive resource for individuals, fire safety professionals, and policymakers seeking to enhance their understanding of fire extinguishersand mitigate fire-related risks effectively.

I . INTRODUCTION:

Fire is a formidable force that can wreak havoc on lives and property within moments. From residential homes to industrial complexes, the threat of fire is ever-present, making effective fire prevention and suppression measures imperative. Among the arsenal of tools available for fire safety, fire extinguishers stand as frontline defenders, capable of swiftly tackling small fires before they escalate into catastrophic disasters. In Fire Extinguishing, we intend to build a system that could extinguish a small flame bysensing and moving to the location itself. It will automatically detect the fire with the helpof flame sensors. Once it detects the fire breakout location, it navigates itself accordinglyto reach the fire source and extinguishes the fire by using built-in fire extinguishing system. For fire detection it is using three flame sensors. First one for the Left direction second one for the forward direction and third one for the right direction. Fire extinguishing system will get activated when fire detection system detects fire. It then reaches the breakout point and water pump will start ejecting the water when it detects fire. The key features of this system are to provide surveillance of fire so that major fire accidents can be prevented and loss of human lives gets minimize.

II. CIRCUIT DIAGRAM:
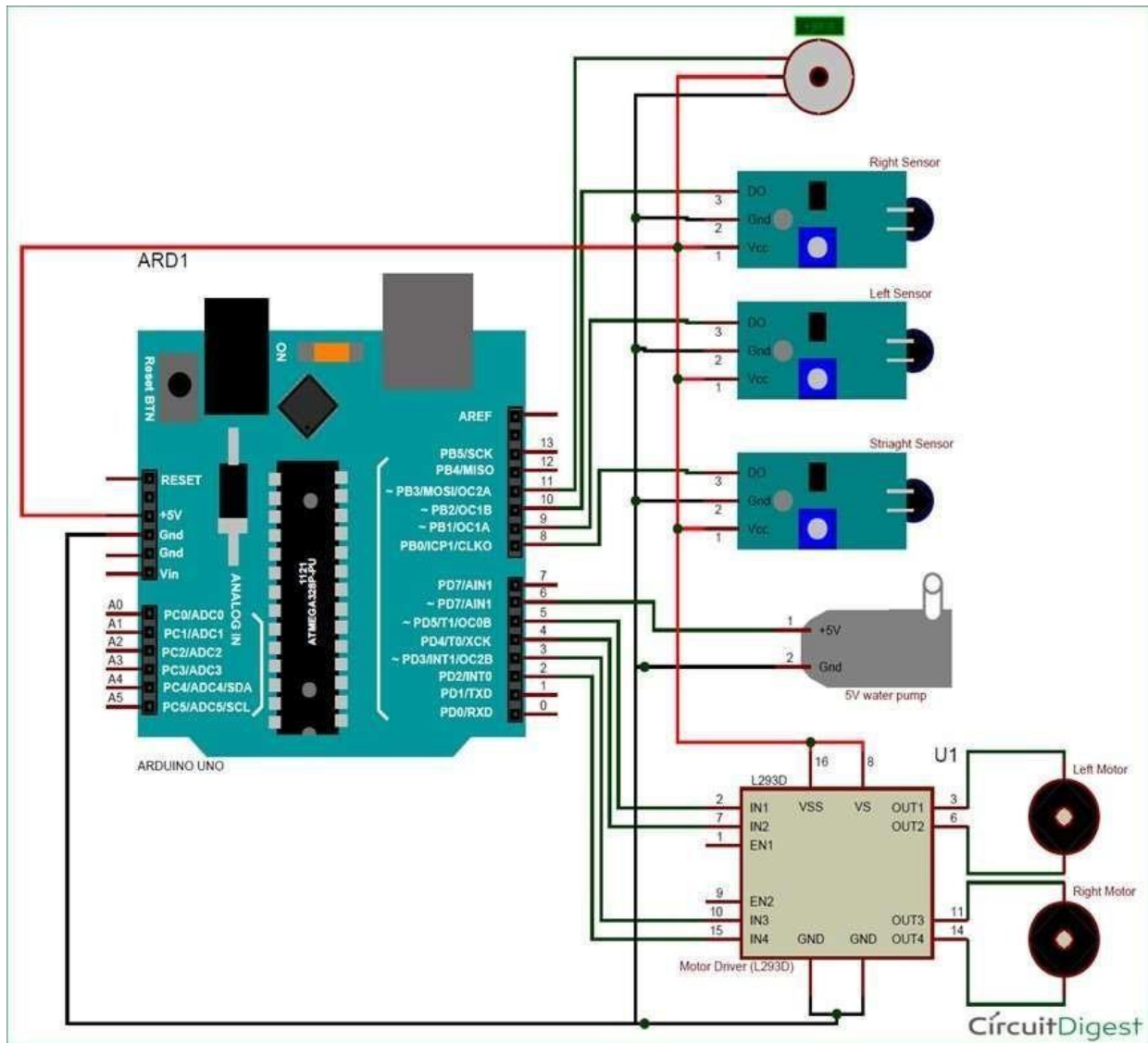
III. WORKING:

The main brain of this project is the Arduino, but in-order to sense fire we use the Fire sensor module. The sensors have an IR Receiver (Photodiode) which is used to detect the fire. When fire burns it emits a small amount of Infra-red light, this light will be received by the IR receiver on the sensor module. Then we use an Op-Amp to check for change in voltage across the IR Receiver, so that if a fire is detected the output pin (DO) will give 0V(LOW) and if the is no fire the output pin will be 5V(HIGH). So, we place three such sensors in three directions of the relays to sense on which direction the fire is burning We Detect The Direction of the fire we can use the motors to move near the fire by driving our motors through the L293D module. When near a fire we have to put it out using water. Using a small container we can carry water, a 5V pump is also placed in the container and the whole container is placed on top of a servo motor so that we can control the direction in which the water has to be sprayed. The Arduino UNO development board issued to control this automatic fire extinguisher system, which is made up of HC-SR04 sensors. A gas sensor (MQ2) for sensing hazardous smoke, a temperature sensor (LM35) for more precise temperature measurement, and a fire flame sensor(IR) for detecting and sensing the approaching fire are all mounted on a servo-motor for obstacle detection and free path navigation. In addition, for extinguishing the flames, it also makes use of a water tank and a spray gun mechanism. With the aid of a 12V pump, water is pumped from the main water tank to the water nozzle.

IV. COMPONENTS

A. Microcontroller: The Arduino Uno is a compact microcontroller board with dimensions typically around 68.6mm x 53.4mm, featuring a blue-coloured PCB housing various electronic components and connectors. At its core lies an Atmel ATmega328P microcontroller clocked at 16 MHz, offering 32KB of flash memory, 2KB of SRAM, and 1KB of EEPROM.

B. Sensor: Sensors like flame sensor, ultrasound sensor and temperature sensors are put into use.

C. Batter relay pack: A relay battery pack represents a sophisticated and versatile solution for managing power distribution and control in a wide range of electronic systems and devices. At its core lies a relay, a specialized electromechanical switch that enables the seamless switching of electrical circuits under the control of an external signal.

D. Motor driver module: The L298N motor driver module stands as a pinnacle of engineering ingenuity, offering a robust solution for controlling DC motors and stepper motors in a myriad of applications. At its core lies a sophisticated H-bridge circuit, a marvel of electrical design that facilitates bidirectional control of motors with ease.

V. ADVANTAGES

Early Detection: Automatic fire extinguisher systems are equipped with advanced sensors that detect the presence of fire at its incipient stage. This early detection allows for swift response before the fire has a chance to escalate, minimizing potential damage and loss.

Rapid response: Upon detection of a fire, automatic fire extinguisher systems activate quickly and without human intervention. This rapid response helps to contain the fire, preventing it from spreading and reducing the risk of injury or loss of life.

24/7 protection: Automatic fire extinguisher systems operate continuously, providing round-the-clock protection against fire hazards. This constant vigilance ensures that fires are detected and addressed promptly, even in unoccupied or remote areas.

Efficient use of resources: Automatic fire extinguisher systems are designed to deploy suppression agents precisely where they are needed most. This targeted approach minimizes the waste of resources such as water, foam, or extinguishing agents, optimizing their effectiveness in extinguishing fires.

Minimal human intervention: By automating the fire suppression process, automatic systems reduce the need for human intervention in high-risk environments. This decreases the likelihood of human error and ensures a consistent and reliable response to fire incidents.

Integration: Automatic fire extinguisher systems can be seamlessly integrated with other building systems, such as fire alarms, HVAC systems, and emergency lighting. This integration facilitates coordinated responses to fire emergencies, enhancing overall safety and efficiency..

Cost effective: While the initial investment in an automatic fire extinguisher system may be significant, it can result in long-term cost savings by reducing property damage, insurance premiums, and business interruptions associated with fire incidents.

Peace of mind: Knowing that an automatic fire extinguisher system is in place provides peace of mind to building occupants, employees, and visitors. This confidence in the building's fire safety measures fosters a sense of security and wellbeing within the environment.

VI. CONCLUSIONS

In ulmination, the project cantered on automatic fire extinguisher systems epitomizes a monumental stride towards bolstering fire safety protocols through a synergistic amalgamation of technological breakthroughs, interdisciplinary collaboration, and relentless research endeavours. The exhaustive examination of cutting-edge advancements spanning sensor technology, suppression agents, data analytics, and system integration unveils the transformative potential inherent in these systems to mitigate fire hazards and fortify the protection of lives and property. With an astute utilization of state-of-the-art technologies like AI, IoT, and edge computing, automatic fire extinguisher systems stand poised to deliver unparalleled levels of precision, efficiency, and adaptability across fire detection, suppression, and management domains. Moreover, ongoing research endeavours, aimed at enhancing system resilience, addressing environmental considerations, and ensuring regulatory compliance, underscore a steadfast commitment to perpetual advancement and sustainability in fire safety engineering practices. As we cast our gaze towards the horizon, the project on automatic fire extinguisher systems serves as an emblem of progress, heralding a future where built environments thrive with heightened resilience, minimal fire-related risks, and communities flourish with unwavering confidence and tranquillity.

VII. REFRENCES

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