International Journal of Scientific Research in Science, Engineering and Technology

Print ISSN - 2395-1990
Online ISSN : 2394-4099

Available Online at : www.ijsrset.com
doi : https://doi.org/10.32628/IJSRSET23103198

IOT based Fire Detection System with Automatic and Manual Extinguishing System

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ARTICLEINFO

Article History :

Accepted: 01 July 2023
Published: 30 July 2023

Publication Issue :
Volume 10, Issue 4
July-August-2023

Page Number :
209-212

ABSTRACT

A Novel fire extinguishing monitoring and control system is proposed in this paper. The system combines online monitoring of fire extinguishing information based on internet of things (IOT), early fire warning and alarm system with building safety evaluation, which are designed to acquiring the real-time information of fire extinguishing working condition, improving the reliable prediction mechanism in traditional fire monitoring system. A perception terminal based on IOT is developed and the fire real-time monitoring and control system is designed in this paper. The novel system can acquire the real-time working condition information of fire extinguishing facilities, such as pipe flow, pressure, temperature and humidity of the environment, current and voltage of the electric equipment, valve switch, relay action, alarming message, it can upload the collected data to the monitoring center through the (Client /Server) architecture. Based on these data, an electrical early fire warning model based on neural network is proposed. A fire safety evaluation model based on ontology with the usage of protege is established, which facilitate the on-line monitoring and control of building fire protection information, the prediction of electrical fire and improve building safety level evaluation.

Keywords: IOT, Fire Detection System.

I. INTRODUCTION

Nowadays, fire incidents have become a critical issue, which must be dealt with on time without any unnecessary delay to avoid the loss in lives and belongings. It is considered a fire situation when the monitored temperature exceeds 50o C. In critical places such as hospitals, schools, and banks, personnel's arrival time to come for help in fire hazards is around 15 minutes.

The statistics show that there are 475,500 structural fires annually in India, causing 2,950civilian deaths, 12,775 civilian injuries. According to the National Fire Protection.

Smoke alarms will more likely detect fires before it really starts. Smoke comes when the energy of an object is consumed due to the loss of Carbon Dioxide (CO2) from heat. Smoke detectors are classified into three types: ionization, photoelectric, and combination. All these types can be studied further in instruments and measurement books. In this study, we will highlight a brief description of ionization. In brief, ionization is a radioactive material that receives radiation from the fire. It enters the ionization chamber, which is an air-filled space between two electrodes and permits a small, constant current between the electrodes. This type is the best for fast fires or fires caused by bombs or accidents.

Many regions around the world are moving towards a future in which all new residential builds are mandated with installing automatic fire sprinklers. Their life-saving ability is undeniable, but numerous studies estimate the effectiveness of fire sprinkler systems ranges from approximately 70 percent to 93 percent. An admiral figure, but with significant room for improvement when you compare them to another life safety device, say an airbag, which has an effectiveness of 99.9 percent. But those success rates for sprinklers plummet in households, where they fail 1 in 10times, primarily because they are largely ignored and are designed to blend in and be forgotten.64 percent of failures are due to the system being shut off, with another leading cause being lack of maintenance. Today, the winners in the industry have the best rates. Digital technologies allow insurers to set themselves apart from the pack; however, these technologies weren't easily adopted. Spreadsheets and manual data input between systems reluctantly gave way to automated software to improve accuracy and reduce bottlenecks in insurance processes. It was a surprisingly difficult transition to make because, as often happens in legacy industries, only a finite group of people understood the legacy knowledge behind the established models, whilst others feared the risk of losing data, functionality, and customer satisfaction whilst newer products were being introduced.

II. METHODS AND MATERIALS

The main intent of this project is to design and bring about a robot prototype by using.

- Arduino
- Power Supply
- Temperature Sensor
- Thermistor
- Contact Sensor
- Gas Sensor
- Optical gas sensors

III.RESULTS AND DISCUSSION

The Device was assembled and through daily use and testing it is found that it has more benefits that not using them at all. We will discuss about the parts that has been used.

A. Arduino Pro Mini 328

Arduino microcontrollers come pre-programmed with a bootloader that allows you to easily upload your programs to on-chip flash memory. The default bootloader for Arduino UNO is Opti bootloader. The clipboard is loaded with program code via a serial connection to another computer. Some Arduino serial boards include phase shifters between the RS-232 logic levels and transistor-to-transistor logic (TTL) signals. Modern Arduino boards are programmed over the Universal Serial Bus (USB) and used using a USB-to-serial adapter chip such as the FTDI FT232.

Some later boards (like the Uno board) replace the FTDI chip with another AVR chip with USB to serial firmware that can be reprogrammed in its own ICSP header. Other modifications like Arduino Mini and Bad Controller use USB to serial adapter boards or cables, Bluetooth, or other methods. When using a legacy microcontroller, use standard AVR In-System Programming (ISP) programming instead of the Arduino IDE. Official Arduino Uno R2 and I/O resource description.

B. Power Supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

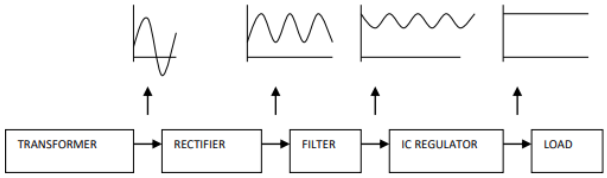

Figure 1: Block Diagram of Power supply

C. Temperature Sensor

Temperature sensors are devices used to measure the temperature of a medium. There are 2 kinds on temperature sensors: 1) contact sensors and 2) noncontact sensors. However, the 3 main types are thermometers, resistance temperature detectors, and thermocouples. All three of these sensors measure a physical property (i.e. volume of a liquid, current through a wire), which changes as a function of temperature. In addition to the 3 main types of temperature
sensors, there are numerous other temperature sensors available for use.

D. Gas Sensor

Gas sensor measures the concentration of gas in its vicinity. Gas sensor interacts with a gas to measure its concentration. Each gas has a unique breakdown voltage i.e. the electric field at which it is ionized. Sensor identifies gases by measuring these voltages. The concentration of the gas can be determined by measuring the current discharge in the device.

E. Contact Sensor

Contact temperature sensors measure the temperature of the object to which the sensor is in contact by assuming or knowing that the two (sensor and the object) are in thermal equilibrium, in other words, there is no heat flow between them.

Examples (further description of each example provide below)

- Thermocouples
- Resistance Temperature Detectors (RTDs)
- Full System Thermometers
- Bimetallic Thermometer

IV.CONCLUSION

The fire detection systems proposed in the literature served fire stopping with no care of the responsiveness. Therefore, this study considers the existing issues and build an efficient and effective fire detection system based on IoT technology, gas, temperature, and smoke sensors to collect the data accurately and rapidly. The continuous readings sent over WIFI modules to the central unit to analyze the data and trigger the water sprinkle. This system structure enhances the efficiency and effectiveness of fire detection. Moreover, using the Ubidots platform in this system made the data exchange faster and reliable. However, this study's proposed approach obtained an average response of 5 seconds to detect the fire and alert the property owner. Meanwhile, the water pump activated to suck water from the tank and release it into the water sprinkler to minimize the fire until the property owners and emergency services reached. Hence, the proposed system overcame the challenges of the issues of affordability, effectiveness, and responsiveness. The proposed system still needs further enhancements. Thus, one of the enhancement directions is integrating machine learning with the system to predict the potentiality of fire based on the collected data from different sources. Machine learning may help the

operators find and overcome the vulnerabilities in their building to prevent fire instead of detection only.

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Cite this article as :

A. Alban Santhosh, R. K. A. Bhalaji, A. Jason, "IOT based Fire Detection System with Automatic and Manual Extinguishing System", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 10 Issue 4, pp. 209-212, July-August 2023. Available at doi : https://doi.org/10.32628/IJSRSET23103198

Journal URL : https://ijsrset.com/IJSRSET23103198