International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 04 | Apr 2023 www.irjet.net p-ISSN: 2395-0072

FIRE ALARM SYSTEM BASED ON MCU FOR INDUSTRY APPLICATION

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ABSTARCT:

Prior to a fire consuming their houses, people need to be warned, and fire alarm systems are crucial for this. But in today's world, installing fire alarm systems takes a lot of wiring and labour. Users become less inclined to put them in their residences as a result. As a result, we are suggesting a wireless, simple-to-install fire alarm system that is based on the Internet of Things. The suggested system is an ad hoc network that is dispersed throughout the home. This system uses an infrared flame sensor and a microcontroller (ESP8266 node MCU), which continuously senses the environment to look for fire. The microcontrollers establish their own Wi-Fi network. When a sensor detects a fire, the sensor sends a signal to a microcontroller, which activates a local alarm, an SMS to the user, and a call to the user. Sending an SMS to the system allows the user to inquire about the status of his home. A prototype of the suggested system was created, and it successfully implemented the intended functionalities with an average latency of less than 30 seconds.

***Key words:** Node Mcu, Buzzer, LED,IOT Cloud.*

INTRODUCTION:

1.1 PREAMBLE

The two fire alarm boxes that came with the classic fire alarm system each had a telegraphic key. When someone saw a fire, they would turn the handle on the fire alarm box, which would then broadcast the fire alarm box number and the specifics of the incident to a central alarm station. The fire department reaction team would be informed of the box's position as soon as the station's telegrapher received the message.

Since we are in the twenty-first century, everything has been updated. These outdated techniques won't allow us to save everything. We are launching the IoT-based fire alarm security system for this reason. Our time and lives may be saved by this.

One of the most dangerous fire tragedies has a solution: the fire alarm system. ESP8266 Node MCU, Flame sensor, and Buzzer are only a few of the hardware components that must be integrated to create a Smart IoT-based Fire Alarm System. These devices must also be connected to a computer for data handling and transmission. Using the Twilio app, which will communicate the message to the system, makes it possible to accomplish more. As a result, the hardware and software components that make up the Fire Alarm System's fundamental building blocks are both present. This makes it easier for us to spot and put out fires immediately.

1.2 LITERATURE REVIEW

In [1], the research on fire using fire alarm systems is discussed. In [3], Fire Behaviour and Fire line Safety is discussed. In [5], Review on Forest Fire Detection using sensors is discussed. In [7], Forest Fire Smoke Video Detection Using Spatiotemporal and Dynamic Texture is discussed. In [10], Multilayer Neural Network Based Fall Alert System Using IOT is discussed. In this paper, we introduce Node MCU instead of Arduino. It will consume less power from the source.

1.3 INTERNET OF THINGS

The term "Internet of Things" (IoT) refers to a scenario in which objects (including people, animals, and machines) are given unique identifiers and the capability to automatically transmit data over a network without requiring human-to-computer interaction. ESP8266 Node MCU is an open source IoT platform that includes firmware that runs on the low cost Wi-Fi enabled ESP8266 Wi-Fi SoC from Espressif Systems and hardware that is based on the ESP-12 module. In this IoT Fire Alarm, we are using two GPIO pin to get the digital data from the flame sensor. ESP8266 Node MCU is a key component of the Internet of Things.

Fig :1.3 Node MCU

1.4 FIRE ALARM SYSTEM

Chemical factories, shopping centers, neighbourhood stores, educational institutions, parking lots, businesses, etc. are all used in our system.

2. DEVICES USED IN THE ENTIRE SYSTEM

The existence of a fire source or any other bright light sources can be found using a flame sensor. A flame sensor can be implemented in a number of different ways, however the module used in this project is an infrared radiation sensitive sensor.

A LM393 comparator chip is used by the module to produce a steady digital output signal. The driving capacity of this comparator is 15 mA. Fire alarms and other fire detecting systems or projects are just a few applications for this flame detector sensor.

FIG 2.1 FLAME SENSOR

2.1 FUNCTIONAL DIAGRAM

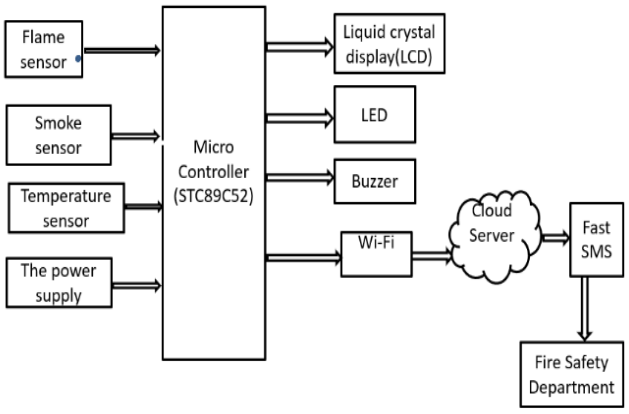


FIG:2.1 FUNCTIONAL DIAGRAM

2.2 OVERVIEW

Open source prototyping board designs are available for the Node MCU firmware, which is accessible for free download. Combining the words "node" and "MCU," the term "Node MCU" (micro-controller unit).Rather than the related development kits, the firmware is strictly speaking referred to as the "Node MCU" in this context. The prototyping board designs as well as the firmware are both free source. Using IoT Twilio, it also alerts the relevant authorities.

3. SOFTWARE DESCRIPTION

Programming in the C language is possible for this system. With the help of the SMTP (Simple Mail Transfer Protocol) infrastructure, you can automatically send and receive a lot of emails from distant locations. Due to its quick and dependable service, it is primarily utilised by developers and marketers to save time while sending emails securely. Its servers and data centres are dispersed across the globe, allowing it to choose the nearest server and hence offer the fastest connection for sending and receiving emails. It can be used in IOT applications to send emails automatically when a specific job occurs. When fire is detected by the flame sensor in this project, email warnings will be sent using SMTP2GO.

3.1 FIRE ALARM SECURITY SYSTEM

Flexible: There are currently fire alarms available that can also be monitored on mobile devices and can get messages from the alarm, including an alert event; which detector has triggered so you know the location of the potential fire.

Accessible: Through the system or a mobile device, it can be used from anywhere.

4. PROPOSED METHODOLOGY

Fire safety is one of the crucial factors to ensure the safety of your premises, be it home or office. It is essential to have a good quality fire alarm system in place to protect the premises and warn people when a fire breaks out. In case you own a commercial property, it is your fundamental duty to install a conventional fire alarm control panel to ensure 100% safety of the employees and resources. The main goal of establishing a fire alarm system is to be alerted when smoke or fire is discovered in a building, allowing people adequate time to escape. You can choose a fire alarm based on your location's needs from a variety of models that offer a range of features. There is nothing more important than protecting the lives of individuals visiting your home or place of business, thus installing a fire alarm in your premises should be at the top of your priority security checklists.

4.1. SCHEMATIC OF THE SYSTEM

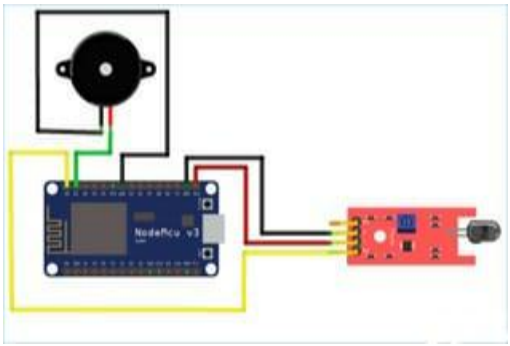


Fig :4.1 Schematic Diagram

4.2. CIRCUIT CONNECTION

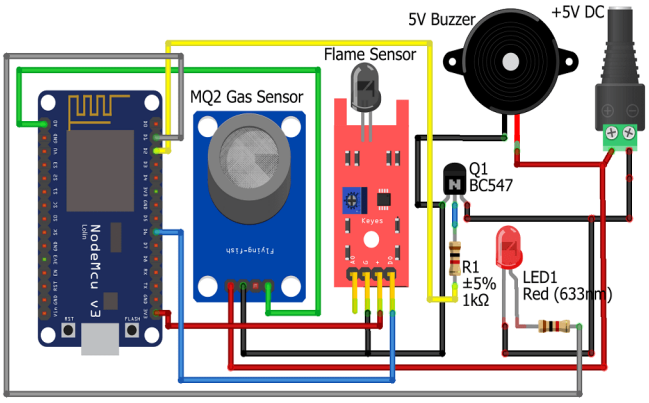


Fig:4.2 Circuit Diagram

4.3.EXPERIMENTAL SETUP/HARDWARE

The hardware prototype that has been created to implement the suggested methodology is shown in the image below. The tests were carried out using the experimental set-up listed below.

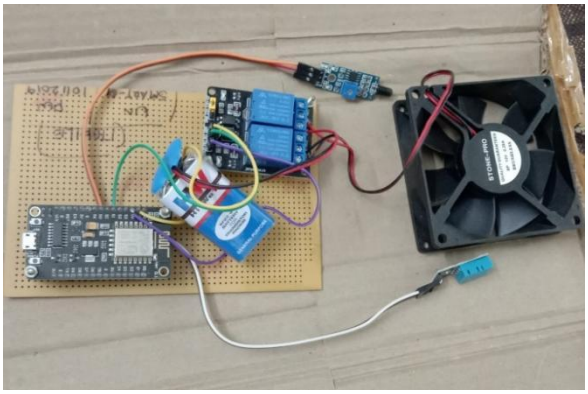
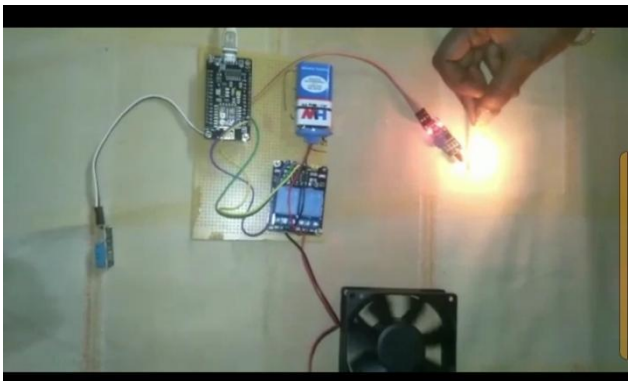


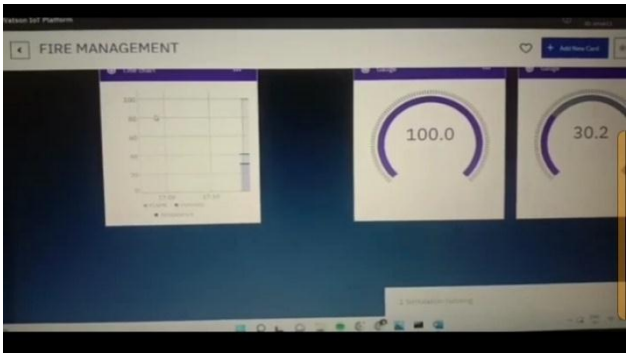
FIG: 4.3 HARDWARE DIAGRAM

4.4. WORKING

All of the fire alarm modules in a building are managed by a fire alarm system, which is an active fire prevention system. It is made up of power supplies, wirings, fire control units (sprinkler systems or fire extinguisher systems), alarm initiating devices (smoke detectors and heat sensors), alarm notification appliances (sirens or devices that make loud noises), and alarm initiating devices (smoke detectors and heat sensors). Smoke detectors, heat detectors, or a manual activation method can all activate the fire alarm system. These sensors are programmed to recognise specific heat or smoke levels that might be a fire sign. To warn people within the structure, a resounding bell or siren, sometimes accompanied by blinking or flashing lights for those with hearing difficulties, blasts. Let's look more closely at the fire alarm system's components so that you can comprehend how it operates on a deeper level. A smoke detector to detect smoke or fire is always present in a fire alarm system. The system's procedure The Node MCU board establishes an internet connection with the Twilio cloud as soon as the system is turned on. The Twilio app interface will then let us turn this system ON and OFF. As soon as the red LED and buzzer are turned on in the event of a fire when the system is turned on, the smartphone receives a push notice. Then, the system returns to its original state. After that, the green LED bulb is turned on.

5. RESULTS





6. CONCLUSION AND SCOPE FUTURE

The non-contact fire alarm security system built on the Internet of Things was thus successfully created and validated. Using GSM (Global System Mobile) for long distance can expand the suggested strategy. Since they have a very high efficiency and can be used for security purposes, electronic circuits can therefore be designed for fire-based alarms. The best way to achieve early fire detection is to install and maintain fire detection equipment in all rooms. Since they have a very high efficiency and can be used for security purposes, electronic circuits can therefore be designed for fire-based alarms. Installing and maintaining fire detection systems in all rooms and other sections of the home or business is the best way to accomplish early fire detection. The above experiment's findings demonstrate that different types of fire detectors have varying sensitivity to fire. Both types of equipment are active fire protection systems, according to the trial. Two distinct types of heat detectors were utilised to compare them for the heat detector. The outcome demonstrates that the Rate of Temperature Rise Detector is more sensitive to heat; it took 192.57 seconds to sense heat, compared to 183.70 seconds for the Heat Detector (60 °C) Set Point.

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