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ENHANCING FIRE SAFETY IOT-BASED FIRE DETECTION, MONITORING, AND ALERTING SYSTEM

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ABSTRACT: The "Internet of Things" refers to the process of connecting items and people over the internet. It has become the norm for businesses across a wide range of industries to implement new strategies. The Internet of Things (IoT) enables emergency management to respond quickly and effectively in real time by providing access to information and contact channels that allow them to make the most of their available resources. This study proposes utilizing an Internet of Things (IoT) system to assess how successfully fire risk reduction works. Fire is the leading cause of death in accidents worldwide. This suggested system consists of an inexpensive Wi-Fi module, temperature sensors, gas and flame sensors, a standard buzzer, and a warning buzzer. The sensors use the information they collect to determine who the person is and promptly contact emergency services in the area. Fire departments, police stations, hospitals, and other locations receive notifications via a module that is linked to all of them. This portion provides the user and operator with the exact address. Using the Internet of Things (IoT), a comprehensive smart system is established to swiftly and effectively handle and mitigate any dangers that could endanger persons or property.

Keywords: Ardino board, Fire detection, IoT based monitor, Wi-Fi module.

1. INTRODUCTION

This work focuses on an internet-of-things (IoT) fire monitoring and alarm system suitable for both residential and commercial applications. Flames are the leading cause of unintended deaths, claiming lives and destroying valuable property. The exponential and rapid expansion of fire distinguishes it; everything it comes into contact with is instantaneously destroyed. As a result, early detection of fires is critical for preserving property and saving lives. The technology detects flames, smoke, rising temperatures, and other changes. Following that, the information can be transmitted by GSM to a remote control device, which will activate the necessary security measures and notify the nearest house helper. The proposed technology demonstrates that it can detect smoke, fire, and a variety of other contaminants.

This technology will allow area hospitals, police stations, and fire departments to obtain specific coordinates for the risky scenario. With its systematic Internet of Things architecture, this fire and gas sensor system is primarily intended to assist the public safety and livelihood services industries. Figure 1 depicts the implementation of a fire detection system based on IoT-compliant design principles. A GPS module locates the device, a PT333B spark detection sensor detects sparks, and a MQ-6 gas detection sensor detects flammable gases such as LNG and LPG. Using a Wi-Fi microcontroller that connects the sensors to the Internet, they may convey warnings about potential hazards to the local service centers, where they can obtain a variety of assistance.

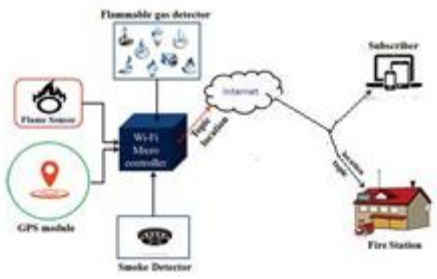

Fig.1. Block diagram

Internet of Things

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The Internet of Things (IoT) refers to the idea that many everyday products and equipment can connect to the internet. These instruments communicate with one another using a remote system. They are equipped with an abundance of sensors and other highly advanced components. They are also subject to thorough review and, on occasion, alterations may be applied. Machine learning, sensor networks, embedded systems, wireless sensor networks, control systems, and automation (including home and building automation) have all helped to accelerate the growth of the Internet of Things (IOT). The term "keen home" refers to home appliances and technologies that are adaptable with varied lifestyles and can be operated via compatible phones or remotes, such as speakers and mobile phones. These are the most well-known consumer IoT applications. In this project, we are using Internet of Things (IoT) technology to quickly assess and collect significant information on potential threats that can be actively avoided. The Internet of Things (IoT) simplifies certain tasks for customers. Furthermore, it allows us to adjust the layout as needed to improve its dependability and utility.

About this project

A fire is an extremely dangerous situation because of the considerable risk it provides to both people and property. Fires claim an estimated countless lives each year and destroy numerous structures. Potential damage can be considerably reduced by preventing fires from igniting and implementing preventative safety measures. Construction in wealthier countries includes safety elements. However, developing or emerging countries lack access to such services. Our proposed equipment will act as a preventative measure, signaling and eventually stopping any fatalities of this sort. This method results in significant cost savings, making it both reasonable and economical to apply. This technique intends to improve security in public spaces, institutions, housing, and businesses. The key constraint in maximizing the benefits of the system was to ensure its cost-effectiveness. Because of its low cost, the gadget can be used to protect both people and property.

Billing if the overall system

Table 1 Overall budget

Component	Quantity	Cost(In Rs)
LM35	1	80
Infrarred Sensor PT333b	1	55
MQ6	1	150
Adapter	1	200
Buzzer	1	60
Aurdino	1	350
16*2 LCD Display	1	230

2. EXPERIMENTAL SETUP AND WORKING

There are two sensors in this configuration. They're designated LM35 and MQ6, and they're integrated within the Arduino board. Looking at the LM35 is kind of cool. The LM35 monitor is used to obtain precise readings when the room temperature is close to room temperature. The MQ6 smoke monitor is capable of detecting smoke. The tool is a gas sensor, but it can also do additional functions. You can use this tool to locate LPG, isobutane, propane, hydrogen, and smoky methane. There are two things to mention about this sensor: it works well and responds promptly. The gas's power affects the sensor's return. The focused handling unit is a small controller that performs additional tasks based on the data collected by these sensors. Every frame has a bell that is tightly soldered to it. A Wi-Fi dongle connects the entire system, allowing sensor data to be sent and used on many computers. Each structure is assigned a number value that helps it stand out. In addition to their ID, clients must provide crucial information about the site where the framework is being installed, as well as their contact information and login credentials.

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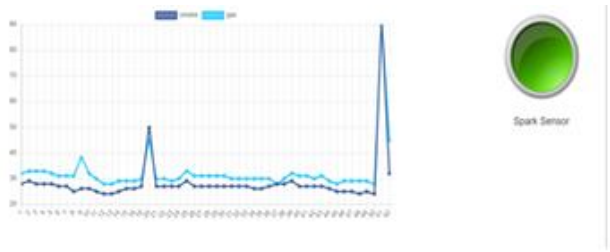

Fig.2. Readings of Setup

In an emergency, people use more sophisticated ways of communication. In order to verify authenticity, we have created a webpage focused on current health concerns. Local fire department personnel will be able to examine the structures and their motion from this location. This proverb serves as a cautionary tale.

The framework's devices will collect data via the Wi-Fi module and send it continuously throughout the region. The public expects credible authority to be up to date on recent developments in all fields. If the sensor value changes considerably, a notification will be sent to both the system's designated phone number and the local fire department. If the required degree of respect is exceeded, an alarm will sound. If the temperature or gas concentration exceeds the set thresholds, the sensors will activate. An adjacent squad of firefighters will immediately issue a caution and send out an alert to the region. Given the facts provided, the local fire department must dispatch aid immediately. The fire station nearest to the accident scene will receive an instant notice from the principal firefighting organization operating in the area. In the event of a difficulty, an immediate alarm is sent to the nearest medical facility, allowing for prompt assistance.

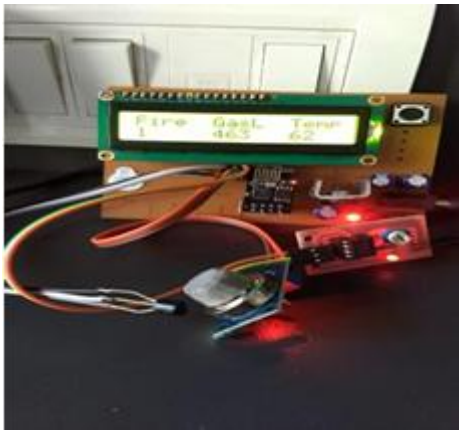

Fig.3. Experimental setup

3. HARDWARE ASPECTS

Gas sensor (MQ6)

The equipment detects flammable gasses using a MQ-06 sensor. Upon deflation of the balloon, the sensor detects all gasses that emit carbon dioxide into the atmosphere. The threshold levels in these sensors are predefined. When this limit is exceeded, an alert is sent. Gas heater coils are made of Ni-Cr alloy. Pt and Au are used as electrodes.

Fig.4. Image of Gas sensor

Spark Sensor

The device detects a spark in an electrical or burning system and activates a light. The sensory component is known as Pt333B. The module is referred to as LM358.

Fig.5. Spark sensor

Arduino Uno Board

The Arduino Uno is a microcontroller board that connects to a variety of devices and includes a Wi-Fi module. It is then linked to the page, allowing the process to proceed.

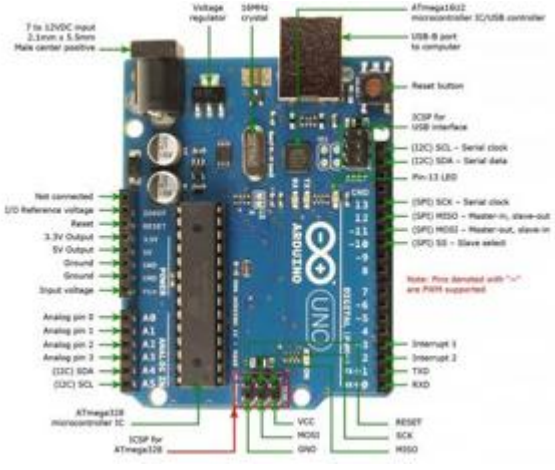

Fig.6. Micro controller board

Temperature sensor (LM-35)

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The LM35 temperature sensor detects and reports any temperature changes in the room.

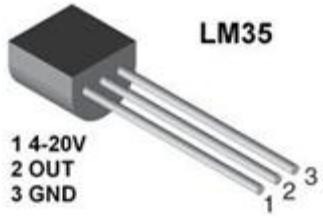

Fig.7. Image of temperature sensor

Wi-Fi module (ESP8266)

Fig.8. Wi-Fi module ESP8266

The Wi-Fi module connects you to a wireless network and sends data to the system and web app. Following that, it collects all data from the sensors and notifies the web app of any changes. The ESP8266 is a microprocessor that includes a full TCP/IP stack and microcontroller functions, so you won't need to do anything else to utilize it. This little module allows microcontrollers to easily connect to Wi-Fi networks and establish TCP/IP connections using simple Hayes-style commands. It is a single piece of hardware, the ESP8285, that can connect to Wi-Fi. The device is essentially an ESP8266 microcontroller with 1 MiB of flash memory built-in.

4. SOFTWARE ASPECTS

Throughout this project, we used a variety of programming techniques to construct software for the Arduino board. The data is obtained from the system and transferred to both the client and the website using the Arduino board's Wi-Fi module. The data from the spark sensors was presented on the chart using PHP (Personal Home Page). To improve the visual appearance of the page and website, other programming languages such as HTML and CSS were used.

Software allows programmers to create apps for the Arduino board. It supports a number of platforms, including Windows, Linux, Mac OS X, and Portable IDE. The hardware and software instrument are simple and compliant, and they can be used as an open source foundation for electronic design. The Arduino IDE has various benefits, including the ability to quickly produce prototypes and aid for students who have no expertise of software development or circuits. It offers newbies a simple, adaptable, and basic technique of learning to code.

5. CONCLUSION

Fires pose a significant risk to public health and infrastructure. They can inflict property damage, either partial or complete, as well as injuries or fatalities. Because of the magnitude of this loss, this article advocates developing a fire department alert system based on the Internet of Things (IoT). As long as the fire signal is there, this type will promptly notify both the user and the nearest fire station. The purpose of this program is to assist persons who do not have a caretaker to remain at their home, employment, or other business. Its role is to notify them of any fires that occur while they are not present. People in this situation will benefit from our app since it will allow them to immediately obtain information about what is going on and expedite the process of contacting the nearest fire station. To ensure that aid arrives soon, the program has a feature that alerts the user, the nearest fire station, and home assistants. In addition, it is simple to use and effective. This method has attempted to protect homes and their contents from practically every feasible viewpoint.

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