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IOT EMPOWERED: AUTOMATIC FIRE ALARM SYSTEM FOR ENHANCED SAFETY

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ABSTRACT: A business catastrophe is an unplanned and spontaneous event in which one's home is ruined as a result of a material, person, object, or radiation. Fire can cause a wide range of tragedies. Fire and smoke detectors can detect flames or smoke early on, potentially saving lives. A temperature and pollution sensor-equipped Internet of Things alert system is now being considered. In addition to notifying a portable device via IoT of the presence of a fire for a set amount of time, it will also send relevant information. The basic data collected at the sensor end is converted into computerized signals using smoke, temperature, and an easy-to-advanced converter. The signals are then sent to an Arduino and a small-scale controller. The small-scale controller is programmed to activate the ringer when the predetermined odor and temperature thresholds are met. Data is sent concurrently from Arduino to the ESP8266 Wi-Fi module. The ESP8266 will then broadcast the required data to the IoT platform, allowing authorized users to monitor the incident and take appropriate measures. A gadget ID, a unique number allocated to a specific device, allows staff to acquire information about the location of the identified incident. This book has the potential to motivate many new professionals to further their studies in the constantly increasing field of IoT.

KEYWORDS: Internet of things, Smoke sensor, GSM networks, Arduino controller.

1.INTRODUCTION

A fire is a condition of combustion characterized by heat and flames. There is a significant chance that the fire will inflict extensive property damage and injury to the residents. According to Mechanical Security Survey Magazine, 25,000 people died in fires in India between 2001 and 2014. Unintentional fires in business structures can result in fatalities and structural damage. This study seeks to uncover employee characteristics that are linked to work-related and business-related concerns, such as those that contribute to fire occurrences in firms. The use of fire accident approaches to propel IoT breakthroughs across the entire corporate sector. The possibility of serious injuries and costly effects for the network and the condition needs continual safety plan development, suitable technique selection for managing industrial hazards, and timely execution of standard operating procedures when risks are detected.The fire at the Hong Kong shipyard was a significant incident that highlighted the tremendous potential of risks such as fire explosives to cause irreversible harm to human lives, property, and overall welfare, with long-term implications. Every business uses IoT-enabled alarm systems to avoid fires, which can also be used to manage forest fires. When a miserable casualty's afflictions from a fire disaster are transmitted to the laborers, their personal happiness suffers significantly. Second, badly burnt portions frequently result in terrible scarring; in cases where these scars are visible, the settlement amount is usually raised due to the considerable damage inflicted. Consume wounds can cause extreme pain or limit a person's movement, necessitating a prolonged rehabilitation procedure that includes physical activity. It is critical to understand an organization's current degree of fire risk in order to predict the severity of events and the impact they will have on official control efforts. If a fire decides to transition states in an attempt to extinguish itself due to a mechanical or human

failure, the repercussions will be felt close to human life and working circumstances. This inquiry aims to uncover possible causes of association fires. Using this methodology would allow for the differentiation of fire incidents that occur within businesses, easing the implementation of relevant control measures. Forest and fire danger levels are constantly growing, making it more difficult to contain. The current conditions for fire suppression and observation are extreme. They place a great importance on innovation and knowledge in order to avoid catastrophic fire catastrophes. Concerns have been expressed about the use of developing technology in firefighting and field observation, including remote sensor arrays and the Internet of Things. The integration of IoT and distant sensor networks efficiently suppresses flames to a large extent. Establishing a wellness framework through the identification of alarm indicators that correspond to the risk of forest fires, as well as providing fire fighters with an IoT-based solution, would help to maintain the wildlife sanctuary and the lives of forest animals. This is a crucial part of workplace fire insurance.

2. METHODOLOGY

IoT must be self-sufficient in search operations, intelligent decision-making (software program) based on real-time data or current conditions (object detection), and search operations in order to achieve the aim or goal. 3. Design for Internet of Things (IoT) systems: By combining digital and physical components, IoT systems collect data from tangible items and deliver essential operational insights. The components include physical devices, sensors, gateways, cloud servers, analytics, dashboards, secure connections, and data extraction.

3.MODULE DESCRIPTION

An IoT-based fire notification system consists of two main components: hardware and software.

Smoke Sensor

Figure 1 shows a list of gases that the MQ-2 smoke sensor can detect or quantify: alcohol, propane, LPG, hydrogen, carbon monoxide, and even methane.

Fig1. Smoke Sensor

The Digital Pin in the architecture of this sensor module allows it to work independently of a microcontroller, which is useful for detecting a single gas.

Lcd Screen

For temperature display, a 16 x 2 LCD panel is used. A five-by-seven pixel symbol will appear on the screen. A 16x2 display consists of two rows of display lines and sixteen columns of symbols. It has two registers: one for commands and one for data. It detects the temperature at which heat is released from the industry when a fire breaks out [6]. It is a popular and sought-after module due to its low cost, ease of programming, and ability to display a huge number of unique characters (see Figure 2). The Arduino board provides a solid foundation for creating interfaces that communicate with a variety of devices, such as LCDs and sensors.

Fig 2. Lcd Screen

Temperature Sensor

A DHT 11 sensor was used to detect flames in the vicinity. The documented abnormal temperature was the source of the heat wave. The DHT11 temperature sensor has four pins: data out (for transferring measured data), supply VCC (for power input), not connected (NC), and ground (GND) (to discharge excess current; see Figure 3). The allowable VCC terminal voltages range from 3.5 to 5.5V. It is recommended that 5V be used to attain the optimum efficacy. The temperature sensor and microcontroller communicate via a single connection.

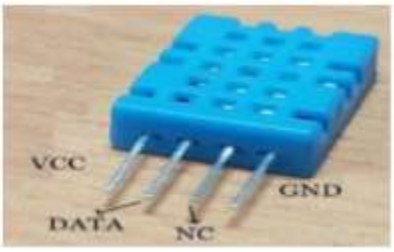

Fig 3. Temperature Sensor

Arduino Uno Board

The most popular choice for projects is an open-source, scriptable Arduino platform that makes programming easier. Because the microcontroller is actually programmable, the program is created and prewritten PC code is given to it using the computer's IDE (Integrated Development Environment).

Fig 4. Arduino Uno Board

The input of an Arduino Uno can be used to calculate environmental parameters (see Figure 4). The data displayed here is gathered by a number of sensors capable of controlling lighting, engines, actuators, and other environmental variables. The Arduino board's ATmega328 microprocessor can be customized using the Arduino programming language and IDE. The USB (Universal Serial Bus) connection is shown in the figure above the segment designated by 1. It is recommended to use a constant force of 7 to 12V. It is not recommended to use a force supply more than 20 V since it may damage the Arduino board due to voltage controller overheating. The three-digit segment represents "ground," or GND. There are numerous GND fasteners on the board; use any of them to protect the circuit while avoiding the plentiful supply of ground. The segment labeled "Part 4" corresponds to the 5V supply pin, which provides 5 volts by default. The 12V input (component number 5) provides an intensity of 12 volts. Pins A0 through A5 make up the ANALOG underpin, as defined in Section 6. The Arduino's ADC translates the analog input signal from the basic input pins to a digital format. The Section 7 board has thirteen advanced pins numbered 0 through 13. Accepting increased yield and enabling automated input via pins.

GSM Module

A System Global for Mobile It is envisaged that the use of mobile modules will improve performance in the correspondence sector, which is fundamentally different from the broadband sector. The aforementioned GSM invention was used to send pre-programmed SMS messages to all functional personal mobile phones. The module has a unique proof number, and its working frequency range is inside the 9001800 MHz bands, which are commonly used for communication via an embedded interface that allows the Arduino to transfer data sequentially [8] (see figure 5).

Fig 5. Global System for Mobile Module

4.6 Programming with Arduino. Considering the availability of all microcontrollers, Arduino software is the most generally recognized. Furthermore, the software is easy to program. The program is updated in a timely and seamless manner. The port command allows for lower-level, faster manipulation of the microcontroller's I/O pins on an Arduino board. The creation of Arduino software for a fire alarm system that can detect fires in industrial environments and inform the appropriate person.

4. WORKING

The IoT-based fire alert system consists of two sensors: temperature and smoke. An ADC converter converts the fundamental signals collected at the sensor end into digital signals, which are then transmitted to the Arduino and small-scale controller. The bell is programmed to sound when the temperature and amount of smoke surpass a specified threshold set by the small-scale controller. When smoke is detected on the work floor, the vapors fan is triggered instantly to

extract it. Data is sent concurrently from Arduino to the ESP8266 Wi-Fi module. The ESP8266 chip is used to connect lower-scale controllers to WiFi networks. Following that, the ESP8266 will broadcast the essential information to the IoT site, allowing authorized users to take the appropriate procedures to extinguish the fire. The following information may be displayed on the LCD monitor to provide details about the IoT-based fire alarm system. 1. Degree of temperature in Celsius 2. Percentage of Value of Smoke 3. Identification of the device. 4. A label that shows the time and date.

The device ID is a unique identifier provided to each device, allowing people to collect information about the location where the fire was discovered. To work as an IoT-based fire alarm system, the Wi-Fi module must be connected to a router or Wi-Fi zone. By attaching the GSM module to the Arduino via UART, data transmission across wires is feasible using transmitting and receiving cables. The GSM module and Arduino communicate using the Serial AT command. When the Arduino detects gas, smoke, or fire, it sends AT commands to the GSM module. An SMS was sent to the registered mobile phone, which was setup by the system for emergency communications.

5. RESULT AND DISCUSSION

This article examines the use of an Internet of Things (IoT) architecture to eliminate the need for fire delivery operators and chief control in the case of a leak, as well as an analysis of the structure. This allows readers to keep a safe distance from such calamities. In the same way that it initiates communication with authorities, it delivers a warning. Additionally, it may be beneficial to keep the sensor from being disguised, as this may allow it to detect the location using hidden codes. Temperature and gas detection generates an IoT-based warning. It is linked to the internet via the web of things if specific sensor readings are detected, and it is routinely monitored by an IoT server.

6. CONCLUSION

The major goal of this project is to build and install a fire alarm system that uses the Internet of Things (IoT) to detect fires and quickly notify authorized personnel in the affected area. Fires in businesses and other dangerous situations are efficiently avoided by examining several writers' literary reviews using this method. The fire illuminates a wide range of environments, including homes, businesses, and offices. Because Internet of Things-based fire alarm systems may detect and prevent fires, treatment should never be preferred over prevention.

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