IOT based Fire Detection System

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ABSTRACT

Wireless sensor networks are being developed for high-rise buildings. In order to suppress fires as soon as possible, many detectors that regularly measure smoke or temperature concentration are installed in buildings. Observation center ride.-Organize hierarchical wireless sensor networks. The test results of the prototype system show that the automatic fire alarm system meets the design requirements. The project mainly includes the development and implementation of monitoring and fire extinguishing systems based on wireless sensor networks. The fire monitoring system continuously monitors the environment and records the registered temperature and intruders detected by the monitoring nodes. Once the fire extinguishing system detects a fire or the temperature exceeds the allowable value, it will activate the fire extinguisher. A certain threshold achieved by the extinction node. The results show that the overall performance of the method is very good.

Keywords: -IoT, NodeMCU, smoke sensor, thingspeak, buzzer, fire detection.

INTRODUCTION

A wireless sensor network (WSN) is a self-configuring wireless network with minimal infrastructure that monitors physical or environmental conditions including temperature, sound, vibration, strain, motion, or contaminants and transmits data via the network's first place. Or a receiver that can observe and analyze data. The receiver or base station serves as the interface between the user and the network. By entering a query and collecting the results from the recipient, you can get the information you need from the Internet. A wireless sensor network usually has thousands of sensor nodes. Sensor nodes can communicate with each other via radio signals. Wireless sensor nodes are equipped with sensitive equipment and computing equipment, radio transmitters and power supply components. Each node in a wireless sensor network (WSN) is resource constrained in some way: processing speed, storage space, and communication bandwidth are all restricted. After installation, the sensor nodes are in charge of self-organizing the necessary network infrastructure and frequently communicate with them through multi-hop communication. Then, the built-in sensors begin to collect information of interest. Wireless sensor devices also respond to requests from "checkpoints" to follow specific instructions or provide samples for testing. The sensor node can operate in either a continuous or event-driven mode. To calculate your location, you can use the Global Positioning System (GPS) and local positioning algorithms. Actuators may be added to wireless sensor systems to make them "work" in specific situations. Wireless sensor and actuator networks are a more generalised term for these networks. New technologies can be supported by wireless sensor networks (WSNs). Protocol architecture necessitates unconventional paradigms due to a variety
of constraints. Due to the requirements for low device complexity and low power consumption (i.e., long network life), a reasonable balance needs to be struck between communication and signal/data processing capabilities. This has stimulated tremendous efforts in the field of research, standardization and wireless sensor networks. Technology and agreements. In the past ten years, there have been 4 industrial investments in this area. Currently, most of the research on WSN is focused on the development of computing and energy-saving algorithms and protocols, and the scope is limited to simple data-driven monitoring and reporting applications. Chen et al., 2011 proposed a CMT (Cable Mode Switching) algorithm to find the smallest value The number of active sensors needed to maintain the site's K coverage and network's K connectivity. Allocate downtime to cable sensors in particular without impacting network access and coverage criteria, which are solely dependent on local data. Aiming at the wireless sensor network, a data acquisition network structure based on time delay is proposed. The purpose of the proposed network structure is to minimize data latency. In (Matin et al., 2011), the author studied relay nodes to alleviate the geometric defects of the network, and used the particle swarm optimization (PSO) algorithm to determine the best position of the receiver relative to these nodes. Overcome the problems in life. (Paul et al., 2011; Fabric et al. In (Paul et al., 2011), the author proposes a geometric solution to determine the best location of the receiver and maximize the network lifetime. In most cases, research on wireless sensor networks believes that sensor nodes are homogeneous. Heterogeneous sensory network, in which the energy of sensory nodes are different from each other. In heterogeneous wireless sensor networks with different transmission radii, an author solved the problem of implementing relay nodes to ensure fault tolerance, that is, increasing network connectivity. The new heterogeneous network architecture and the latest development of this technology. Remove current restrictions and significantly expand the scope of potential uses of WSN. All of these are changing rapidly.

ARCHITECTURE
A large number of sensor nodes are used in wireless sensor networks. These sensor nodes are used for typical purposes, such as event monitoring, fault detection, humidity measurement and so on. To some extent, sensor nodes are also responsible for detection and processing. The sensor device consists of four main components: Detection unit: usually consists of the following components. ADC converts the analogue signal produced by the sensor based on the observed phenomenon into a digital signal, which is then fed to the processing unit.

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2. Processing unit: Manage the program executed by the sensor. One node communicates with other nodes to perform assigned discovery tasks.

3. Usually associated with small storage. Transceiver: Connect the node to the network.

4. Power supply: Since wireless sensor networks pay more attention to energy efficiency rather than quality of service (QoS), this is one of the most important components of detecting nodes. The power source can be compatible with energy recovery equipment (such as solar panels). Sensor nodes can only be equipped with limited power supplies.

5. There are other sectors depending on the application: location finder: usually required, because most of the technical tasks involved in routing and discovering sensor networks require
knowledge. High positioning accuracy may be necessary to move the sensor to complete the assigned task.

6. Mobilizer: Sometimes it may be necessary to move the sensor to

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**Sensors Used in the Project**

**Smoke Sensor**
The MQ2 gas sensor detects the concentration of gases in the air, such as liquefied petroleum gas, propane, methane, hydrogen, alcohol, flue gas, and carbon monoxide, using an electronic sensor. MQ2 gas sensor is also called chemoreceptor. When in contact with gas, a sensitive material changes its resistance. This variation in resistance value is used to detect gas. A metal oxide is MQ2. Gas sensor made of semiconductors. To measure the gas concentration in the gas, use the pressure divider network in the sensor. The sensor operates at a constant voltage of 5 V. It can detect gases in the concentration range of 200 to 10,000 ppm. The ESP8266 Wi-Fi module is an independent SOC with an integrated TCP/IP protocol stack, allowing any microcontroller to access your Wi-Fi network. An application can be hosted on the ESP8266, or all Wi-Fi network functions can be loaded from another application processor. AT command set firmware is pre-programmed into each ESP8266 module. The ESP8266 module is a highly lucrative board with a wide and rapidly rising user base.

**WORKING**
The fire detector detects smoke and/or heat. In the event of a fire, these devices will react to smoke or extremely high temperatures. After activation, the device will send a signal to the alarm system to perform a programmed response to the area.
Since fire alarms are generally more likely to detect smoke and/or heat than actual fires, these devices are generally not called "fire alarms." These devices can be referred to as "smoke detectors" and "heat detectors," respectively. Some of these devices are standalone devices that only detect smoke or high temperature, while others are multi-functional and detect the presence of smoke and high temperature. When it comes to detecting fires, multifunction devices are typically the most reliable. Single-function machines, on the other hand, are usually less expensive. In addition, multi-function devices may not be suitable for all fields. For example, there may be a room in it. In households that smoke regularly, this may include the kitchen or designated smoking rooms. For these areas, a thermal sensor with one function may be more suitable than a smoke and heat detector with dual functions.

After the smoke and/or heat detector is activated, a signal is sent to the alarm system to achieve a predefined response. Many users configure their systems to send emergency calls to the central monitoring station as soon as the device is activated. Ensure that the fire department arrives at the scene as soon as possible.
However, it is also common for the detector to receive the fire confirmation before sending the message. Notify the main railway station. This usually means that the sensor will be activated twice in a short period of time. By programming the sensor in this way, the user can avoid false alarms. In addition, many new "fire detection sensors" (such as Honeywell Six SMOKE) can use infrared vision to detect flickering flames associated with fires. There may be a real "fire alarm" that looks specifically at the actual fire, rather than the smoke and heat associated with it.

**OBJECTIVES**
1. Study the working principles of smoke and fire alarm systems.
2. Design a cheap fire alarm system based on microcontroller.
3. Design an automatic fire alarm system to protect users and the environment.
4. Create a simple fire alarm system. Use a fire alarm system.
5. Make people's lives easier.
6. Design a prototype fire alarm system with smoke detector as input and buzzer and text message as output. Arduino Uno card, embedded system: NodeMCU, smoke sensor (MQ2), cable connection, red and green LED, power supply unit, buzzer, LCD

**Circuit Diagram:** The circuit diagram will be made using Tinker cad online circuit making tool.

![Circuit Diagram](image)

**Components Used**
- Arduino Uno Board
- Embedded system: NodeMCU
- Smoke Sensor (MQ2)
- Connecting Wires
- Red and green LEDs
- Power Supply
- Buzzer
- LCD Display

**Circuit Diagram Description**
Two boards are used, the first is Arduino uno, and the second is NodeMcu. On the Arduino Uno, the piezoelectric buzzer is connected to digital pin D10 and ground. The smoke detector is connected to analog pin A0. The red and green LEDs are connected to digital pins D7 and D6 on the Arduino card. The result is displayed on the LCD. Connect the other end of the smoke sensor to GND. Connect two resistors Sen Flema (level Vivi)
Project Flow

**Fig. 5: Project Flow of Fire Detector System**

- When smoke detector detects smoke in the room it sends current smoke value to the NodeMCU.
- If Smoke value is more than the normal then its starts the buzzer.
- NodeMCU sends the collected data to the ThingSpeak server.
- ThingSpeak sends emergency message to the user’s mobile phone and alerts him.

### APPLICATIONS

Some Domains where WSN is used.
- Wearables
- Smart Home Applications
- Health Care
- Smart Cities
- Agriculture

### INDUSTRIAL AUTOMATION

**Project domain: Smart city**

A smart city is a system that is primarily made up of information that communication technology (ICT) and is used to create, introduce, and encourage sustainable development practices in order to address the growing challenges of urbanisation. Wireless and cloud: IoT cloud applications receive, analyze and manage data in real time to help communities, businesses and citizens make more informed decisions, thereby improving the quality of life. Citizens can communicate with the smart city ecosystem in a number of ways using smartphones and mobile devices, as well as connected vehicles and homes. Coupling equipment and data with the city’s physical infrastructure and services can reduce costs and increase resilience. Communities can boost energy distribution, simplify garbage collection, and alleviate traffic congestion. The Internet of Things will also help to boost air quality. Users may use home automation services based on the Internet of Things with home automation (IoT). Household appliances are monitored via the Internet in today’s homes, which are automated. Receive custom commands on the Internet via Wi-Fi modem. The microcontroller has an interface with this modem. The system status, as well as system information, is displayed on the LCD screen. This is an unusual home automation system that uses the Internet of Things to control all of the devices in the house. As the prices of IoT devices fall and ordinary people realize the benefits of these products, the smart home market is gaining momentum. Starting from the smart home, the next logical step is intelligence. Smart homes are a small part of our everyday lives, and the Internet of Things will change in the coming years.
CONCLUSION
The model continuously monitors fire alarms and sends alarms to users. The reception and system we propose can achieve its main goal, mainly to build an IoT-based fire alarm system. Call them when you find the fire. The answer is sent to the user via SMS. Using this product can help these people quickly learn about the incident and the nearest fire department. You will receive a valid notification. It is cheap and easy to install.

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