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Research on the development and testing of remote automatic fire alarms based on the internet of things

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Abstract: *With the gradual maturity of 5G technology in recent years, the application of the Internet of Things has begun to enter our lives more deeply, but there will always be fires in our lives, and the automatic fire alarm is to control the fire in time to avoid greater Loss. The core technology of the automatic fire alarm system is the fire signal sensing technology [1]. The comprehensive processing of multiple sensors enables the alarm to issue alarms more accurately. Within the coverage of the 5G network, once the alarm is triggered, the alarm will be sent to the mobile phone and the 119 center through the 5G network and the fire level can be dealt with in time.*

Keywords: *Internet of Things; 5G; automatic fire alarm; sensor; remote fire protection*

1. Introduction

In the intelligent age of the Internet of Things, intelligence not only makes our lives more convenient, but also our work becomes easier. The development of intelligence has become mature, and the advantages of the Internet of Things have become more prominent. We face some problems in our lives and employment can be solved in an intelligent way. Fire is one of the common problems. Fire problems are more troublesome, because in modern life, there are many reasons for fires, such as aging power transmission equipment, short circuit of household appliances, excessive use of electrical appliances, unintentional cigarette butts in the garden, etc., are all causes of fires. These fires happen unintentionally, and in order to prevent the fire from becoming more serious, we need an alarm to tell us in time to avoid unnecessary losses.

2. System hardware configuration

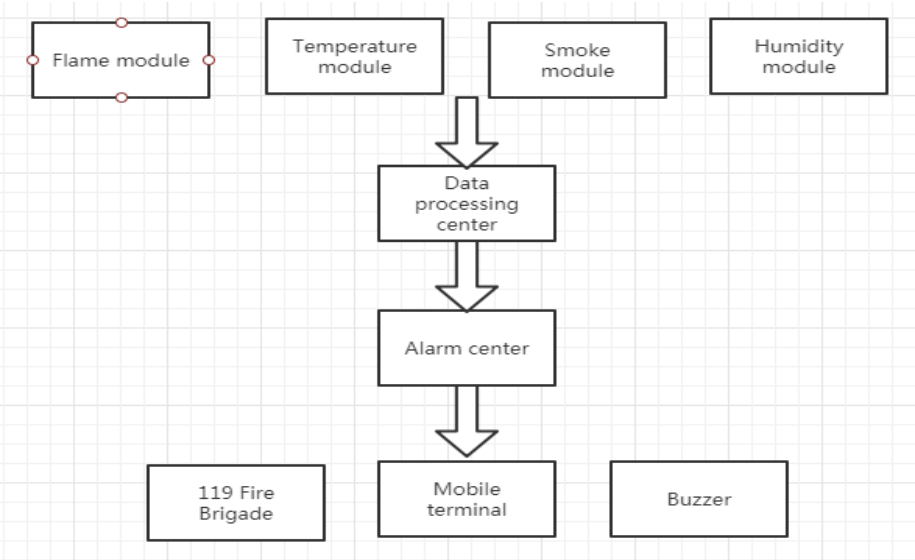

Figure 1 System structure

1) This system is mainly controlled by the arduino development board as the central control device. Compared with other development boards, the arduino development board is cheaper and has more

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advantages. The arduion single-chip microcomputer is easy to operate, and you don't need to understand the hardware knowledge. As long as you know some simple C language, you can use arduion to write programs. arduion is open source, software and hardware are completely open, and there are no technical reservations, which can speed up the efficiency of creation and make our learning or creation cost low.

2) The whole system has four modules for sensing and collecting data, including flame module, temperature module, smoke module and humidity module. The flame module converts the received current signal into a voltage signal and transmits it to the data center; the temperature module uses a digital sensor to transmit the data to the data center; the smoke module transmits the voltage signal to the data center according to the received gas or resistance changes; humidity The module sends the signal converted by the capacitance to the data center by the humidity sensor. In the last system, each sensor transmits the data to the integrated data center. According to the data feedback, the fire occurrence is obtained, and then the alarm center issues an alarm.

3) The temperature sensor module is a connected multi-channel digital temperature sensor for functions such as temperature collection and mobile phone data upload. Through this module, a digital temperature sensor with high measurement accuracy and good stability can be connected to the PC and the man-machine interface, which is convenient for users to realize a multi-node networked measurement system at low cost. The temperature in the environment is transmitted to the data center. If the temperature in the environment reaches 300 degrees Celsius, the data center combines other sensor data to determine whether a fire has occurred.

4) Humidity sensor, made according to the principle of physical machinery, mainly composed of humidity sensitive components. The capacitive humidity resistance is generally made of polymer film capacitors. When the moderation in the environment changes, the dielectric constant of the humidity-sensitive capacitor changes, and the capacitance also changes, and the capacitance is proportional to the moderation. When the humidity changes abnormally and is lower than a certain value, a signal is transmitted to the integrated data center, waiting for comprehensive analysis.

5) Flame module, the output signal of the infrared flame sensing circuit is sequentially transmitted to the amplifying circuit and the A/D data conversion circuit, and the output signal of the A/D data conversion circuit is transmitted to the single-chip control circuit. The output signal is sent to the optocoupler linkage circuit, and it is practical to detect the flame based on the infrared diode, which can detect the light source with the wavelength in the range of 760 to 1100 nm, and generate the corresponding current signal. Then there is an algorithm amplifier and conversion circuit to convert the current into a voltage signal, and finally input to the single-chip system for processing, send out the control signal, drive the relay to pull in, linkage control related equipment, realize module intelligent control, cost saving, simple linkage control, etc. advantage. Flame detection technology [2], when a fire occurs at a close distance, the flame sensor senses the occurrence of the fire and directly triggers the alarm.

6) MQ2 smoke sensor module, the working principle is to judge whether there is combustible gas or smoke particles according to the resistance value of special gas or particle sensitive resistance. There are two output modes. A0 port outputs the current special gas content reference value. Basically, the indication below 100 is normal. D0 is to output a high-level or low-level signal according to a preset reference value range. It is used as an early warning device for judging the leakage of liquefied gas, and it can also be used as an auxiliary gas for judging the fire. The volume detection technology [2] can accurately detect the smoke concentration of the gas in the environment. When the carbon dioxide concentration in the gas reaches 2500ppm, a signal is transmitted to the data comprehensive reaction center for comprehensive analysis and processing by the data center.

7) In order to prevent the sensor from being falsely reported by other factors, it is necessary for the staff to wipe or clean the alarm at regular intervals.

In the entire system, various sensors convert data into signals and send them to the data comprehensive center for comprehensive analysis to achieve accuracy. When a fire is judged, the development board can connect the signal output terminal to the coverage of the 5G network. Mobile or computer. The system can also be remotely controlled by a mobile phone or a computer, which is based on the power of 5G technology.

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3. System software composition

The system software is a program written by appinventor, and the database constitutes a fire detection and alarm system for the core of the operation. APPinventor is a free online app development platform created by the Google R&D team. Under the interface of visual programming, we create applications by splicing modules and run them on mobile phones. This platform can not only be used for teaching, but also can be used to develop more interesting applications and strengthen our computational thinking. It has five advantages. The first environment is simple to set up, directly on the browser and cloud services, and does not need to be installed. Second, the development process is simple. Because the visualization is designed and developed on the interface of the mobile APP, no complicated grammatical rules are required. Third, the building modules are rich, and different types of building modules that have been preset are directly programmed. Fourth, it is convenient for cross-development of multiple machines, and all development codes are stored on the cloud server, which is convenient for developers to develop on any computer, and ensures the consistency and security of the source code. Fifth, the works are easy to share, and the developed apps can be packaged into apk, and Android phones can be downloaded and installed. Therefore, APPinventor is a very practical and reliable development platform.

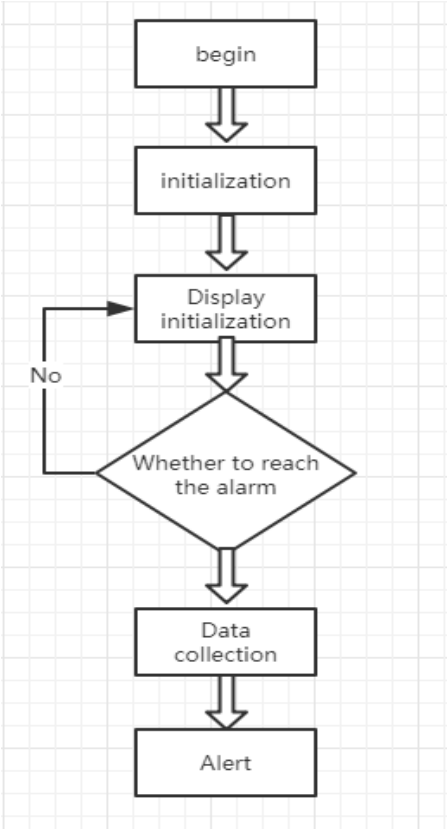

Figure 2 System structure software diagram

When the software system is running, it is first initialized every specified time, and then the signal received by each sensor is changed to the signal recognized in the system. The data center will analyze the received signal to make a judgment. When the value of the fire is reached, the alarm will immediately sound an alarm, and under the coverage of the 5G network, the alarm will be sent to the mobile phone or computer. The function of the alarm is to issue an alarm in time to avoid greater losses, and the software system plays an important role in the machine.

4. The final effect of the system

According to the test at different distances, a total of 30 tests are divided into three groups. When the test value is between 1.6 and 1.8, the accuracy of the alarm system is 90%, and the alarm can basically be accurately issued. The distance that most affects the accuracy of the data is the distance. When the distance is larger, the sensor's induction intensity is smaller, the transmitted signal is weaker,

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and the error is larger. Therefore, the farther data deviates from the accurate value. The system is mainly used in gardens, and can also be used in homes, office buildings, banks and other places. The system can protect our lives and property to a certain extent to reduce losses.

Fig.3

5. Conclusion

This fire alarm system is mainly used in gardens for fire prevention in gardens. According to the garden environment, multiple sensors are selected for comprehensive judgment. There are sensors such as flame, temperature, smoke, and WLAN modules, which are very suitable for the garden environment. In the software, the logic of the sequence structure judges the signal of the sensor to send out the signal of the fire. However, the distance range will be reduced compared to the accuracy rate. The greater the distance, the lower the accuracy rate. The purpose of the alarm is to respond in time, so a more accurate distance sensor is needed. According to practice, we will upgrade and strengthen it accordingly, and make it more accurate. More practical.

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