Remote Monitoring and Alarming System in Construction Site Based on the Embedded System

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Abstract: With the development of information technology in engineering construction, the remote monitoring system on the construction site is gradually moving from digital to real-time. Based on the wired transmission system, combined the ARM development board with the USB camera, temperature and humidity sensor and human infrared sensors. It can obtain the information of the monitoring area in real time. By analyzing the data, triggered the alarm when the preset conditions are not met the threshold. At the same time, the Zigbee wireless module was used for data transmission and the monitoring status was displayed on the client. The user can receive the monitoring status of different locations according to the different network addresses.

1. Introduction

The construction site belongs to an area with complex environment and personnel, and it is difficult to manage the site through personnel patrol. Considering the safety of equipment and personnel, an effective remote monitoring system can allow managers to understand the safety of production on the construction site. Various remote monitoring and alarming system are increasingly favored by people for their convenience, intuitiveness, and monitoring variety. Especially in recent years, the rapid development of network communication technology, the embedded remote monitoring and early warning system came into being, and has been widely used in various industries. This article uses the embedded development platform to design a remote monitoring system for the construction site, and transmits real-time monitoring data through wired and wireless methods for different users to choose freely [1, 2].

2. Monitoring and Alarming System

2.1 Hardware structure of the system

The monitoring and alarming system is an embedded system based on the S3C6410 development board. With the human infrared sensor, sound sensor, light sensor and the temperature and humidity sensor, the system collected the data and judge it is necessary to alarm and send the data through the Zigbee wireless module [3, 4]. The hardware platform of the system is shown in Figure 1.

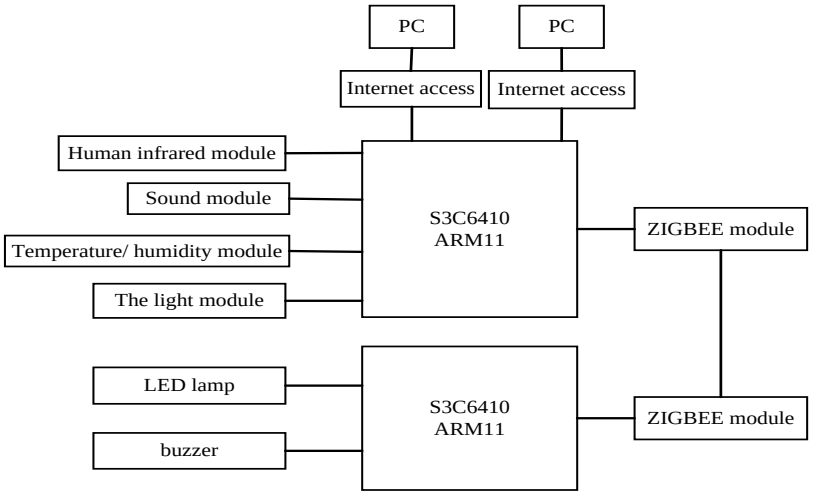


Figure 1. System hardware structure

2.2 The software system

To realize the function of remote monitoring and alarm, with the hardware system, the software system is necessary. The software platform is based on the Linux system. The Linux system is a cross-platform, not only on the PC platform, but also on the embedded board. Due to the advantages of open source [5,6], it widely used in all kinds of hardware equipment. Therefore, the embedded Linux system has been miniaturized after being tailored. It used in a memory chip or a single-chip microcomputer, and can be applied to a special operating system for a certain embedded device. So, the embedded Linux has now become an ideal choice for embedded systems [7].

3. Design the monitoring system

3.1 wired monitoring system

In this system, the development of the video monitoring system based on the S3C6410 development board is divided into three parts [8]. First, the network monitoring system based on wire; second, the network monitoring system based on wireless; third, based on the development of wired and wireless systems Joint debugging. As each system has its own characteristics, users can make different choices [9].

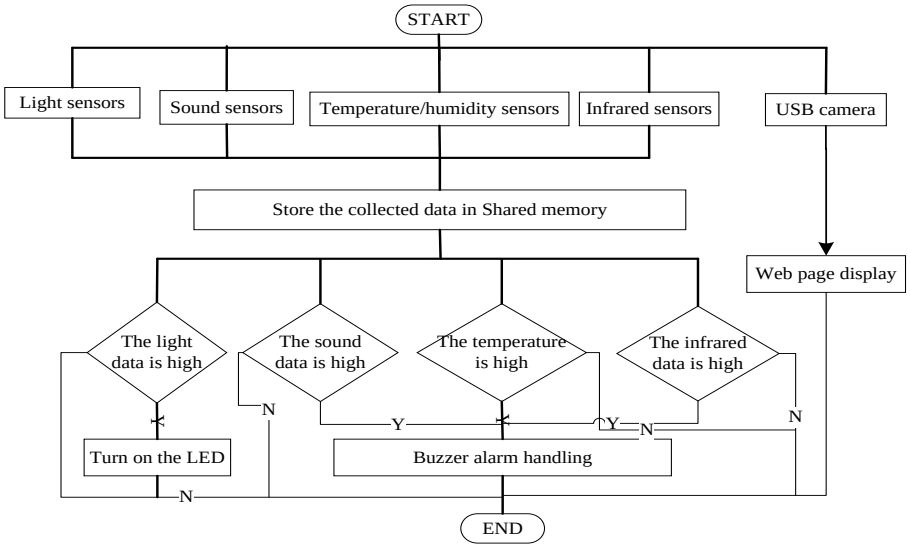


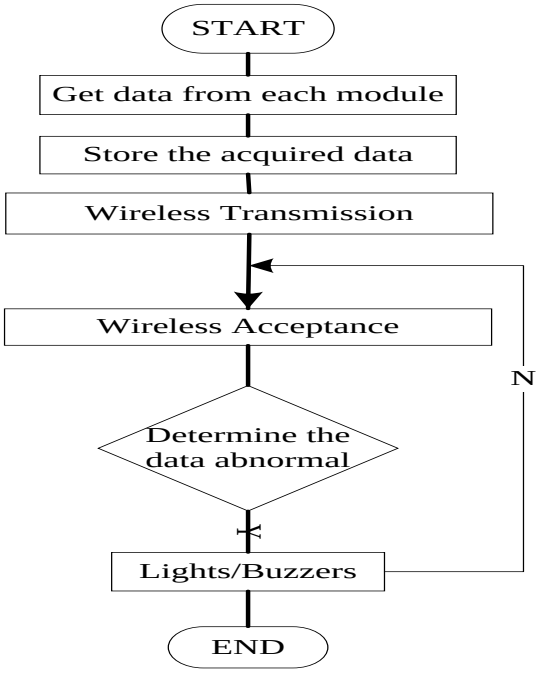
Figure 2. Wire-based monitoring system

Figure 2 shows the process of the wire-based monitoring system. After the system obtains the data from the monitoring site, it is sent to the configuration file. The system obtains the information from the configuration file and judges each data. When the data is not within the normal range, the

alarm processing is performed. At the same time, the client displays on the web page can refresh the content and watch the monitoring scene.

3.2 Wireless monitoring system

When the construction site in complex environment area, it is difficult to manage through personnel patrol [10]. Considering the safety of personnel, an effective wireless monitoring system can allow to construct on the site [11, 12]. The wireless monitoring system is mainly based on the wired monitoring system. The data obtained by the USB camera, human body infrared sensor, temperature/humidity sensor, light sensor, sound sensor and other modules are transmitted through the Zigbee wireless module. The whole process of the wireless system is in Figuer 3.



Figuer 3. Wireless monitoring system

In Figuer 3, the obtained data from the monitoring site was send to the configuration file. The system always obtains information from the configuration file and uses the Zigbee wireless module for data transfer. At the other end, the Zigbee wireless module is used for data reception. At the receiving port, each data is judged. When the data is not within the normal range, the alarm opened. At the same time, the client displays the content on the monitoring site.

4. Test results

4.1 Test environment

In the laboratory environment, the S3C6410 development board is used to build the necessary sensors. The client uses a common PC. The two are directly connected by a network cable to form a local area network and the program is commissioned through the super terminal. The user can open the login interface.

4.2 Test results

As for whether the human infrared sensor can run normally in this system, first, the detection status of the human infrared on the webpage before the test is nobody. When the human infrared sensor is triggered, the state of the webpage interface is showed in Figure 4.

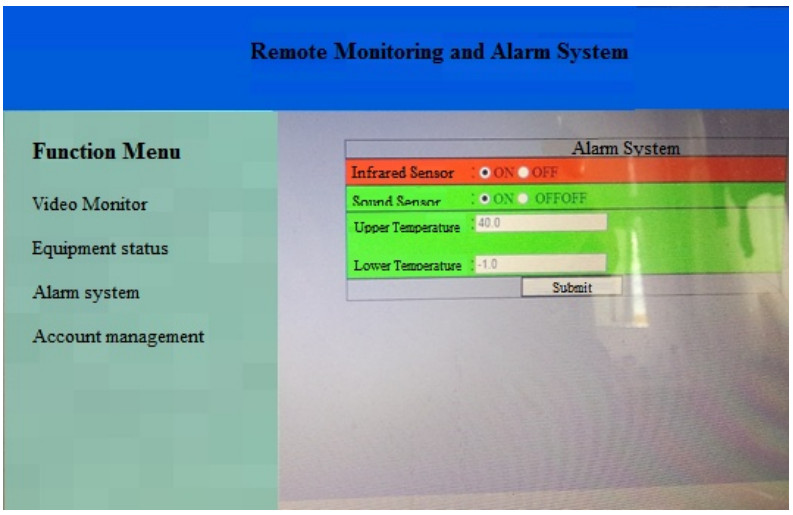


Figure 4. Test result of the system

Since the content of the sensors in the system are relatively similar, the human body infrared sensor test is used as an example for description here.

Comprehensive test results show that the wired monitoring system and the wireless monitoring system are normal and all the aspects of the system are operating well. The entire system is running well and the data from each sensor can only be received when the web page is normal. The entire system has achieved the expected design goals.

Conclusion

Based on the wired and wireless monitoring system, the system using the ARM11 embedded platform with the human body infrared sensors, sound sensors, light sensors, temperature and humidity sensors. The data and the pictures captured are sent through the wired or Zigbee wireless module, and it is determined whether an alarm is required. And the client under the Windows system can access to the development board to meet the needs for more users.

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