

LETTER TO THE EDITOR**Application of Internet of Things Technology in Multi-point Ecological Environment Monitoring System**

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Aiming at the low monitoring efficiency of traditional multi-point ecological environment monitoring system, a multi-point ecological environment monitoring system based on Internet of Things technology is proposed and designed. Combined with the Internet of Things technology, a multi-point ecological environment monitoring system is designed, which is divided into data acquisition module, data transmission module and data processing module. The data processing module is the control center of the whole monitoring system, and the hardware design of the data processing module is carried out. The experimental results show that the proposed system has high monitoring efficiency and provides a reference for ecological environment monitoring.

Multi-point ecological environment; Internet of Things Technology; Data processing

1 INTRODUCTION

Influenced by economy, technology and manpower, the work of ecological environment monitoring in China is not perfect, and the results and efficiency of ecological environment monitoring in China are unsatisfactory due to factors such as time, weather and distance (Shen et al. 2017, Weiss et al. 2018). With the development of science and technology, Internet of Things (IOT) technology is gradually rising. After in-depth research and analysis, IOT technology is formally introduced into ecological environment monitoring in China, and issued to strengthen the development and application of IOT technology (Li et al. 2018).

Novikova et al. (2019) published an article entitled "Personality Ecological Culture: Universals of Ethical Principles of Human-Environment Interaction" in Ekoloji (Issue 107, 2009). The main content is devoted to the development and testing of the universal ethical principles of the innovative mode of individual ecological culture, which upgrades the development of the equal coexistence of man and nature and the sustainable interaction of ecology to the level of law. With the help of environmental monitoring, as a main research method, the validity of the ethical principle universality of the coexistence mode of human and nature equality has been tested and proved by experiments. This paper reveals the preconditions for the transformation of individual eco-culture, establishes the content of ethical principles for rethinking individual eco-culture; on the basis of the research results, the value, cognition, procedure, structure and content of directional components of the innovation model for individual eco-culture are proved, and the practical significance of the universality of the model ethical principles is also proved. On the basis of this model, this paper proposes and designs a multi-point ecological environment monitoring system based on Internet of Things technology (Mollenhauer et al. 2017).

2 IDEA DESCRIPTION

2.1 Internet of Things technology

Internet of Things (IOT) is a technological structure based on the development of Internet technology. It uses radio frequency identification, infrared induction, protocol and other measures to connect data, so as to realize physical connection. Moreover, with the help of information sensing system, the Internet of Things integrates production, life and network, guarantees the quality and efficiency of work, provides convenient services for life, and realizes the comprehensive integration of resources by means of intelligent and networked systems. It should be noted that in the Internet of Things, the induction layer, the network layer and the application layer are the key points, which can play their own practical role (Barry et al. 2017). Internet of Things technology includes sensor technology, wireless communication technology, embedded system technology and intelligent technology. Sensor technology uses professional sensors to monitor the environment, such as monitoring the atmosphere, water quality, soil, pollution, floating particles and so on. Wireless communication technology is usually used outdoors, such as SZ06 ZigBee wireless data acquisition equipment, 4-20 mA, 0-5 V, temperature and humidity and so on. After summarizing and analyzing the data, the embedded system technology meets the mining requirements (Vieira et al. 2018).

2.2 Design of multi-point ecological environmental monitoring system based on Internet of Things

The wireless environmental monitoring system designed is an intelligent monitoring system for monitoring environmental temperature, humidity and dust data. It is a hardware and software platform integrating data acquisition, transmission and display. According to the actual needs, the temperature, humidity and dust parameters of any node can be viewed. The overall structure of the monitoring system is shown in Figure 1.

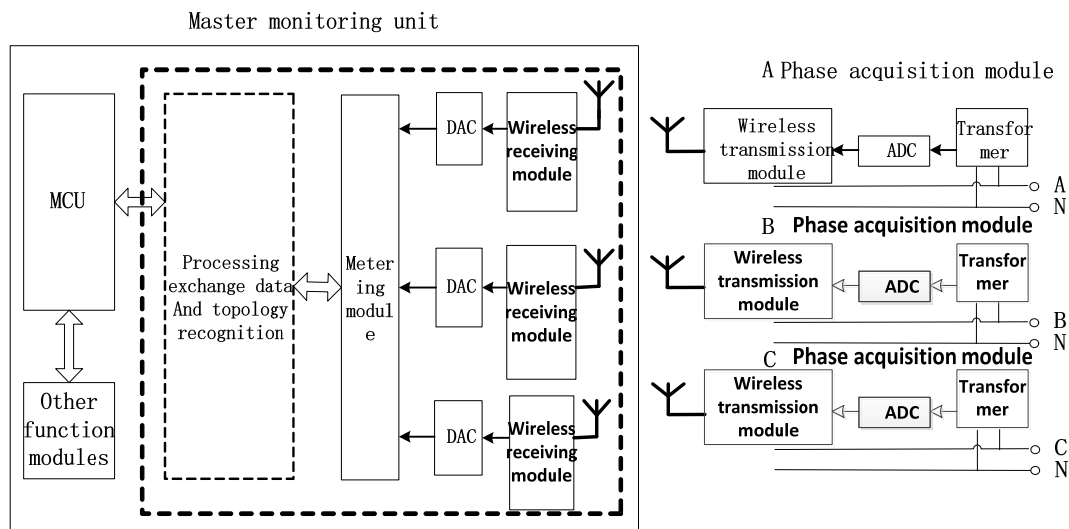


Figure 1 Block diagram of overall structure of monitoring system

(1) Data acquisition module

Data processing module is the lowest part of the whole system. Its function is to collect the temperature, humidity and dust data in the environment by using the Internet of Things technology. The collecting nodes consisting of mountain modules and sensor nodes distributed in the environment report the data to the coordinator. The interaction mode between nodes and coordinators is through wireless sensor networks. The network is composed of coordinators. Nodes can only transmit data to the coordinator and receive commands from the coordinator, and can not communicate with each other (Stepanova et al. 2018).

(2) Data transmission module

Data transmission module is the middle part of the system, including nodes and coordinators. The main function of the transmission module is data receiving and uploading. Data receiving means that the coordinator receives data from nodes. Data uploading means that the coordinator uploads the received data to the processor through the serial port. All monitoring nodes and coordinators form a wireless sensor network. Coordinator is responsible for receiving and uploading data, and plays the role of data transfer in the system.

(3) Data processing module

The data processing module is equivalent to a terminal in the system, and is also the control center of the system. Its function is to display the data uploaded by the coordinator and store it in the database. The processing module includes processor, intelligent display terminal and storage module. All commands of the system are issued by the data processing module. We can select the acquisition node and backup the data collected by each node.

2.3 Hardware design

Data processing module is the control center of the whole monitoring system. Its functions include storing, sending acquisition commands and displaying data transmitted by the coordinator. In order to meet the needs of the system, the module should have the following functions to receive and process the data of wireless sensor network, specifically to realize data transmission through serial and co-ordinator, and store the data in the database, and display the data. The data processing module of the environmental monitoring system is the core of the system, which is responsible for data reception, data storage and data display. The purpose is to transplant the Chinese-in operating system on the hardware platform. Therefore, in order to achieve these functions, there must be interfaces to meet these functions on the module. Specific interfaces are as follows:

(1) There is one RS232 interface for intercourse and compilation, and communicates with the host's computer.

(2) There are two USB interfaces, one is for selecting the files to be transplanted through the super terminal while transplanting the operating system, and the other is for communicating with the coordinator.

(3) There is one LCD interface, used to display the environmental temperature, humidity and dust data collected by the node. It can be operated on the monitoring graphical interface by touch screen, such as selecting the acquisition node and viewing historical data.

(4) There is one SD card interface, used to backup the collected historical data.

The hardware structure of the data processing module is shown in Figure 2.

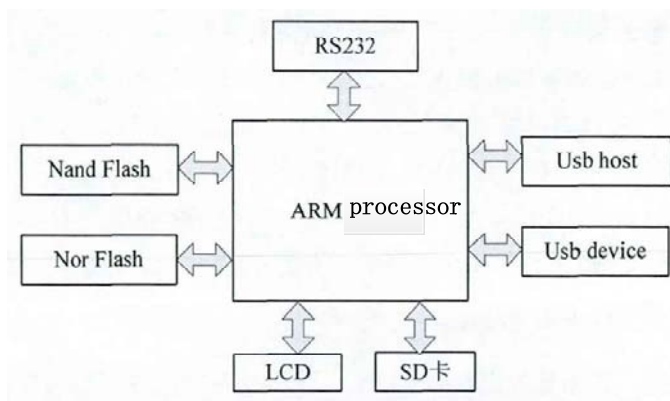


Figure 2 Hardware structure of data processing module

3 RESULTS

In order to verify the performance of this system, a test is needed. The algorithm is tested by MATLAB7.0 software. The operating system is Windows XP, and the memory is 244 B. In the test, 1000 real data sets of ecological environment are randomly selected.

The traditional system is a better monitoring method in the existing research, and has obtained better research results. The monitoring efficiency of the system in this paper is compared with that of traditional system. The results are shown in Figure 3.

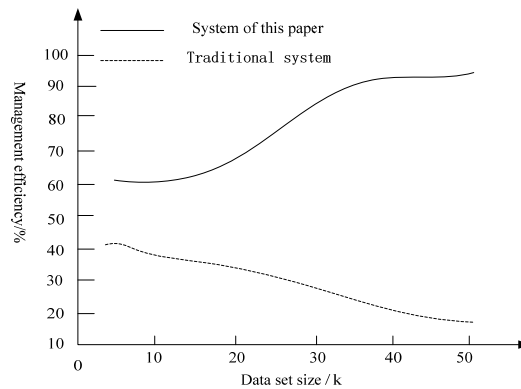


Figure 3 Comparison of monitoring efficiency

From Figure 3, we can see that the monitoring efficiency of the proposed system is getting higher and higher with the expansion of data scale, reaching more than 95%. The monitoring efficiency of traditional system decreases with the expansion of data scale, and the execution speed is slower and slower. Therefore, this system can improve the monitoring efficiency and shorten the monitoring execution time.

4 CONCLUSION

At present, the Internet promotes the human society to enter the era of interconnection of all things. The system boundary is blurring day by day, and the means of network threat attack have changed tremendously. The old static single-point protection measures are no longer applicable. It is necessary to innovate the concept of network security defense, adhere to the idea of dynamic comprehensive security protection, and effectively prevent the ever-changing security risks through continuous innovation and network development. Therefore, a multi-point ecological environment monitoring system based on Internet of Things technology is proposed and designed to meet the control and improvement needs of environmental management system, and lay a solid foundation for the sustainable development of environmental monitoring projects.

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