Research on the Intelligent Building Electrical Monitoring System Based on Computer Web

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Abstract. With the development of computer information technology, the traditional building electrical monitoring system has been unable to meet the needs of users. However, the automation degree of the electrical equipment in the current intelligent building is also low. Especially for the electrical monitoring system, there is no convenient and real-time management and service architecture, so there is still a large room for improvement. Based on this, this paper first analyses the intelligent building electrical monitoring system based on Web, then studies the related technology of intelligent building web monitoring system development, and finally gives the implementation strategy of intelligent building electrical monitoring system based on computer web.

Keywords: Intelligent Building, Electrical Monitoring System, Web

1. Introduction

With the rapid iterative development of information technology, the network information technology represented by web has been widely used and developed in all walks of life. At present, the development of artificial intelligence technology makes the concept of intelligent building gradually rise. Intelligent building is mainly based on the Internet of things and artificial intelligence to realize the intelligent application and use of building electrical equipment. Intelligent building not only has strong autonomous control performance, but also has high reliability, maintainability and environmental adaptability. At present, the application of intelligent building based on Web Architecture benefits from its high openness and information interaction ability, which makes it play a great role in node control, intelligent management and network system in intelligent building. At present, the electrical monitoring of intelligent building based on computer web has been gradually transiting and developing to several aspects as shown in Figure 1.
In addition, with the rapid popularization of information technology represented by the Internet, it has brought unprecedented opportunities to the development of intelligent buildings[2]. At present, not only the high-speed interconnection of information networks has been realized between regions and regions, but also the development of wireless communication technology with longer distance and higher speed makes the application forms and software and hardware systems of intelligent buildings change dramatically. The application of web structure in the field of intelligent building can quickly, safely and conveniently integrate the electrical equipment of the physical layer of the building and the monitoring network layer effectively, so as to realize the information communication and data sharing inside and between buildings.

However, the traditional building electrical monitoring system has been unable to meet the needs of users, but the degree of automation of the current intelligent building electrical equipment is also low[3]. For example, for the electrical monitoring system, it has not yet built a convenient, real-time management and service architecture, and failed to realize the intelligent control of building electrical equipment, so there is still a lot of room for improvement. The intelligent building electrical monitoring system based on computer web can realize the centralized monitoring and decentralized management of all electrical equipment in the building, so as to realize the efficient utilization of equipment resources and the significant improvement of management efficiency and effect. Therefore, the research of intelligent building electrical monitoring system based on computer web has important practical value.

2. Electrical monitoring system of intelligent building

2.1. Monitoring range and parameters of electrical monitoring system in intelligent building
Intelligent building system can implement centralized monitoring, management and decentralized control of the operation status, safety status, energy use status and energy saving management of many scattered electrical equipment in buildings or building groups, so as to realize unified management of internal control, management, and maintenance and energy consumption. The monitoring range and parameter contents of intelligent building system are shown in Table 1.
Table 1. The monitoring range and parameter contents of intelligent building system.

| System                  | Contents                                                   |
|-------------------------|------------------------------------------------------------|
| Air conditioning system | Fresh air, return air and VAV air conditioning units       |
| Cold / heat source system | Refrigeration / heat pump unit, refrigeration / cooling water |
| Drainage system         | All kinds of pumps and water tanks                         |
| Security system         | Security door lock, patrol                                 |
| Electrical system       | Lighting control, high / low voltage signal measurement, standby generator set elevator |

2.2. The effect of intelligent building electrical monitoring system
Based on the actual monitoring and management of air conditioning unit, cold / heat source system, water supply and drainage system, power system and security system of intelligent building, the constant temperature control in intelligent building can be realized, as well as the maintenance and repair of all equipment in the building, which could greatly facilitates the construction management personnel to operate and monitor the operation of the equipment, and improves the overall management and operation level of the building[4]. In addition, the application of intelligent building electrical monitoring system can significantly improve the service life of electrical equipment in the building. It can not only ensure that the equipment operates in the appropriate range, timely detect and early warn the equipment failure, ensure the timely positioning of maintenance personnel, but also improve the replacement and maintenance cycle of equipment, so as to significantly reduce the operation cost of electrical equipment in buildings.

2.3. Composition of intelligent building electrical monitoring system
The intelligent building electrical monitoring system is mainly composed of two parts, namely the building site part and the central control part of the building[5]. Among them, the field part of building electrical equipment mainly includes detection elements, various sensors, actuator and various transmission channels. The central control part of intelligent building is mainly composed of central processing unit, human-machine interface and other peripheral equipment and systems. In addition, the network structure of intelligent building electrical monitoring system is shown in Figure 2.

![Figure 2. Structure of electrical monitoring system in intelligent building.](image)

2.4. Design of intelligent building electrical monitoring system
The design of intelligent building electrical monitoring system should be based on the overall functional requirements of the building and the control level of management mode, and combined with the requirements of the building area and the characteristics of the controlled system, to determine the technical scheme of the construction[6]. Secondly, it should comprehensively consider the technical progress, maturity and reliability of the electrical monitoring system of intelligent buildings, so as to
realize the maximum economic benefits of the electrical monitoring system within the affordable cost range, and realize the optimization of the control system scheme and equipment investment. Secondly, the intelligent building electrical monitoring system is input into the computer through the input device. After the corresponding program calculation and processing, the processed signal is output by the output device, and then the corresponding electrical equipment is controlled.

In addition, the intelligent building electrical monitoring system can realize various control functions of the electrical system in the building, at the same time, it has various management functions, including energy control and management functions, as well as the adjustment control and monitoring of the relevant parameters of the electrical system, and realizes the start-up and stop control of the specified time, so as to achieve the purpose of energy saving. In the maintenance level of electrical equipment, through intelligent control of the replacement or maintenance time of electrical equipment, the service life of the equipment is extended, the operation quality of the equipment is improved, and the good working condition of the equipment is maintained.

3. Development of Web monitoring system for intelligent building

3.1. Application of Web in intelligent building monitoring system
First of all, in the construction of intelligent building electrical development environment and tools based on computer web, the installation and development environment are for the programming to the final test run. Secondly, in the application level of multi-threaded technology, the application of multi-threaded technology can realize the rapid response and small cost of intelligent building monitoring system. Secondly, at the model view controller framework level, the framework can make the development of each layer independent of each other. While reducing the development time, it can improve the maintainability and easy upgrade of web application system. The typical model view controller framework is shown in Figure 3 below.

![Figure 3. The typical model view controller framework.](image)

In addition, the application level of communication technology mainly includes the application of TCP/IP communication, HTTP communication and USB communication\(^7\). Among them, TCP/IP includes a variety of protocol sets that can complete various functions. HTTP communication can realize connection and release control instructions of front-end users for many times. USB communication interface has unified technical specifications and standards. USB interface and USB data line are used to realize connection and communication with intelligent building electrical web monitoring system. At the level of data transmission format, cross platform development language is suitable for the characteristics of web communication transmission, which is helpful to describe structured data under uniform rules.

3.2. Function design of intelligent building electrical monitoring system based on Web
Firstly, the overall design level of intelligent building electrical monitoring system based on Web mainly includes the overall structure of intelligent building electrical monitoring system, the business description of Web monitoring system and the design of Web monitoring system\(^8\). Among them, the overall structure of intelligent building electrical monitoring system can expand the gateway couplers
of multiple local monitoring networks, and the business description of Web monitoring system can establish the monitoring information network model based on control network and join the structure of Internet monitoring system. Secondly, in the communication protocol level of the intelligent building electrical monitoring system based on Web, it mainly includes text protocol and binary protocol, in which the text protocol includes the node equipment to be monitored, the action mode and the effect of electrical equipment. Binary protocol uses control message to control the behavior of the specified module, and uses query message to query the node state parameters of a monitoring module.

4. Realization of intelligent building electrical monitoring system based on computer web

4.1. Development environment of intelligent building electrical monitoring system based on web

The development environment of intelligent building electrical monitoring system based on Web based on B/S architecture is adopted. The B/S structure simplifies the work of the client. Only a small amount of client software needs to be configured on the client, and the database access and application program execution will be completed on the server. The web server is composed of a separate layer to undertake its tasks, and the load is allocated to the web server. Its architecture is shown in Figure 4 below.

![Figure 4](image)

This architecture imports the updated data from the database of the monitoring system into the web database, which is finally used by the query function components of the monitoring system.

4.2. Realization of function module of intelligent building electrical monitoring system based on Web

The function modules of intelligent building electrical monitoring system based on Web mainly include monitoring system user authority module, login operation information module, monitoring system control scene module and data format conversion function module. The data format conversion function module also includes control data format and acquisition data format. In addition, at the level of accessing USB gateway devices, the web monitoring server sends the data to the terminal gateway equipment, and sends the status data of electrical equipment in intelligent buildings to the web monitoring server based on the set server parameters, so as to realize the real-time monitoring of the status of the site equipment nodes by the server.

5. Conclusion

In summary, the intelligent building electrical monitoring system based on computer web can realize the centralized monitoring and decentralized management of all electrical equipment in the building, so as to realize the efficient utilization of equipment resources and the significant improvement of management efficiency and effect. In addition, it can effectively integrate the electrical equipment of the physical layer of the building and the monitoring network layer, so as to realize the communication and data sharing of the internal and inter building information. Based on the research of intelligent building electrical monitoring system, this paper analyzes the monitoring range and parameters of intelligent building electrical monitoring system, and studies the application and function design of web in intelligent building monitoring system by analyzing the related technology of Web monitoring system development of intelligent building. Finally, through the research on the realization of the
intelligent building electrical monitoring system based on the computer web, this paper analyzes the implementation strategy of the functional modules of the intelligent building electrical monitoring system based on Web.

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