Design and Implementation of Energy Saving Management System Based on Data Mining

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Abstract. With the acceleration of urbanization, various items have generated a large amount of energy consumption on the basis of intelligent control, which has aroused widespread concern. Energy conservation has become an important direction of society. Colleges and universities are an integral part of society and a large energy consumer. Therefore, energy conservation management in colleges and universities is an important content. At the same time, designing energy-saving management systems in colleges and universities can not only meet the needs of energy-saving supervision in colleges and universities, but also deepen the significance of building a resource-saving concept into students. Through the construction of energy-saving management, it can realize the supervision of campus energy consumption, and further provide reliable data support and effective solutions for the school's energy-saving management level.

1 Introduction

With the development of economy, environmental problems are becoming more and more prominent. Recently, although economic construction has achieved fruitful results in various aspects, it has sacrificed resources and environment. Energy has become a key factor affecting global economic development. Energy conservation and emission reduction have become the requirements of social development. More and more governments and organizations are spontaneously carrying out the work of energy conservation and emission reduction [1]. The energy consumption of colleges and universities also occupies a certain proportion. It is quite urgent to establish the energy saving system in colleges and universities. The design is based on the campus and can be extended to other public buildings. With the increase of urban energy consumption [2], the energy quantity of colleges and universities also increases year by year. However, domestic colleges and universities lack scientific management in energy use. Energy conservation systems vary widely among institutions. It is of great significance to build an applicable supervision system for campus energy conservation. Colleges and universities are places to train constructors. By building an energy conservation supervision system, we can shape people's awareness of energy conservation, which is also meaningful for the future.

At present is an information age, the general trend throughout the world every corner. While the impact of the Internet on the human way of life, at the same time, the technological leap also affects the way people think. Therefore, the campus energy conservation management system [4] also needs to be in line with The Times from the perspective of development, and its process needs to be informatization and digitalization.

The system mainly adopts B/ s-based digital energy saving platform, which has strong expansibility and compatibility. At the same time, the server side can support popular databases, and energy-saving management monitoring points can be established in campus, buildings, floors and rooms [5]. Power, water and gas can also be monitored through wired or wireless equipment, and real-time monitoring, transmission and analysis can also be carried out. Figure 1 shows the principle of B/S system.

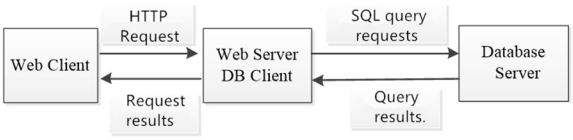

Figure 1. Principle of B/S system

2 Data mining

Data mining is a technical process of identifying unknown and useful knowledge from massive application data [6]. As an interdisciplinary subject, data mining involves many subjects, such as machine learning, database, etc. With the development of informatization, data mining has been paid more and more attention. Data mining [7] mainly solves the problem that the amount of human data processing increases sharply. It can help people according to some technical means to obtain useful knowledge for themselves. Generally, the steps of data mining are as follows: first, data cleaning is to process the given data. Its main purpose is to clear the noise in the data, but also can correct the

wrong data; Secondly, data integration [7] can be regarded as a process of inductive integration. It often uses the database technology to integrate multiple data into a consistent data for storage; Again, data conversion. Data conversion takes relevant data out of the database [8] and converts the data into a form suitable for mining through some operations; Then you move on to data mining, which is the core step. We need to use the mining model [9] to extract some data patterns based on the data prepared in the early stage; Then comes the model evaluation, which is usually a combination of the result evaluation and analysis, and the feasibility of the result can be judged according to the standards and materials. Finally, knowledge representation, usually presenting data results to users in a popular way [10].

The system is controlled by computer, campus communication technology and other traditional equipment systems. It can carry out automatic control to complete the work of energy saving control and management of buildings and facilities in the unit area, so as to achieve the goal of energy saving. This energy saving management system mainly designs the system from the supervision aspect. Its main process is to collect information and then provides guidance. At the same time, the data result is usually the result of calculation and processing of energy saving business, including some data statistics. Each of the different data often takes the cell as the measurement point data, and the calculation node of energy saving management based on data mining is shown in figure 2.

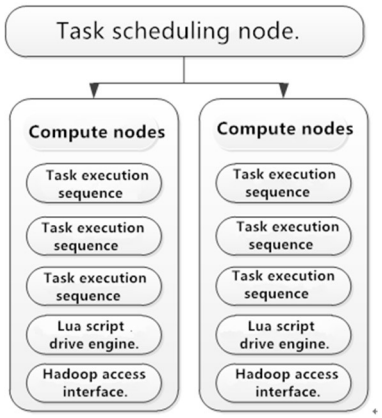

Figure 2. Calculation node of energy saving management

3 Regulatory model

Traditional energy conservation supervision system usually sets a closed value inside the system when conducting supervision. In order for this system to compare the energy consumption collected with the closed value data, a pre-set index value is usually required. However, there are many problems with this solution: for example, it is difficult to determine the data of a closed value. It is too high or too low to have some impact on the system of energy conservation supervision. This makes it less effective to regulate. Different seasons and different building structures will also hinder the supervision. Our processing method is generally static analysis of historical data first. The results we get are usually not monitored in real time. As a result, the energy consumption supervision system is lagging behind. Therefore, we propose a new regulatory model. This model is based on data mining technology to monitor the energy consumption of buildings. This model can be monitored in real time. Firstly, the building energy consumption pattern is identified and the data is saved to match the previous building energy consumption pattern. Then we analyze the results of pattern matching to determine whether there is abnormal energy consumption, and then determine whether the energy consumption is normal. FIG. 3 shows the flow chart of building energy consumption supervision.

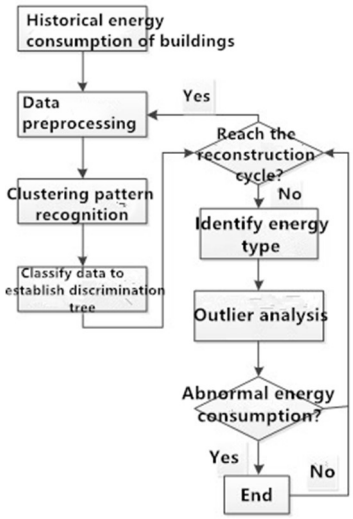

Figure 3. Flow chart of building energy consumption supervision

The main purpose of energy consumption regulation is to improve the accuracy of regulation. Firstly, we should excavate the energy consumption of the monitored buildings. Since the patterns corresponding to the energy consumption of buildings usually change with the characteristics of buildings, the results of pattern recognition of buildings need to be reset and judged. The condition must be satisfied before we can recognize the pattern again. The specific steps are as follows:

First of all, the historical energy consumption value of the pretreatment building in the system platform can be generally treated in accordance with the requirements put forward to specify the energy consumption characteristics of the system, such as the time usually involves every minute, every second, every day, every month, etc., while the average energy consumption, low energy consumption and so on are usually considered in the characteristics.

Secondly, after pre-processing, the mode of building historical data value in the platform needs to be recognized again, and then the established energy consumption mode of the building is obtained. Finally, the judgment tree of energy consumption mode is constructed based on the recognition results.

Thirdly, according to some cases of newly introduced building energy consumption values, the energy consumption of newly collected building energy consumption data can be identified and analyzed with the corresponding patterns in historical data. At the same time,

the current outlier can be determined according to the judgment results. If not, it means that the energy consumption of the buildings collected at present is normal.

Fourthly, if the alarm platform of a particular building has a continuous alarm over a long period of time, it can be concluded that the building has reached the model reconstruction cycle.

Finally, if building energy consumption pattern recognition just meets the pre-set pattern conditions, it is necessary to repeat the previous process of building energy consumption pattern recognition and the process of building energy consumption pattern judgment conditions, so as to obtain new building patterns and judgment conditions, otherwise it will be under supervision all the time.

4 Conclusion

Since entering the 21st century, the lack of energy and resources in China has been accelerating. Energy conservation and emission reduction have gradually become research hotspots. Research based on energy conservation management becomes very necessary. This paper takes colleges and universities as the research object, studies the supervision platform, especially the energy consumption of buildings, and hopes to be helpful for the follow-up work.

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