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Research Article

Analysis Of Energy Saving And Consumption Reduction Technology In IOT Control System -Campus Energy Saving And Consumption Reduction Street Light System As An Example

Huacheng Huang[1], Ping Wang[2]

[1]. Hezhou College, Guangxi, China
[2]. Krirk University, Thanon Ram Intra, Khwaeng Anusawari, Khet Bang Khen, Krung Thep, Maha Nakhon10220, Thailand
Email: huacheng-h@foxmail.com (Huacheng Huang , Corresponding author)

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Abstract: Internet of things control technology is through the sensor technology, follow the prescribed protocol, the sensor data and network links, sensors through the network transmission data for identification exchange and networking, to achieve artificial intelligence, parameter identification, positioning, tracking, supervision and other functions. In the era of high-speed development, IOT control technology is a new control system model, is the era of artificial intelligence, driving the direction of economic development, is the focus of attention of people from all walks of life.

The proposed Internet of Things control technology, coupled with the development of artificial intelligence technology is gradually rising, is the control system in the rapid development of high-tech industries. The development of society is inseparable from the construction of roads and energy saving and consumption reduction. The artificial intelligence technology of the Internet of Things (IoT) replaces the manual work monitoring, and can accurately and intelligently control and make a series of energy saving and consumption reduction. This paper discusses the IoT control technology based on the IoT campus energy saving and consumption reduction street lighting system.

Keywords: Internet of things technology; sensor information transmission key technology; street light control system; energy saving and consumption reduction

1 Introduction

The rapid development of an intelligent society relies on three major technologies: automation technology, Interner technology, and Internet of Things technology. It is due to the rapid development of the three major technologies that has brought an unprecedented artificially intelligent earth culture to society, and IoT control technology is the most important component of the three major technologies. IoT control technology penetrates into all walks of life in society and is recognized and affirmed by relevant researchers, proving that IoT control technology as a basic control technology is the level of technology that replaces manual work and is the value of IoT control technology. The important technology in the IoT-based campus energy saving and consumption reduction street light system studied in this paper is the IoT control technology, which effectively reduces the output of manual duty and energy loss. IoT control street light can intelligently realize a series of operations according to different time periods, different environmental factors, different traffic flow, etc. Only a simple code control and internet access function can realize more complex operations that cannot be done manually. The process of IOT-based campus energy saving and consumption reduction street light system is: through the collection of environmental change data, the central processor to process and sense the environment and then transmitted to the execution controller, the execution controller receives the instruction and immediately executes the relevant operation, without waiting for manual confirmation, to achieve the purpose of energy saving and consumption reduction.

2 Literature Review

Through literature research, the Energy Conservation Law of the People's Republic of China refers to strengthening energy management, taking technically feasible, economically reasonable and environmentally and socially affordable measures to reduce consumption, reduce losses and pollutant emissions, stop waste, and use energy effectively and reasonably from all aspects of energy production to consumption. From LEED v4.1 BD+C, the requirements for energy efficiency performance have been greatly adjusted, and the latest LEED standard tends to measure energy efficiency of buildings in an "economic plus environmental benefit" oriented way. 2012 Yunnan Electric Power Technology Forum proposed that the formation of These technologies are conducive to the construction of energy control systems in smart buildings and the renovation of building energy efficiency; the 2017 Smart Grid Development Workshop proposed that any moment, any place, any object In addition to RFID technology, sensor technology, nanotechnology, intelligent terminals and other technologies will be more widely used; the first International Symposium on Information Construction proposed the basic framework of intelligent monitoring and auxiliary control system based on the sensor

network platform and the integration of auxiliary system functions. The key technology of information transmission in the Internet of Things (IoT) control system is proposed, and the concept of IoT and the emergence of IoT technologies provide new opportunities and challenges for the development of networked control systems.

3 IOT control technology research

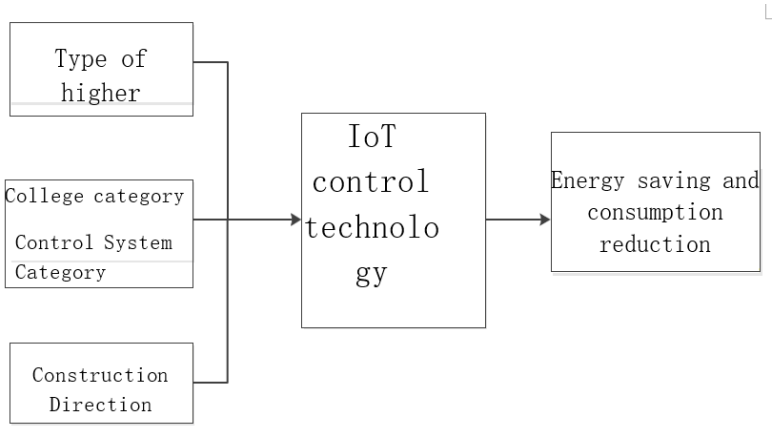

Figure 1 Research architecture

The research structure of this paper is shown in Fig. 1, based on the street light control system of major universities, assuming that the street light control system used by all universities is IOT control technology, the energy reduction will be more enhanced; however, the control of street lights in some universities is still the traditional human patrol method, patrolling at the point, switching on and off the electric gate at the point, most of the time without considering the weather, environment and other factors, which sometimes causes poor lighting or energy waste. or energy waste.

(1)Literature analysis method: Through various information channels to review the theory related to IOT control technology, learn the IOT control method, summarize and analyze the example literature, and conduct in-depth discussion on the current development of the university street light control system industry.

(2) Comparative analysis method: By comparing the street light control system used by major universities in Guangxi as an example, the traditional control system and new control technology requirements are combined and dissected.

(3) Case analysis method: summarize the control systems of major universities to bring about energy saving and consumption reduction problems, and identify and analyze the risk impact of key factors from the perspective of energy saving and consumption reduction with actual cases that occurred.

(4) Questionnaire survey method: On the basis of analyzing the influence factors of IOT control technology in practical application, we design corresponding topics and conduct questionnaire survey on relevant department managers and key employees and technical experts to widely solicit opinions from all parties in order to determine the influence size of each control system and discover the key influence factors.

（5）Systematic scientific approach: integrated scientific analysis method for systematic analysis of the impact of the control system of IoT control technology to bring global energy saving and consumption reduction.

Research content: Within the framework of the basic methodology and approach, complete the collection and analysis of material information for the thesis research. By completing the research on the topic, the impact of the street lighting control system on energy saving and consumption reduction will be developed and used as a reference basis for related research.

This paper sets up the following chapters, Chapter 1, Introduction, which describes the source of the selected topic of the article and the significance of the research. Chapter 2, draws out the state of the background of energy saving and consumption reduction control brought by street light control systems in recent years. Chapter 3, details the specific situation of the control systems of the major universities investigated in this paper. The analysis of the changes in different control systems on energy losses produced. In the fourth chapter, the relevant procedures and related measures are proposed in relation to the actual situation of major universities, including: changing the IOT control technology system measures and improvement strategies. At the end of the article, the shortcomings of the research work and the need for improvement are explained, and the recommendations for a reasonable IOT control technology are concluded.

4 Results and Discussion

In this paper, the data and energy loss of street light control system used in major universities in Guangxi, China are used as the basis.Based on the relevant IOT control technology, the value of IOT control technology in the current artificial intelligence era of college street light control system can be analyzed based on the energy saving and consumption reduction achieved by the relevant IOT control technology compared with the traditional control technology. In the global call for energy conservation and research on the premise of new energy, IOT control technology is the main key technology to solve the problem of energy saving and consumption reduction. Taking Guangxi University as an example, the use of IOT control technology occupies a relatively large advantage over the use of traditional patrol methods in saving energy.

(1) Application of Internet of things control technology

Taking the campus street light control system of Guangxi universities in China as the investigation background, the types of street light control systems of major universities were consulted through visits as shown in Table 1.

1.Table 1 Types of street light control systems in Guangxi universities in China

School	Internet of Things Control	Traditional control
Guangxi University	No	Yes
Guilin University of Technology	No	Yes
Guilin University of Electronic echnology	Yes	No
Guangxi Normal University	Yes	No
Guilin Teachers Technical College	No	Yes
Guilin Institute of Tourism	No	Yes
Guangxi University of Science and Technology	Yes	No
Guangxi Normal University	No	Yes
Hezhou University	No	Yes
Nanning Normal University	No	Yes

Data source: collated by this research

From the survey in Table 1, it can be found that the street light control system in the major universities, mainly in science and technology, is an IoT control system, while the universities, mainly in arts, still use the traditional control system. The difference of the control methods shows that the science and technology schools are more deeply into the research of IOT control technology and have been using effective control methods in practice.

It is found that the colleges and universities that use IoT control technology to control street light switches are more relevant than the types of colleges and universities that use traditional control technology, and most of their colleges and universities that apply IoT control technology are science-based engineering schools. This type of school mainly studies engineering majors, and IOT control technology is the engineering specialty of this type of school, which can achieve the effect of learning to apply in the application of street light control system. Some liberal arts schools, on the other hand, have certain difficulties in using control systems, which makes liberal arts schools weaker than science and engineering schools in areas such as IOT control technology.

(1) IOT control technology energy consumption

In order to better analyze the differences of street light control system and energy loss of major universities, the power usage of major universities was investigated.Table 2 shows that

Table 2 Energy consumption size of street lights in Guangxi universities in China

school	Total classroom power consumption	Road power consumption	Total power consumption	The total area
Guangxi University	1,340 kwh/day	kwh/day	kwh/day	4,700 acres
Guilin University of Technology	1,250kwh/day	235 kwh/day	1,485 kwh/day	3,300acres
Guilin University of Electronic Technology	1,350 kwh/day	298 kwh/day	1,648 kwh/day	4,153acres
Guangxi Normal University	1,650 kwh/day	310 kwh/day	1,960 kwh/day	4,605acres
Guilin Teachers Technical College	430 kwh/day	132 kwh/day	562 kwh/day	1,068acres
Guilin Institute of Tourism	580 kwh/day	184 kwh/day	764 kwh/day	1,885acres
Guangxi University of Science and Technology	1,440 kwh/day	295 kwh/day	1,735 kwh/day	4700acres
Guangxi Normal University	493 kwh/day	221 kwh/day	714 kwh/day	1,011acres
Hezhou University	510 kwh/day	168kwh/day	678 kwh/day	1,400acres
Nanning Normal University	1,450 kwh/day	260 kwh/day	1,710 kwh/day	3,476acres

Data source: collated by this research

The survey found that the statistics of comprehensive energy consumption in each university differed according to different street light control methods, while the loss of electrical energy varied greatly. The scope of the statistics is the actual consumption of primary energy (such as coal, oil, natural gas, etc.) and secondary energy (such as petroleum products, steam, electricity, gas, etc.) used in the teaching and research process in the statistical period (in days) of this type of buildings. The calorific value of solid fuels is measured according to the provisions of GB/T213-2008, and the calorific value of liquid fuels is measured according to the provisions of GB/T384-1981. Among them, the colleges and universities using the IOT control technology system have lower average energy consumption for the loss of electric energy than the colleges and universities using the traditional control method, which is better than the traditional control method in terms of energy saving. In the traditional control, there is also the cost of labor and the cost of loss due to long time lighting. The difference in size and type of university makes a difference in terms of energy loss. In the study objective, it was found that the colleges and universities that applied IOT control technology to control street lights had significantly lower energy consumption than those that applied traditional technology patrol control. Under the average area, Guilin University of Electronic Science and Technology, as an engineering research school, consumes relatively less energy for its streetlights, while Nanning Normal University, as a comprehensive school, consumes more energy. The main aspects of this are as follows.

（（1））.Adopting IOT control technology to control street light switches mainly relies on sensor data transmitted to the central processor for processing through IOT, so as to calculate environmental factors and feed back to the executive unit for automatic adjustment and control through comparative data to achieve timely reduction of unnecessary waste.

（（2））. In terms of switching time, the application of IOT control technology can be more time and season to adjust the switching time of street lights, while the traditional control technology is to specify a time period for human patrol control, in terms of switching time can save more energy

（（3））.IoT control technology can be used to control street lights as needed during vacation time or when no one is walking on the road, thus achieving an effective application of energy conservation.

(1) Support of IOT control technology

Through the questionnaire, it was found that teachers and students in colleges and universities want to install street light control with IoT control technology system. The respondents said that by using IOT control technology system to control street lights, they can study and live better, and can automatically carry out lighting in dim light and poor weather conditions, and can automatically turn off lights when there is sufficient light and no one is around, so as to achieve the purpose of energy saving and reducing unnecessary waste.

Survey

The results of the questionnaire are shown in Table 3.

Table 3 Whether students and teachers in Guangxi universities in China suggest installing IOT control technology system streetlights

school	teachers	students
Guangxi University	98％	98％
Guilin University of Technology	95％	99％
Guilin University of Electronic Technology	98％	99％
Guangxi Normal University	98％	97％
Guilin Teachers Technical College	92％	91％
Guilin Institute of Tourism	92％	94％
Guangxi University of Science and Technology	98％	99％
Guangxi Normal University	96％	98％
Hezhou University	98％	96％
Nanning Normal University	90％	95％

Data source: Compiled by this study

From the survey, it can be found that the value of the use of IOT control technology in the street light control system has really achieved the role of energy saving and consumption reduction, making great contributions to energy saving. And in the twenty-first century, IOT control technology has long entered the homes of the common people in society. However, due to the wide expertise involved in IOT control technology, network security issues have to be solved, and there are more constraints.

In today's artificial intelligence, IoT control technology as the core of its control is recognized in the global application, but relatively weak compared to some universities. Based on the application of IoT control technology in street lighting, including remote control of classroom lighting, design, etc., compared with traditional control technology, in the field of environmental factors, IoT control technology occupies the advantage, can be controlled with the change of the environment, without workers to patrol control. In some colleges and universities, due to limited expenditure, no support from relevant departments in changing the street light control system or limited project start-up funds, they have to continue to use the traditional control method.

5 Conclusions and Recommendations

In a word, if universities want to achieve rapid economic and social development and the overall goal of energy saving and consumption reduction, it is necessary to introduce the Internet of things control technology in the street light control system, give full play to the value of Internet of things control technology, so as to promote the Internet technology, computer technology to achieve transformative development, and the world should also take the Internet of things control technology as an important basis for the development of a reasonable and sound, scientific and reasonable development strategy.

However, the application of IOT control technology is not very mature in China or globally, and many problems have arisen due to the influence of various external factors. In this paper, the key aspects of information application in IOT control system are studied from a new perspective in order to further expand the scope of application of IOT control technology and to achieve the global standard of energy saving and consumption reduction.

The application of IoT control technology should be strongly supported in modern colleges and universities, whether they are liberal arts colleges or science colleges, especially in street light control systems, where the future development trend will skyrocket. Using IoT control technology to control street lights can greatly reduce the intensity and involvement of personnel patrols, improve energy conservation and ensure that street lights carry out

suitable lighting status. IOT control system is artificial intelligence infrastructure, in which IOT control technology is based on the environmental factors collected by sensors and each special situation, with the help of the Internet of Things to achieve energy saving and consumption reduction in a timely manner. People flow and climate change, seasonal changes, etc., IOT control system will be reasonable adjustment, intelligent control in a certain brightness and switching time.

The continuous development of artificial intelligence, the direction of the development of IoT control technology, has a huge potential for the application of energy saving and consumption reduction of street lights in universities, laying a solid foundation for the global response to the greenhouse effect to become an innovative and strategic goal and global leapfrogging. The future of IoT control technology to control street lights will be part of the realization of artificial intelligence, is to achieve an intelligent response and application due to the lack of energy.

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