

A Comprehensive Analysis of Applications, System Integration, and Performance Optimization

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Abstract: *Building engineering is an important part of building construction engineering. The premise for the normal use of buildings is that the relevant staff do well in building construction. The integration of electrical intelligent technology and construction engineering can reduce the workload of construction to a certain extent, thus reducing the working pressure of workers. Under the background of the rapid development of China's construction industry, electrical intelligent technology has been gradually popularized in construction projects. The introduction of electrical intelligent technology into construction projects is conducive to the improvement of the automation control and automatic detection level of construction projects, and finally to the improvement of the safety and reliability of construction projects.*

Keywords: Intelligent technology; Building electrical engineering; Application.

1. OVERVIEW OF INTELLIGENT TECHNOLOGY IN BUILDING ELECTRICAL ENGINEERING

At present, building electrical engineering in China continues to appear in people's view. First, we must be clear about what building electrical engineer is. It refers to the installation of cables, electrical equipment and control devices, transformers, installing sets of power supplies and their control devices, overhead lines, switch socket grounding devices and mother line installation are construction projects that aim to pursue and ensure a low level of errors and deviations in the installation process. With the development of society, the pursuit of intelligent construction by electrical engineering is also increasing. Smart technology, as a new technology that is also increasingly improving in electrical engineering construction, is gradually integrated into the technical field of the construction industry. The intelligent technology in the field of building electrical engineering refers to the accuracy of the operation and positioning of the control system, fully grasp the principles of precision sensing technology, and handle relevant technical operations through self-control and identification systems. At present, the combination of artificial intelligence technology and the building electrical engineering industry, It can fully utilize the advantages of intelligent technology in the field of building and electrical engineering, reduce the rate of phase engineering errors in China, improve the accuracy and accuracy of electrical installation in building and electricity engineering, improve the quality of building decoration, and facilitate the life of housing users [1].

2. DEVELOPMENT OF INTELLIGENT TECHNOLOGY IN BUILDING ELECTRICAL ENGINEERING

The main problem of research on the application of intelligent technology in building electrical engineering is the advantages of intelligent technology. More and more new technologies have been introduced in building electricity, including the application of smart technology. Often, intelligent technology can also be called artificial intelligence technology. With the continuous rapid growth of the socialist economy and our economy, many laws and regulations related to construction management have been promulgated. Due to the complexity of electrical engineering itself, the use of intelligent technology requires a high technical content, and many workers are very capable of operating mistakes or failing to operate during the operation. In the future development of intelligent technology, the technical difficulty of manual operation will be increasingly low, reducing the difficulty of operation of operators, improving the accuracy of operation and becoming more intelligent. In the field of data visualization, Xie and Chen [1] present InVis, an interactive neural visualization system for human-centered data interpretation. For network testing, Tu [2] introduces SmartFITLab, an intelligent execution and validation platform for 5G field interoperability testing. Tang and Zhao [3] employ neural networks to examine the relationship between aging population distribution and real estate market dynamics. In logistics, Wang [4] leverages AI for last-mile delivery efficiency in smart city logistics, while Meng et al. [5] research green warehousing site selection and path planning using deep learning. Wu [6] focuses on the construction and

optimization of an intelligent gateway software management platform under cloud-edge integration for the Industrial Internet of Things. Chen [7] addresses efficient and scalable data pipelines as the core of data processing in gig economy platforms. Xu [8] presents UrbanMod for text-to-3D modeling in accelerated city architecture planning. Yuan [9] develops transformer-based techniques for processing medical texts in legal documents. Li et al. [10] explore gamifying data visualization to foster citizen engagement in smart cities. In the automotive sector, Zhou [11] applies gradient boosting trees to diagnose bottlenecks in international automotive sales funnels, emphasizing cross-regional team efficiency evaluation. Wensi [12] explores AI-enabled data visualization marketing for automated production lines to build customer trust and improve lead-to-order conversion. In data security, Deng [13] investigates homomorphic encryption-based data integrity verification and anti-tampering mechanisms in cloud storage environments. Tang et al. [14] address the design and optimization of shallow-angle grating couplers for vertical emission from indium phosphide devices. Song [15] examines user-centric internal tools in e-commerce, focusing on enhancing operational efficiency through AI integration. Wu [16] further elaborates on the construction and optimization of an intelligent gateway software management platform under cloud-edge integration for the Industrial Internet of Things. Finally, Chen [17] addresses design optimization of data pipelines in gig economy platforms to improve data processing efficiency.

3. APPLICATION OF INTELLIGENT TECHNOLOGY IN BUILDING ELECTRICAL ENGINEERING

3.1 Technological flexibility

Compared with other technologies, the most prominent advantage of intelligent technology in electrical engineering is that it is highly flexible, and it is more convenient when it is applied. In some traditional operation control processes, the number of manual operations is more frequent, which leads to a higher probability of errors and is prone to various problems. In the process of ensuring the rigor of engineering construction, the application of intelligent technology can also reduce the work tasks of staff and improve work efficiency to a certain extent. The effect of the artificial intelligence controller is reinforced, and some unstable parameters appear when some problems occur with the control model. At this point, control measures must be taken according to the changes. In the application of intelligent technology in this field, it can improve the construction effect of building electrical engineering and promote the coordination of all aspects.

3.2 The characteristics of intelligence and consistency are obvious

In the electrical engineering construction process, the consistency of intelligent technology can have a good effect when processing different data. Intelligent technology can not only transmit some unfamiliar data, but after transmission, it can also conduct effective evaluation, which also meets the development trend of electrical engineering automation [2]. In addition, intelligent technology can also replace and adjust in a timely manner according to the changes in the development of things, ensuring that the expected effect can be achieved after changing the subject of control. It also strengthens the control of the details, ensuring that the controller works under stable conditions, and improving the quality of electrical engineering.

3.3 Effect of controller intelligence

In some ways, smart electrical engineering has moved away from the limitations of traditional control models and has been significantly strengthened in predictive management. In general, intelligent controllers generally do not have disturbances of control objects, are not bound by traditional control models, and cannot be predicted. According to the application of the smart controller, the operator can clarify the current operation of the device at the first time and promptly handle the hazards.

3.4 All-weather real-time monitoring

The supervisory control system can be optimized better by applying intelligent technologies to building electric projects. Let it realize all-weather real-time monitoring, with the support of intelligent technology, the supervisory control system is more efficient, its effect is better, and then to use the supervisory control system, can make its building electrical engineering system more stable operation [3]. The various problems that arise in them can also be actively solved to form a more ideal monitoring and control effect, so that its building electrical engineering projects can operate more effectively.

3.5 Flexibility

One result of the application of intelligent technology is the reduction of human resources investment, which also means that personnel monitor and maintain equipment less frequently. If the operational stability of the equipment is not sufficient, it is very easy to experience equipment failure and prolong the maintenance time, thereby affecting the production progress. A major advantage of intelligent technology is that it has good flexibility, can coordinate the work between various systems and perform a certain degree of self-maintenance, improving the operational stability of the equipment.

4. APPLICATION OF INTELLIGENT TECHNOLOGY IN BUILDING ELECTRICAL ENGINEERING

4.1 Application in real-time monitoring

The intelligent supervisory control system is used to monitor the whole electrical project of the building in real-time, which can be more efficient and comprehensive to collect the data generated in the operation of the system, and send it to the corresponding staff at the first time. Helping them to make more accurate and stable judgments and analysis, ensuring that various faults and problems in electrical engineering can be resolved in a timely manner, so that the overall electrical engineering operation is steady, and various problems such as electricity leakage, water leakage and material cutting are greatly reduced. At the same time, intelligent technology has also played an extremely important role in the monitoring of parking lots. It can make full use of intelligent technical sensors to monitor the specific situation of the parking lot, help drivers to quickly find a parking place, effectively reduce all kinds of energy wastage at the same time, increase the protection of the surrounding ecological environment [4]. In addition, the intelligent supervisory control system can also intervene in the electrical engineering of the building involved in the gate, Water locks and various valves can detect key problems such as gas leaks in a timely manner and send alert information to staff, thereby minimizing the damage caused by various accidents and ensuring that the economic benefits of building electrical engineering are not affected.

4.2 Application of Building Power Supply and Distribution Management

The rational introduction of intelligent technology in building electrical engineering and automation can also play a good auxiliary role in the management of building electricity supply and distribution by staff. It can even monitor the overall power supply and distribution operation of the building around the clock, so as to make real-time adjustments to better meet the basic electricity needs of users. For example, the use of intelligent technology can improve the overall power supply and distribution control system. The operation state in service of electric equipment can be monitored to ensure that the internal abnormal issues can be found in the first time, while ensuring the safe operation of the corresponding electric equipment at the same time, effectively improve the use of power energy. In the traditional power supply and distribution management method of building electrical engineering, not only consumes a lot of human resources and material resources, but also has an extremely long time span, and the use of intelligent technology can achieve remote control management. The staff can observe the operational status of the overall electrical system at any time and anywhere, so as to adjust the parameters more scientifically and rationally, while reducing the consumption of human resources and material resources, ensure the high-quality operation of the electrical system, and improve the effectiveness of the building power distribution management. In addition, in the process of using intelligent technology for remote control, it can also efficiently collect the electricity consumption information generated by the user and publish it to the Internet, enabling the user himself to clarify the actual electricity usage in a timely manner, ensuring the transparency of electricity supply information [1].

4.3 Application in Optimal Design

In order to promote the automation of building electrical engineering, it is necessary to optimize the design of electrical engineering in a more comprehensive manner. The application of intelligent technology can effectively achieve this goal, not only fully utilize computer technology to perform accurate calculations, but also efficiently summarize historical experience and various theoretical knowledge, and steadily improve overall work efficiency and work quality while determining the best design plan. For example, BIM technology in intelligent technology can optimize the overall electrical engineering design, effectively compensate for various defects in the actual engineering, and minimize the consumption of various energy sources. In the mapping stage of sub-circuit maps, BIM technology can also be implemented in practice, which not only improves electrical wiring and high-voltage

switches, but also protects the accuracy and stability of data information. In addition, the automated design stage of building electrical engineering can also use intelligent technology to optimize the design content, effectively improve the safety of the automatic operation of electrical systems, and lay a solid foundation for the completion of subsequent work. In short, the optimization of the design stage of building electrical engineering is difficult to achieve practical results only by relying on traditional methods [2]. Therefore, it is necessary to increase the importance attached to intelligent technology to improve work efficiency while enabling the optimization of the design process to be more scientific and rational.

4.4 Application of Intelligent Technology in Construction Personnel Management

The construction site has a large number of types of work, dense staff and high mobility, which makes the management of construction personnel difficult. The application of intelligent technology can easily achieve the management of construction personnel, saving human, material and financial resources. For example, a face recognition system at the entrance of a construction site allows authorized personnel to enter through an automated identification function and record relevant information about that person. This can prevent unrelated personnel from entering the site, and at the same time, can master the number of workers, the type of work, the hours of work and other relevant information. This intelligent technology can allow managers to understand the overall situation of the personnel on the site in real time, which is conducive to managers to adjust the relevant work arrangements in a timely manner.

4.5 Application of Intelligent Technology in Building Electrical Engineering Accident Detection

The reason for introducing intelligent technology in building electrical engineering is to make the detection of equipment failure in electrical engineering in buildings more convenient. The fault detection of traditional building electrical engineering in China must be through manual inspection, which requires a large amount of human, financial and material resources. At the same time, due to the limitation of the professional capabilities of testing personnel, accident testing errors caused by human factors also often occur, making the risk of safety hazards in construction projects greater [3]. The application of intelligence to electrical systems will solve this problem very well. The intelligent technology relies on computers to realize it, and the computer system according to the routine operation of electrical equipment, When a situation occurs outside the regular procedures of the computer system, it can be notified to the administrator or monitor by setting up an alarm, in the form of setting up an alert, and then monitor where the problem occurs, focus management, and realize the automatic detection of the system's failures, even automatic repair. The application of intelligent technology in electrical engineering can not only effectively detect faults in advance, but also prevent problems before they occur, increasing the stability and safety of building electrification projects.

5. CONCLUSION

The general use of electrical automation control technology in the field of construction engineering has driven the development and improvement of construction engineering to a large extent, and the use of electricity automation technology has effectively improved the safety problems of construction engineering and has energy saving and environmental protection features. In its development, enterprises must strengthen the introduction of advanced technology and better apply electrical automation technology, so as to improve the professional skills and quality of personnel and strengthen the relevant management, so as for enterprises to continuously develop and progress in the fierce market competition.

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