Research on the Application of Artificial Intelligence Technology in Electrical Automation Control

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Abstract: In this paper, the application of artificial intelligence technology in electrical automation control is discussed in detail from the perspectives of conventional electrical control, fault diagnosis, manufacturing and general technology development, hoping to provide assistance for the development of electrical automation technology.

1. Introduction

In fact, there is no specific definition of artificial intelligence, but in essence, it is based on advanced computer technology to carry out in-depth system programming, and further develop machines that can participate in people's production and life, which to a large extent reduces the burden of people's production and life.With the change of society, electrical automation is involved in a more and more wide range, in fact, because of the deep progress of intelligent technology, there are many work content is not suitable for people to intervene, and the convenience of artificial intelligence technology, reliability, intelligence and many other significant characteristics in the actual environment reflected incisively and vividly.

This paper focuses on the application of artificial intelligence technology in electrical automation, and further expounds the specific application.

2. Application of Artificial Intelligence Technology in Electrical Automation

The field of electrical automation itself is a more complex field of work, the unique nature of the work requires the relevant technical personnel must have good professional quality and professional ability.The field of electrical automation not only requires the relevant personnel to master a lot of theoretical knowledge, such as circuit, electromagnetic field, etc., but also needs to have a certain amount of design experience.According to previous design experience, the design method adopted in most cases is usually the simplest, and the designer develops the design according to his usual experience.In recent years, computer software, hardware in all kinds of high and new technology development is rapid, also promote the new changes have taken place in electrical automation design, electrical products is no longer simply rely on the traditional design manual labor, but by computer to more sophisticated design, effectively shorten the design cycle, also facilitate the later fault maintenance, and can according to the actual situation to determine the best design solution.The application of artificial intelligence technology in electrical automation at the same time, but also make some technologies have been unprecedented development, such as CAD, accelerate the design efficiency of electrical products, improve the production quality of electrical products.It is obvious that artificial intelligence technology has already become an indispensable prerequisite in every field of contemporary society.on the other hand, has the control function of artificial intelligence technology, its advantage is the ability to analysis and processing and storage, the data were collected with real-time monitoring the operation of electrical equipment, have the function that time alarm, the main advantage is the ability to collect real-time and on to the system analog numerical electric equipment, can also according to the record before and after the event, automatic filter out already processed.

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3. Application in Electrical Routine Automation Control

3.1 Fuzzy Control

At present, used in industrial production of common electrical automation control technology belongs to the technical types, it only depends on the programmed according to the established rules of programming software, to achieve practical application, while the electrical control technology integrated AI technology can directly simulate human thinking and behavior, in the case of no programming, complete accurate data processing, presented the strong learning intelligent characteristics.

Fuzzy control function in the process, as one of the important applications of AI technology, mainly applied to automatic control system as a whole and coordination, workers through fuzzy control statements constructed controller, and can realize the nonlinear control of the electric system, relieves the complex system conditions, due to excessive variable system dynamic description of the problem, improved the precision of electric conventional automation control, to help industrial production level of ascension.

3.2 Thought Analog Control

In conventional electrical automatic control, the application of AI technology advantage is mainly reflected in two aspects of self learning ability and the knowledge accumulation, workers with the analysis of the technology of multi-dimensional data model, to implement the simulation control of thinking, and on the basis of the theory of knowledge, determine the optimal electric control scheme, given electric automatic system top of imagination, achieve the real time control electric overall system, enhance the level of automation of the system operation.

In addition, the simulation control of thinking, the AI technology of artificial neural network structure, can simulate human make logical thinking ability, intuitive, and enlightenment, at the same time in the operation of the system in the simulation of all kinds of possible condition, and then on the basis of all kinds of working condition, put forward more or the best deal, but also to evaluate each solution, implement regular control decision-making, reduces the need for artificial participation, further optimization of the electrical system control level.

3.3 The Protection and Control Function of Electrical Automation System is Realized

At present, the application of artificial intelligence technology to realize the automation of analog data, the switch quantity, real-time dynamic processing and acquisition, and according to the requirements of the system design, mass timing for storage and sorting, using image generation software at the same time, the simulation of the practical operation of electric automation system, the staff can visually see the breaker, isolating switch, equipment and parameters such as voltage, current changes in, the staff in combination with the practical operation requirements of electric automation system, compile professional graphics and analysis of relevant data, because of pictures and images should pay attention to in the process of electrical automation system resources is more,

Therefore, the operation performance of the electrical automation system control equipment and the requirements of the software system should be fully taken into account to prevent the control terminal from occupying a large number of resources and consuming computing resources due to the acquisition of a large number of images, which will affect the normal operation of other programs in the electrical automation system.In addition, the operation control of the electrical automation system, the staff can remotely control the circuit breaker and the isolation switch through the mouse or keyboard, automatically adjust the excitation current, modify or set online parameters, improve the reliability and stability of the electrical automation system operation.

4. Application in Fault Diagnosis

When electrical equipment fails, there will be omens. Different omens will represent the occurrence of different accidents. Omens are generally divided into two kinds: nonlinear omens and uncertain omens.Therefore, before the occurrence of equipment failure, it is necessary to monitor

the omen, make a comprehensive judgment of the actual type of fault, and locate the fault to facilitate maintenance, which plays a very important role in the normal operation of equipment.The effective use of artificial intelligence technology can effectively locate and repair the faults existing in electrical equipment to ensure the stable operation and safety of equipment.At present, neural network, fuzzy logic and expert system in artificial intelligence technology are widely used in fault diagnosis of electrical equipment.For example, the transformer in the electrical system is the most important equipment, and the normal operation of the transformer plays a very important role in the power system. Therefore, transformer fault diagnosis has been a focus of research.

If artificial intelligence technology is used, the gas in the transformer can be effectively analyzed, and the transformer degree and fault type can be mastered. Therefore, the artificial intelligence technology in engine and generator fault cutting is actually used more widely.

4.1 The Data Analysis

Generally speaking, AI technology, as a branch of computer science, usually has powerful computing performance. Through comprehensive, comprehensive and high-precision data analysis, it can timely and accurately find and feedback faults, shorten the troubleshooting time of electrical system and enhance the effect of electrical control.

In terms of data analysis, the AI technology in essence from cloud computing, big data on the basis of development and become, can effectively accommodate the state parameter and processing of electrical system operation, but also can make use of its function of the fuzzy control, clarify the logical relationship between the various data, and then used to extract fault information in a large number of data exception parameters, and then based on this, make accurate diagnosis for the system failure, finally based on the diagnosis, with the aid of the automatic control function, fault repair to processing, at the same time will not be able to control repair fault early warning, further optimize the automation level of electrical control work.

4.2 Prevention and Control of Hidden Problems

In electrical fault diagnosis, workers can construct a rigorous logical control by virtue of the close connection between the AI control system and each electrical process control system, so that the automatic control system can complete complex control tasks and improve the efficiency of automatic control work.

In this process, the breakthrough point of the application of AI technology is electrical operation process control components to simplify, workers by AI technology to simplify the control elements, and can shorten the operation cycle control system, and then according to cumulative risk problem, analysis in advance, or the electrical system to evaluate the running state of anticipation, and accurate information extracting hidden trouble problem, at the same time, the technique, powerful data storage, processing power, can also be permanent memory, hidden information, fault information and build around fault diagnosis simulation framework of thinking, improve the efficiency of subsequent concerns prevention and control.

4.3 Improve the Effectiveness of Electrical Control

Artificial intelligence technology in electrical control plays a very important role, is secure and stable operation of the electric control system of the difficulties faced by many enterprises, and electric control for the operation control of the staff of the standard and normative have high requirements, and the operation control of the specific steps are more complex problems, therefore, experts and scholars in our country has been committed to continuously improve the level of the operation control of the electric control system.In the electrical control application of artificial intelligence technology, the use of automatic calculation and computer system, instead of the staff to complete some work, to the greatest extent to reduce the human error operation, greatly improve the accuracy of operation control.At the same time, the application of artificial intelligence technology in the electrical control system, the application of intuitive interface form, simplified the electrical system operation and control process, based on the computer network system, the realization of some links of the electrical system remote control operation.In addition, the real-time

storage of electrical control system important data and information, for the future query to provide convenience, artificial intelligence technology can automatically produce statements, reduce financial, material and human resources and other resources, effectively improve the accuracy and efficiency of the electrical control system.

The application of artificial intelligence technology in electrical control system mainly includes fuzzy control, neural network control, expert system control and so on. AC and DC transmission in electrical control system is realized by fuzzy control, and the conventional speed control is replaced by fuzzy controller to ensure the accuracy of electrical control.

5. Application of Electronic Automation Control in Manufacturing Field

5.1 Independent Division of Labor and Cooperation

In the history of the development of the mechanical manufacturing, electrical automatic control technology level directly affects the industry's overall production efficiency, therefore, people in order to further promote mechanization production, applying AI technology step by step in the manufacturing of electrical automation control, gives the mechanical equipment of autonomous collaboration ability, reduce the work intensity of the labor personnel at the grass-roots level.In this process, the utility played by AI technology is mainly reflected in the optimization of robot functions, enabling workers to achieve a high degree of automation of electrical control without programming, and optimizing the manufacturing efficiency of products.Siemens company research and development of robot arms, for example, workers with AI technology can build directly from the CAD/CAM model, make the robot can accurately know the model to the connotation of the production tasks, and accomplish a diverse array of product assembly and processing, achieve no programming of autonomous collaboration, improve the efficiency of the manufacturing machinery.

5.2 Break the Boundaries of Human Cognition and Knowledge

Under the AI technology, German Industry 4.0, American Industrial Internet, GE Predix, IBM PMQ have been born, forming a new manufacturing electrical automation control technology system, so that the technology can integrate IOT technology, sensor technology and other high-tech information technology, for the automatic control system to shape a high-quality learning system.In this process, because the traditional automatic system centered on human decision making, lack of reliable basis of perception, lead to the automation level will be subject to the conditions of human learning, thinking ability, so although the progress of the control system performance speed can keep up with the development of technology, but in the human learning speed is lower than the speed of technological progress, it is limited by the border of human cognition and knowledge.

However, the research and development of AI technology gives the electrical automatic control system a reliable perceptual basis and provides a quantifiable basis for the decision-making of the automatic control system.

6. Conclusion

Artificial intelligence technology is an emerging science and technology. Comparing with traditional methods, artificial intelligence technology can not only break through the limitations brought by traditional techniques, but also fully realize automation technology, retain the advantages of artificial methods, and ensure humanization characteristics in technical control.

With the continuous development and progress of modern science and technology, artificial intelligence technology has been widely used in social development. Most computer systems have used artificial intelligence technology to effectively deal with problems that cannot be dealt with in the production and operation of enterprises.

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