Application of Artificial Intelligence in Electrical Automation Control

Li Bo Yang[1*1]

[1] Guangdong University of Science & Technology, Dongguan, 523083, China

Abstract

With the development of modern science and technology, artificial intelligence technology has increasingly affected all aspects of people's lives, especially in the field of industrial electrical automation control, which has achieved good results. Artificial intelligence technology has changed the traditional technology mode and injected new force into the field of electrical automatic control. Firstly, this paper briefly expounds the artificial intelligence technology, and points out the value of artificial intelligence technology in electrical automation control. Then, combined with the value of the article, the application of artificial intelligence technology in electrical automation control is classified and explained, which provides a theoretical reference for future research in related fields.

Key words: artificial intelligence; automatic control; control application

1. Introduction

At present, the application of artificial intelligence technology has become more and more popular, which has been integrated into human daily production activities, and has an inestimable impact on various production fields. On the one hand, because of its high scientific value, it has become a new technology needed by the development of modern society; on the other hand, it has good application value in many industrial fields, especially in the automatic control of industrialization, and has irreplaceable auxiliary role. Zhu Guang, senior vice president of

[1] Corresponding Author. Tel.+(86)
*E-mail: 654337610@qq.com

Baidu, pointed out that in the next five to ten years, every industry will be deeply integrated with AI technology, and there will be some very large platform companies to provide better tools and algorithms to help every industry achieve AI change. The tide of artificial intelligence will give people more time to exert their imagination and creativity, and will better sublimate what machines can not replace. According to the "Research Report on Market Prospects and Investment Opportunities of China's Artificial Intelligence Industry in 2018-2023" published by China Business Industry Research Institute, the scale of China's Artificial Intelligence Market will reach 15.21 billion yuan in 2017, with a growth rate of 51.2%[1]. With the gradual maturity of artificial intelligence technology, the deepening of the layout of giants in science and technology, manufacturing industry and other industries, and the expanding application scenarios, it is expected that the scale of China's artificial intelligence market will break through the 20 billion yuan mark in 2018, reaching 23.82 billion yuan, with a growth rate of 56.6%.

2. Overview of Artificial Intelligence Technology

The rapid development of modern science and technology gives birth to artificial intelligence technology. As a new technology, artificial intelligence technology has been fully used in various fields of social development. Artificial intelligence technology is the result of the integration of computer technology and other disciplines. The root is that artificial intelligence technology is an intelligent tool based on human intelligence simulation, which replaces human beings for complex work. Analyzing the development process and results of AI technology at home and abroad, we can find that at present, the research of AI technology mainly focuses on expert system and robot system[2].The precision and complexity of human brain itself has become the biggest obstacle to the development of artificial intelligence technology, because artificial intelligence technology mainly simulates human brain to complete its work, but early simulation is difficult to achieve good results, but with the development of modern science and technology, these problems are increasingly overcome, and this simulation becomes possible. In addition, the artificial intelligence technology embedded in the simulation environment can greatly reduce human consumption, and improve the simulation accuracy and automation.

One fact needs to be clear is that the application of artificial intelligence technology has become a trend, but it does not show that the current artificial intelligence technology has matured. In other words, artificial intelligence technology is still in the development stage, there are still some problems that need to be improved and optimized.

3. Application of Artificial Intelligence Technology in Electrical Automation

Through the above value of AI technology in the process of electrical automation, we can find that AI technology has a wide range of applications in the process of electrical automation[3]. Next, the application of artificial intelligence technology in electrical automation is illustrated in five aspects: simplified process, fault diagnosis, electrical control, electrical equipment and daily operation.

3.1 Simplified Process

Electrical automation process is very complex, each step and link are closely linked, with a very strict sequence and requirements. Once a link or step has a problem, the whole process will have serious consequences. [4]. It is not wise to waste manpower, but the economic losses are even more serious. However, when artificial intelligence technology is applied to the process of electrical automation, the whole process can be simplified. For example, the fault situation, equipment repair, environmental detection and so on can be solved by artificial intelligence technology. The manual process is very simple, which greatly improves the efficiency of operators.

2.2 Fault Diagnosis

In the actual electric automation control process, many subjective and objective factors will cause equipment failure. For example, earthquakes, tsunamis, typhoons, humidity, improper operation, neglect of details and so on will have an unimaginable impact on the electrical automation control process. If these failures are dealt with timely and effectively, they will not cause further harm. But if these failures have not been effectively solved, it may cause greater security risks. The introduction of artificial intelligence technology not only makes the process of electrical

automation control much simpler, but also makes fault diagnosis faster. At present, in the process of electrical diagnosis, expert system, fuzzy theory and neural network are three common methods of fault diagnosis. If the three fault diagnosis methods are combined, the detection time will be greatly shortened and the detection results will be more accurate.

2.3 Electrical Control

Electrical control is the core link of the whole electrical automation process. It not only determines the operation speed and production efficiency of the electrical automation process, but also can control the whole electrical automation process comprehensively. After the introduction of artificial intelligence technology into the electrical control process, the electrical control process has become more scientific. In addition, the operation efficiency of the equipment has been greatly improved. Moreover, AI technology also effectively processes and controls information processing and production costs in the process of electrical control, making electrical control more efficient and scientific. The following is a brief introduction to the specific control methods of electrical control.

(1) Fuzzy Control

The theoretical basis of fuzzy control is the theory of fuzzy linguistic variables and fuzzy reasoning. Expert experience is the rule of fuzzy control technology. In the actual control process, the main tool of fuzzy control is the fuzzy controller, a closed-loop structure with feedback channels. The reasoning rule of the framework of fuzzy control system is based on the fuzzy logic, which combines the digital control system of computer control system[5].It is very professional and effective. Figure 1 below is the block diagram of the fuzzy control system.
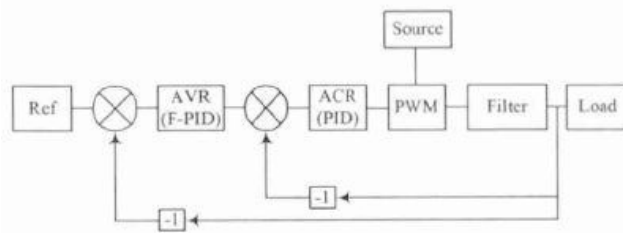

Figure. 1. Fuzzy control system

(2) Expert Control

The so-called expert control is based on the theory and experience of experts in related fields, combined with the relevant knowledge of electrical control to imitate some operations in this field. Accurately speaking, it refers to experience to grasp the control process. Expert control technology has many advantages: firstly, the adaptability and adjustability of expert control technology are very strong, and the controller parameters can be adapted in different situations; secondly, the control efficiency of expert control technology is very high, and it is very flexible to use, and can adapt to many different styles of controllers; thirdly, the safety and stability of the equipment of expert control technology. Qualitative analysis has a very comprehensive consideration, very safe and conservative.

(3) Network Neural Control

The theoretical basis of network neural control is the activity of human brain neurons, and the rules of human brain neurons provide a basic model for network neural control. Nowadays, there are many scholars in the field of network neural control, so the development speed of network neural control is very fast, and many achievements have been made. The research of network neural control develops very fast, which brings great good news to the application of electrical automation control. In order to provide readers with a deeper understanding of network neural control, this paper takes fuzzy control as an example to discuss. Specifically, the function of fuzzy control is mainly realized on the basis of DC and AC drive. In the process of DC transmission, its transmission control is Mamdani and Sueno, the former expresses speed control, the latter expresses trigger control. In the process of AC drive, the automatic control needs to be based on the fuzzy controller. Figure 4 below is a schematic diagram of the fuzzy controller.

(4) Electrical Equipment

Electrical equipment is generally complex, requiring operators to master a lot of knowledge and skills. In the process of designing electrical equipment, artificial intelligence technology can be used to simplify the system of electrical equipment and strengthen the application of artificial intelligence technology in electrical equipment. Using artificial intelligence technology, some parameters of electrical equipment can be set by computer, so that the operation speed of electrical equipment can be faster. Operators will also operate electrical equipment more smoothly.

(5) days regular operation

Electrical automation control is a process closely related to people's daily life, such as power grid control, data acquisition and so on. Take the power grid for example, the traditional daily operation is very complicated, not only the number of lines and equipment in the power grid is very large, but also the number of connected users is very large, which leads to a huge workload of operators. If artificial intelligence technology is adopted, some basic algorithms can be handed over to artificial intelligence technology, and the complex operation process can be simplified. And the operator does not have to go back and forth to collect and process data, just use the computer to supervise and remote control the electrical control process. In addition, AI technology can also simplify the computer's operating interface, backup data in time to prevent accidents. In the past, when manual data acquisition, there will inevitably be some errors. With the application of AI technology, AI technology can compile efficient forms to assist data collation, reduce the workload of operators and improve their work efficiency.

4. Conclusion

Modern society is a scientific and technological society, artificial intelligence technology and other scientific means will only be more and more popular, and will only be used more and more widely. Artificial intelligence technology not only helps to reduce manpower and material resources in the field of electrical automation control, but also reduces the consumption of time, reduces the production cost of enterprises, and improves the overall production efficiency of enterprises. Nowadays, there are many aspects of using artificial intelligence technology in the process of electrical automation, such as fault diagnosis, electrical equipment, simplified process, electrical control, daily operation, etc. Each process has become much simpler, and the level of electrical automation control in our country is constantly improving. In short, the application of artificial intelligence technology has made the electric automation control unprecedented development, and the future potential is incalculable.

5. Reference

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