Research on Electronic Automatic Control Technology Based on Artificial Intelligence Technology

Li Wen, Shasha Xu, Lingling Jiao, Jingna Cui

School of information and Commmunication National University of Defense Technology, Xi'an, China

Keywords: Artificial Intelligence; Electronic Automatic Control; Electronic Engineering

Abstract: The research of artificial intelligence mainly uses computer technology to simulate human's thinking, learning and reasoning and other intelligent thinking processes and behaviors. According to the principle of realizing computer intelligence, the computer is made into a design similar to human brain, and the high-level application of computer is realized. In this paper, AI technology is summarized, and the relationship between mechanical and electronic engineering and AI technology is analyzed. Finally, the application of AI technology is analyzed with the fault diagnosis of hot die forging press as an example. Innovations in the field of electrical automation control require the support of artificial intelligence, and the advantages of artificial intelligence in automation control can indeed be greatly enhanced in this field. The introduction of artificial intelligence technology into the field of electronic engineering, its simple operation page allows the electrical system to achieve remote control, greatly improving the production efficiency of the electrical system, and providing a guarantee for its safe operation.

1. Introduction

With the rapid development of China's economy, people's living standards have been greatly improved, but also led to the upgrading of China's industrial level. Under the guidance of the market, the competition mechanism is developing continuously and becoming more and more complete [1]. From traditional mechanical engineering direction to electromechanical engineering, and its automation level and intelligent level are constantly improving, entering a new stage of development and field of development, so the combination of artificial intelligence technology and mechanical and electronic engineering field has become a research hot spot [2]. The basic principle of artificial intelligence is a technical form of simulating and setting the form of human thinking and logical reasoning. Artificial intelligence is an advanced stage in the development of computer technology [3]. The active use of artificial intelligence's new results is undoubtedly conducive to the development of electronic automation disciplines, especially in the field of automatic control, and is also conducive to improving the intelligent level of electronic equipment operation, which is of great significance for accelerating production efficiency.

After years of research and development, artificial intelligence technology has matured, and electrical engineering automation has applied this technology. This practice not only has a significant effect in improving the automation efficiency of electrical engineering, but also enables enterprises to obtain higher economic benefits. [4]. Computer technology is also constantly developing along with the development and application of computers. However, in this development process, human beings have gradually realized that the human brain is the most advanced information analysis and processing instrument. The application of artificial intelligence technology has many advantages. It is not only the need of the development of computer information technology, but also the need of improving the efficiency of electronic engineering. At the same time, its rapid development also makes automation, digitalization, intelligence and other computer-aided technology related fields and research directions grow rapidly [5-6]. Combining the production and transmission links organically, reducing the investment of manpower and capital, forming a one-stop flow operation, is conducive to improving the production efficiency of the electrical system.

  DOI: 10.25236/iwmecs.2019.055

2. Methodology

In today's society, computer technology has penetrated into all aspects of production and life. The rapid development of computer programming technology has led to the rapid development of automated production, transportation and communication [7]. In artificial intelligence work, it mainly includes image recognition, natural language processing, robots and so on. Electrical engineering mainly focuses on the development and research of automatic control and information processing systems related to electrical engineering. Users input mechanical on-line monitoring data to the system through man-machine interface, and inference engine activates corresponding rules to get diagnosis results according to forward reasoning mechanism. The advantage of the artificial intelligence controller over the traditional controller is that it utilizes the AI function approximation. The advantage of this function controller over the conventional conventional controller is that it is easier to integrate the control system [8]. Their design does not require the control of the object model. In many cases, it is difficult to obtain the exact dynamic equation of the actual control object. The model of the actual control object often has many uncertain factors in the controller design.

The controller system consists of two major parts: hardware and software. The hardware part consists of a tag, a reader and an antenna. The software includes middleware and can also be defined as a computer unit. As shown in Figure 1.

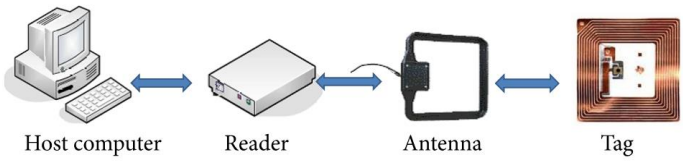

Fig.1. Controller system components

Figure 2 below shows the basic principle diagram of the composite fuzzy PI controller, which is the weight of the copper liquid, which is the difference between the set value and the measured value. The PID is a proportional integral derivative controller, which is used to measure the weight deviation. The deviation rate of change and the amount of control are normalized.

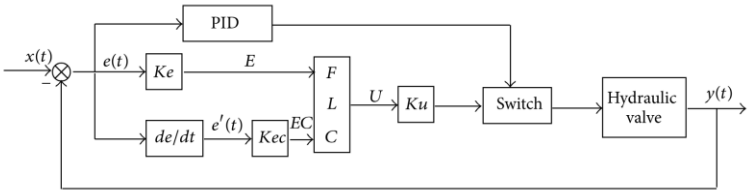

Fig.2. Basic schematic diagram of composite fuzzy PI controller

Electrical engineering automation intelligent technology is mainly used for fault diagnosis, optimization of electrical products and control of protective boxes. Because the optimization of electrical products is very complicated, not only advanced technology is needed, but also previous design experience needs to be integrated. In order to apply artificial intelligence very well, we must understand every control method in artificial intelligence, and can achieve "different things from time to time", according to different artificial intelligence, choose different control methods [9]. In the process of producing hot forging presses, some common serious faults are generated. There are many reasons for these faults. The hot die forging press fault diagnosis method combining rule reasoning and case reasoning can be used. In addition, rule base and membership function can be automatically and real-time determined in the process of fuzzification and de-fuzzification when using artificial intelligence controller to control electrical automation. They are easier to adjust than classical controllers. When expert knowledge is not required, they can also be designed by responding to data. However, the realization of automation control in electronic engineering can reduce the supervision of staff, reduce the pressure of staff, and improve work efficiency.

In fact, the performance of the controller can be improved by adjusting the relevant data of the controller. The database is used to store the basic parameters of the hot die forging press itself, the

state information in the production process of the hot die forging press, the intermediate data and statistical data obtained from the analysis [10]. The main goal is to use system technology to achieve stable solutions, and find the simplest topological structure scenario, self-learning fast. When the adaptive fuzzy neural controller is used, the rule base and membership function can be determined automatically and in real time in the process of fuzzification and de-fuzzification. There are many ways to implement this process. Electronic engineering automation intelligent technology is to improve the efficiency of work and reduce the work pressure of the staff, but in the actual application process, the application status of electronic engineering automation intelligent technology is not very satisfactory, and it is necessary to further improve the intelligent technology. As we all know, the adjustment ability of ordinary controllers is very poor, artificial intelligence makes up for this defect, reduces the control difficulty, and can better adapt to new information and data faster.

3. Result Analysis and Discussion

With the development of artificial intelligence technology, many colleges and universities and research institutes have carried out research work on the application of artificial intelligence in electrical equipment, and tried to apply advanced artificial intelligence technology to various fields of electrical systems to improve electrical automation. Level and productivity. The design of electrical equipment is a complex task. It requires not only the application of knowledge in circuits, electromagnetic fields, electrical appliances, etc., but also extensive use of empirical knowledge in design. Due to the complexity of technology in current electrical product optimization, electronic engineering automation control is difficult to implement, and intelligent technology is optimized according to the set program. Each kind of control has a specific object, so the control effect of this method is very good, but its shortcoming is also very obvious, that is, the flexibility is poor, for a control object, it can not do anything. Case-based reasoning (CBR) is used to infer the acquired information, and to find representative cases with high similarity to the current situation can be reused and search results can be obtained. If artificial intelligence is used in the fields of optimization design, fault prediction and diagnosis, control and protection of electrical products, more gratifying achievements will be achieved in the future with the further research in this field in China.

The relationship between the fault of electrical equipment and its symptoms is complex, uncertain and non-linear, and artificial intelligence method can give full play to its advantages. The application of electronic engineering automation intelligent technology is the embodiment of the development of science and technology, and also the need to promote the development of the entire electrical industry. With the maturity of artificial intelligence technology, its application fields are more and more extensive, and its role is more and more important. Especially in electrical engineering, its importance is beyond words. According to the case library established by the hot die forging press production fault, and the case library is retrieved, the matching degree between the old case and the new case is calculated, and one or more similar fault case sets are obtained. It not only applies the knowledge of circuits, electromagnetic fields, electrical appliances and other disciplines, but also extensively uses the empirical knowledge in the design to perfectly combine the functions of all aspects of electrical equipment to design an electrical device that meets operational needs. At present, the most common method for fault diagnosis of transformers is to analyze the gas decomposed in the transformer oil to determine the degree of fault of the transformer.

With the development of information technology, the information age has arrived, and people's lives and production methods have changed. Realizing information management is an important trend for social development. However, the relationship between the failure of electrical equipment and its symptoms is complex, uncertain and non-linear, and artificial intelligence can just take advantage of it. Different signs correspond to different faults, but these signs are characterized by diversity, uncertainty, and nonlinearity. Therefore, if the symptoms can be timely and accurately determined by the symptoms, the cause of the failure can be determined. This requires continuous

improvement of computer programming of automation intelligent technology to improve the work efficiency of the entire electronic engineering industry. Expanding the application field of automation intelligent technology is not only the need of information technology development, but also the need to improve the working environment of employees. With the development of computer technology, the design of electrical products has gradually changed from manual to computer aided design (CAD), which greatly shortens the product development cycle. With the introduction of artificial intelligence, the traditional CAD technology has become more and more popular.

4. Conclusions

The development of information technology has a very important impact on people's way of life and production. The application of information technology in production has improved work efficiency to a certain extent. The application of AI is embodied in problem solving, logical reasoning and theorem proving, natural language understanding, automatic programming, expert system, robotics and other aspects, which all embody an automatic feature. All these aspects embody the characteristics of automation and express a common theme, namely, to improve the consciousness of mechanical human beings and strengthen the automation of control. Theoretical and practical research shows that intelligent technology has been widely used in all aspects of mechanical systems, coupled with the rise of computer technology such as knowledge discovery and distributed artificial intelligence, making artificial intelligence more effective in mechanical systems and other fields. The use of artificial intelligence control can make electrical automation control safer and more efficient, provide protection for the grid system at the operational safety level, and also improve the efficiency of the grid system operation, and contribute greatly to the development of China's electric power industry.

References

[1] Wang, Quan G. Research on Artificial Intelligence Technology of Electrical Automation Control [J]. Applied Mechanics and Materials, 2014, 624:469-472.

[2] Jia W, Li Y, Qu R, et al. Automatic food detection in egocentric images using artificial intelligence technology[J]. Public Health Nutrition, 2018:1.

[3] Yu Y, Gu L L, Wu X Q. The Application of Artificial Intelligence in Ocean Development[J]. Advanced Materials Research, 2013, 864-867:2116-2119.

[4] Patnaik P R. Artificial intelligence as a tool for automatic state estimation and control of bioreactors [J]. Laboratory Robotics & Automation, 2015, 9(6):297-304.

[5] Liu, Ying H. Control System of Image Synthesis Based on Cluster Mathematical Model of K-Means Intelligent Computer [J]. Applied Mechanics and Materials, 2014, 543-547:2431-2434.

[6] Ogan A, Walker E, Baker R, et al. Towards Understanding How to Assess Help-Seeking Behavior Across Cultures [J]. International Journal of Artificial Intelligence in Education, 2015, 25(2):229-248.

[7] Kemp S E, Roach P A, Ware A J, et al. Artificial Intelligence for Automatic Container Stowage Planning Optimisation[J]. Ship Technology Research, 2003, 50(4):151-156.

[8] Singh S P, Prakash T, Singh V P, et al. Analytic hierarchy process based automatic generation control of multi-area interconnected power system using Jaya algorithm[J]. Engineering Applications of Artificial Intelligence, 2017, 60:35-44.

[9] E. A. Kol’chugina. Self-organizing software systems with distributed artificial intelligence[J]. Automatic Control\s&\scomputer Sciences, 2015, 49(4):216-220.

[10] Shi Y R, Tian Y T, Zhang L, et al. Joint non-linear model predict control for air-fuel ratio of SI engine[J]. Journal of Jilin University, 2014, 44(3):726-734.