Application of Intelligent Control Technology in Power System Automation

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Abstract：In recent years，with the rapid development of my country's economy，the public and corporate electricity consumption has increased year by year，which has brought greater challenges to the operation of the existing power system. Under the challenges of the new era，power companies must continue to improve the safety and robustness of power supply，and ensure the stability of power supply，in order to ensure the safety of users' power consumption. In the current environment of rapid development of electric power industry，power supply companies should reasonably use intelligent control technology to make power equipment more stable and automatic operation，so as to make the power equipment safer. This article focuses on the intelligent control technology of the power grid，and at the same time，the intelligent control technology methods and techniques are used in power equipment，and several strategies have been proposed.

Keywords：Power System；Intelligent Control Method；Smart Grid

With the increasing scale of domestic power grids，power companies have to adapt to the current market environment in which the demand for electricity in society is rapidly increasing，and companies must also adapt to the challenges of current grid development to their own reforms，so that the power grid operation capability has been significantly improved. The automatic operation level of power equipment has also been greatly improved，which has put forward stricter standards for the safe operation of the existing power grid. With the increase in the demand for electricity by enterprises and the public，power supply companies must ensure that the power grid operates more steadily and build an automatic intelligent control network. This is the new direction of the current development of the power industry，and it is also the trend of the development of the power industry.

1．Overview of intelligent control

Intelligent control is a new discipline evolved from automatic control and artificial intelligence technology. Intelligent control can obtain external information in the current system，so as to achieve the purpose of scientific control of uncontrollable elements in the power network. Intelligent control methods in power network include fuzzy control method，expert method，neural network method，genetic algorithm and so on. Fuzzy control method is based on human decision－making and reasoning to analyze existing data to achieve the purpose of control. Artificial neural network is based on the connection method of nerves in the human brain，and establishes a distributed parallel new network system.

The expert system method is an intelligent method that uses a computer program to write a large amount of knowledge. The general algorithm is to write the existing data information groups and individuals as objects，and use random types of technology to incorporate the program into the data space. Excellent intelligent system control will break away from the dependence on the model，not only has stronger adaptability，has the function of learning organization，but also can make judgments on the external environment and automatically acquire knowledge.

2. The use of intelligent control method in power system

2.1 Application of fuzzy method in power system

Fuzzy method theory tends to fuzzify the theory of set method, adding variables and logic to form fuzzy technology. Fuzzy technology is to simulate all links of similar people's reasoning and decision－making, and it is also a practical technology. Combining the pre－set management and control principles and obtaining data, fuzzy data input is used to derive fuzzy data output, including fuzzy reasoning and decision－making. With the development of fuzzy technology, the characteristics of fuzzy control have also been widely recognized. It is suitable for some problems caused by uncertainty, inaccuracy and noise. Fuzzy technology will use linguistic variables to integrate the expertise and experience of experts, which is closer to people's reasoning mode, so that it can also realize the application of knowledge. In recent years, the use and research of fuzzy technology in power systems has increased year by year, and higher－quality research and development results have been obtained. Through the use of fuzzy models, in general linear models in use, only the sub－optimal method can be used to fuzzy relations. The model can simulate a nonlinear process. This is a simple, more effective method and fuzzy relations. The model is relatively concise. And it can directly explain the relationship between input and output, which is easier to implement for output systems. However, it is more difficult to output data. In order to make up for the shortcomings, some current researches effectively integrate fuzzy technology with other intelligent technologies, and more research results have been obtained.

2.2 Application of expert system in power system automation control

Expert law developed relatively early and has developed relatively mature. This is also a type of intelligent technology. Within this technology, there will be a kind of knowledge base, reasoning and other content. The system also prevents domain experts from reasoning, simulating experts, and then making reasonable decisions to reach the technical level of experts. In the domestic power system, automation technology is still used to ensure the operation of the system. This technology can accumulate knowledge, but there is a lack of effective profit methods. Part of the model state parameters within the system can't be obtained quickly. This is no longer suitable for the complex requirements of the current power network. When expert technology is applied tothe power system, the future development direction of the power industry. With the development of expert technology, some systems are gradually put into use in the power network. Combined with the expression of related operating results, the application of the effect is also obvious, and it can enter the actual promotion process. However, due to the short running time of the system, there are still some problems. To improve the system operation, research will make the expert technology more complete. During the use of expert technology, reasoning will be restricted by some rules, and system problems can only be handled offline or online, which will not be able to achieve enhanced control of the system, so this aspect needs to be enhanced.

In recent years, with the upgrading of domestic expert systems, some systems have been gradually used in power systems, and through the analysis of expert systems and application interfaces, the application effects of expert systems are relatively significant, and they can enter the substantive promotion stage. The system investment time is relatively short, but it is still. There are some issues that need further research to make the expert system run more robustly.

The existing expert system has a weak coping ability and endurance ability to deal with some new emergencies. When the system fails or the system equipment changes errors, it is easy to produce some wrong codes. Therefore, the intelligent control technology used can take advantage of its powerfulautomated operation capabilities to make the expert system more efficient. After the expert system runs for a period of time, the amount of data inside the database increases, which also brings certain difficulties to the maintenance of the personnel database. Electric power companies must be more prepared for the construction of the expert system.

2.3 Artificial neural network for power system applications

Neural network is a way of simulating the neural processing of the human brain to transmit processing information. This method is similar to neuron information transmission, and it will form a complete control network within the system. Each neuron can realize data flow betweennon－linear connection, connection will

make the neural network have non－linear characteristics. Neural networks can achieve directional processing between neurons, as well as distributed storage, which has a stronger fault tolerance rate. Each neuron data calculation is independent, and it is more convenient to use, and the execution efficiency is faster. Therefore, the neural network has the ability of self－learning and the characteristics of associative memory. This function greatly improves the automation operation level of the power system. Neural network technology is also improving year by year, and the technology is more mature, there are still some problems to be dealt with when using, the learning time is longer, the algorithm calculation speed is slow, these need to be improved in the application, so as to make the technology more mature.

2. 4 Application of integrated intelligent system in power system automation control

The integrated intelligent system has stronger management and control capabilities, high level of intelligence, and its internal composition is more complex, including the intelligent control system and technology between the power networks. For the current electronic control system, it is still in the relatively early stage of development. The development of automatic technology has not stopped. The neural network system is connected to form a new system. The use of the current power network can optimize the operation of the power network system. The neural network can be applied to a new high－quality processing method to enhance the internal unstructured power network. Information processing method. Therefore, the beneficial fusion of neural networks and fuzzy methods has a solid foundation in technology fusion. The development focus of this technology is not the same. The former is more suitable for low－level mechanical calculations, and the latter is more suitable for solving non－statistical problems. Has more obvious practical significance.

3. Conclusion

In the current environment of rapid development of power networks, the use of intelligent control technology can help improve the intelligent level of power network operation. The use of intelligent control technology in the power network, the development will automatically learn to automatically deal with the function of the failure. In the current upgrade of the power grid system, the electric power company introduces expert technology artificial neural network and fuzzy technology, so that these technologies can be comprehensively used to form a complete set of intelligent control technology system, and establish a technical foundation for the intelligent management and control of the power system. In the future development of intelligent power system, there will be more intelligent technologies used in artificial intelligence judgment, intelligent control, etc. , and there is more room for research and development. Therefore, powercompanies need to increase investment in intelligent technology and research new types The fusion technology of smart technology and power grid.

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