THE APPLICATION OF A SIMPLE NEURAL NETWORK
FOR FAULT DIAGNOSIS SYSTEM

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ABSTRACT

The paper designs a new type of neural network model based on the attribute of a complex electric equipment fault diagnosis system according to a few fault of a typical equipment. We discussed the probability and accuracy of the method while using the model to simulate the system faults. The results indicate the validity and rationality of the method. It improves the accuracy of using the model to exclude fault diagnosis comparing to traditional methods. Work experience and expert knowledge are used sufficiently, which has great engineering application value in fault diagnosis area.

1 INTRODUCTION

With the developing complex and automatization of modern equipment, the equipment may turn up lots of faults because the effect of many avoidless factors. It will reduce or lose its prearranged function, even cause serious accident. Recently, in the course of the development of artificial intelligence, great advances have been made in the research on the expert system, which is successfully applied in many fields, such as advisory, diagnosis, education, forecast, design, management and so on. Especially many achievements have been acquired in fault diagnosis fields. However, the development of expert system meets with some serious restricts, for example, knowledge acquirement, memory mode, the agility of fitting new situation and tolerance of input information and so on. But these restricts are determined by expert system based on elicitation logic at present. It is impossible to break through these restricts by preserving intrinsic knowledge storage model. Artificial neural network provides a new approach to work out the problems. The neural network distributes expert knowledge and diagnosis examples and regards them as weights and bias by learning experience sample. Moreover, the information preserving character of neural network is utilized to complete uncertain reasoning and simulates the process of expert experience reasoning. Neural network is a new intelligent model and provides a new frame to create a fault diagnosis system.

The paper designs a new type of neural network model based on the attribute of a complex electric equipment fault diagnosis system according to a few fault of a typical equipment. We adopt a three-layer feedforward BP neural network model to simulate fault diagnosis system that has typical significance, and discussed the probability and correctness of the model while using the model to diagnose. In the course of using traditional method, some defects are proved by theory and practice, for example, the convergence of BP algorithm is slow, it is not a good way to determine the number of hidden nodes and so on. In order to improve the learning speed of BP neural network model and quicken the convergence of network, we adopt a method by dynamic adjusting learning speed and increase the inertia momentum. In the end, we simulate the fault diagnosis system. The simulation results indicate the validity and rationality of the model.

2 THE BP NEURAL NETWORK MODEL
diagnosis is 100% through analyzing the results from Table 2.

We select 2 groups actual diagnosis experiment data (see Table 3) to test the accuracy of the fault model. The 2 groups experiment data are given to network model and the results of BP network are shown in Table 4. According to the conversion rules from the output of neural network to fault, the output Y9 in the first group is the biggest and it approximates 1, so we regard Y9 fault (short between BG1 base and collector). The actual results prove that is right. The output Y5 in the second group is the biggest and approximates 1, so we judge Y5 fault (R4 open circuit). The fact proves that is R4 open circuit and the diagnosis is right.

5 RESULTS AND DISCUSSIONS

The paper puts forward a kind of fault diagnosis method based on neural network. Moreover, the structure parameters of network are improved by using a new algorithm. We adopt the algorithm technology to diagnose the given system. The results indicate the validity and rationality of the model and the method. Work experience and expert knowledge are used sufficiently, which has great engineering application value. It is proved by the actual results that the method has a good learning ability. It can effectively improve the structure of neural network and enhance the accuracy and speed of fault diagnosis. The training speed and accuracy of the new BP algorithm are better than traditional BP methods. The application of the new algorithm in neural network will promote the developing and progressing of artificial neural network. Therefore, it will provide broad foreground of the application of artificial neural network in fault diagnosis system.

REFERENCES


