Chapter 12

Intelligent Diagnosis and Maintenance

Nowadays, intelligent diagnosis for the complex system has been a forefront of issue. The application of the artificial-intelligent technology has made the dream of using men’s knowledge to diagnose the complex system, and improves it up to a new grade.

Traditional diagnosis is up to technical engineer experience to estimate equipment’s status, and make a judgment; this way has many limitations and little efficiency, with the increase of complexity of the equipment, there have to get some more effective methods.

In 1980s, some experts have researched on the diagnosis system using intelligent technology. With the development of computer and network technology, intelligent technology has better support platform. Experts have researched on different branches of diagnosis technology and used these ideas into diagnosis system (Wu J.P. & Xiao J.G., 1997).

As the developing of Internet, all equipments have been cyber and connected to network. More and more system is consists of multiple devices and have the characteristic of the distribution. In this case, remote diagnosis system gets more attentions because of its unmatched benefits. In the remote diagnosis system, the technology of multiple agent or called multi-agent often be used to resolve difficult diagnosis problems.

Intelligent diagnosis is the develop trend that could perform intelligent maintenance in a high level of efficiency. Researching on intelligent diagnosis and applying it have significant meaning.

Definition and development of diagnosis is introduced in this chapter firstly, which including different branch and fusing with other area. The advantage and shortage of different technology also be introduced. Then the remote diagnosis on network is discussed. The theory and development of Multi-agent based remote diagnosis technology is also presented. The trend and scene is been bring on finally.

INTRODUCTION

The fault diagnosis of equipments is from the military needs, with the development of micro-
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electronics technology, computer technology and sensory technology, mechanical equipment fault diagnosis technology has been more perfect and develops towards intelligence. Signal analysis of the various means had provided a good opportunity for the development of fault diagnosis technology (Wu J.P. & Xiao J.G., 1997).

The mode of equipment monitoring and diagnosis has a development process which is from single monitoring and diagnosis systems to distributed monitoring and diagnosis system (DMDS), and then to Web-based remote monitoring and diagnosis system. In recent years, the southern United States power companies, IN-LAND Iron and Steel Company, QUANTUM chemical companies, BENTLY companies have all developed their own network status monitoring and diagnosis (Zhou Z.D., 2004).

Definition of Fault Diagnosis

Fault diagnosis is that the system identifies some causes and features which lead to a functional fault in a certain circumstances, and make a judgment on where the fault state occurs. The basic idea is expressed in general like this: assume that the detected objects all status that may occur consist of a status space X. and its measurable features range consist of features space Y(Zhou Z.D., 2004).

When the system is in a status x, the system has a definite feature y. There is a existence of mapping: g: x → y. Instead, certain features also determine the definite status, namely, the existence of maps f: y → x. The purpose of fault diagnosis is to determine what the condition is basing on measurable characteristics of vectors of the system.

Fault diagnosis theory is a emerging discipline that is based on reliability theory, information theory, cybernetics, control theory, system theory. It used the modern testing equipment and computer technology as means, digesting various object special laws for its theory (Zhang Q.B.,1997). There is three parts, the research on Physical and chemical processes in fault diagnosis, the research on fault information discipline which is concerned with the collection, selection, processing and analysis of the fault signals, the research on the logic of diagnosis and mathematical principles, mainly uses logic methods, to figure next detecting part.

Along with manufacturing system’s development, the monitoring and diagnostic and maintenance technology is the main access to get information in the whole life cycle of manufacturing system, and its role is to ensure that the manufacturing operation of the system is safe, reliable and technical acceptable and make it meeting economic requirements.

Definition of Intelligent Diagnostic System

Intelligent diagnostic system is defined as a system which consists of man, device and software. It is aim to diagnosing identifying and predicting status of the diagnosed objective.

1. It’s an opening system and its capability is progressed in the process of application and interaction with environment.
2. It is a system consists of computer hardware and software. Unlike the traditional computer system, it has indefinite algorithm and procedure approach. According to requirement of diagnosis process, intelligent diagnosis system search and utilize the knowledge and experience of expert to diagnose.
3. It is an artificial intelligent system includes some hardware and software meanwhile is not limited in the traditional computer which has the limitation of local information storing and serial symbol dealing. With the development of ANN, diagnosis system adapt it and use the learning function of ANN, associating memory, distributed parallel information processing to solve the prob-
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