基于 SOM 神经网络的柴油机故障诊断算法设计

摘　　要

人工神经网络作为一种高逻辑性的处理技术，它可以被认为是一种健壮的算法，广泛应用于分类、分组、对齐、预测和压缩。此外，大学的研究和工程实践中常常使用该功能。

柴油机是在现代化生产中最常见的设备之一，主要服务于农业机械、石油钻井、船舶动力等领域。柴油机是大多数动力机械设备的核心，它通过给机械设备提供能量来驱动其工作，该设备的工作状态会直接影响设备的运行情况。但是柴油机有更为繁琐的总体架构，工作条件更加困难，增加了发动机故障的风险。全面的柴油机故障检测可以及时发现故障，有效地预测和消除故障，使柴油机用的时间能够相对延长。这样的功能对降低维护费用，避免重要事故等方面有着重要的经济意义。

30 多年来，随着诊断技术的不断提升，机器诊断技术也不断的在发展。起初因过程简单,机器的诊断主要依靠对所获得的资料和简单的机器维修专家感官缺陷,以及关于确定其故障原因都是主要根据以往积累的经验来进行的。然而，随着检测技术的发展，故障信号的采集越来越标准化和正确。近年来，各种类型的机器和诊断设备变得越来越复杂，正确分析接收到的信号是故障诊断的首要任务。此外，随着人工智能的出现，智能诊断可以模拟人的思维过程，从而大大提高了诊断的准确度。由此，便可使用 SOM 神经网络来进行柴油机故障的诊断，方便我们对故障进行后续处理。通过使用 SOM 神经网络进行无监督学习，可有效检测出柴油机的故障类型并实施分类。

关键词： SOM 神经网络；拓扑结构；竞争网络；柴油机故障检测

Abstract

In the information processing technology class, there is a technology very similar to human neural system, which is called artificial neural network. As a high logical processing technology, it can be considered as a robust algorithm, widely used in classification, grouping, alignment, prediction and compression. In addition, this function is often used in university research and engineering practice.

As a high logical processing technology, it can be considered as a robust algorithm, and its operation status directly affects the working status of the equipment. However, the diesel engine has a more complicated overall structure and more difficult working conditions, which increases the risk of engine failure. Comprehensive fault detection of diesel engine can find faults in time, effectively predict and eliminate faults, improve the safety of diesel engine, and extend the service life of diesel engine. Such functions are of great economic significance to reduce maintenance costs and avoid major accidents.

Over the past 30 years, with the continuous improvement of diagnostic technology, machine diagnosis technology is also constantly developing. At first, due to the simple process, the machine diagnosis mainly relies on the acquired data and simple machine maintenance expert sensory defects, as well as on the determination of the cause of its failure are mainly based on accumulated experience. However, with the development of detection technology, fault signal acquisition becomes more and more standardized and correct. In recent years, various types of machines and diagnostic equipment have become more and more complex, and the correct analysis of received signals is the primary task of fault diagnosis. In addition, with the advent of artificial intelligence, intelligent diagnosis can simulate human thinking process, thus greatly improving the accuracy of diagnosis. Thus, SOM neural network can be used to diagnose the diesel engine fault, so as to facilitate the follow-up treatment of the fault. By using SOM neural network for unsupervised learning, fault types of diesel engines can be detected and classified effectively.

Key Words: SOM neural network ; Topological structure ; Competitive network ; Diesel engine fault detection