

晋永刚, 孟志鹏, 陆明. 基于双树复小波包变换和SVM的滚动轴承故障诊断方法[J]. 航空动力学报, 2014, 29(1): 67~73

基于双树复小波包变换和SVM的滚动轴承故障诊断方法

Fault diagnosis method of rolling bearing based on dual-tree complex wavelet packet transform and SVM

投稿时间: 2012-11-27

DOI: 10.13224/j.cnki.jasp.2014.01.009

中文关键词: [故障诊断](#) [滚动轴承](#) [双树复小波包变换](#) [支持向量机](#) [故障识别](#)

英文关键词: [fault diagnosis](#) [roller bearing](#) [dual-tree complex wavelet packet transform](#) [support vector machine \(SVM\)](#) [fault identification](#)

基金项目: 国家自然科学基金(51075009); 北京市优秀人才培养资助计划(2011D005015000006); 北京市教委科研计划(KM201310005013); 北京市属高等学校青年拔尖人才培养计划; 北京工业大学基础研究基金

作者	单位
晋永刚	北京工业大学 机械工程与应用电子技术学院 先进制造技术北京市重点实验室, 北京 100124
孟志鹏	北京工业大学 机械工程与应用电子技术学院 先进制造技术北京市重点实验室, 北京 100124
陆明	北京工业大学 机械工程与应用电子技术学院 先进制造技术北京市重点实验室, 北京 100124

摘要点击次数: 115

全文下载次数: 157

中文摘要:

针对滚动轴承故障振动信号的非平稳性和现实中难以获得大量典型故障样本的情况, 提出一种基于双树复小波包变换和支持向量机(SVM)的故障诊断方法. 首先通过双树复小波包变换将非平稳的振动信号分解得到不同频带的分量; 然后对每个分量求其能量并归一化处理; 最后将从各个频带分量中提取的能量特征参数作为支持向量机的输入来识别滚动轴承的故障类型. 对试验台模拟信号(包括滚动轴承的正常状态、外圈裂纹故障、内圈裂纹故障和滚动体点蚀故障)的分析表明: 该方法对所测试验信号的故障识别率达到99.5%, 对比传统小波包变换与SVM结合的方法, 故障识别率的准确度更高.

英文摘要:

For the problem of non-stationary signals of rolling bearing and the difficulty to get a large number of typical fault samples in practice, a fault diagnosis method was proposed based on dual-tree complex wavelet packet transform and support vector machine (SVM). Firstly, the non-stationary fault vibration signal was decomposed into several different frequency band components through dual-tree complex wavelet packet transform; secondly, normalization processing was made from the energy of each component. Finally, the energy characteristics parameters of each frequency band component were taken as input of the SVM to identify the fault type of rolling bearing. The analog signals of experiments, containing normal condition of the rolling bearing, crack fault of bearing outer ring, crack fault of bearing inner ring and pitting fault of bearing rolling element, were analyzed and the fault recognition rate reaches 99.5%. The proposed method can identify the working state and fault type of rolling bearing accurately and effectively, as compared with the method of combining traditional wavelet packet transform with SVM.

[查看全文](#) [查看/发表评论](#) [下载PDF阅读器](#)