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### 基于循环统计量的直升机齿轮箱轴承故障早期检测

陈仲生, 杨拥民, 胡政, 沈国际

国防科技大学 机电工程研究所 341室, 湖南 长沙 410073

### Early Detection of Bearing Faults in Helicopter Gearbox Based on Cyclic-Statistics

CHEN Zhong-sheng, YANG Yong-min, HU Zheng, SHEN Guo-ji

Faculty 341, Institute of Mechatronics Engineering, National University of Defence Technology, Changsha 410073, China

摘要

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**摘要** 在分析齿轮箱振动信号的基础上,提出了基于循环统计量的轴承故障早期检测方法,阐述了表征故障的一维和二维循环平稳特征。该方法利用信号与噪声具有不同循环频率的特性实现了信噪分离,能够比较容易地从复杂背景中提取出微弱的特征信息。最后在某型直升机齿轮箱轴承故障的早期检测中进行了实验验证。结果表明,该方法优于功率谱和解调分析,能够提取故障的早期特征。

**关键词:** 直升机齿轮箱 故障检测 循环统计量 循环频率 谱相关密度函数

**Abstract:** On the basis of analyzing gearbox signals, one novel method of detecting early bearing faults based on cyclic-statistics is presented. Then one-dimensional and two-dimensional cyclostationary features of faults are put forward and they can be used to separate useful signals from noise and detect weak faults easily. In the end the proposed method is used to detect early bearing faults in one helicopter gearbox and the results demonstrate that it is superior to power spectrum density (PSD) and demodulation analysis and can be used to extract early fault features.

**Keywords:** helicopter gearbox fault detection cyclic-statistics cyclic frequency spectrum correlation density function(SCDF)

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