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### 应用

## 基于重采样技术的声学信号多普勒畸变校正

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### 摘要:

采用基于道旁的声学信号来分析列车滚动轴承故障的方法是该领域故障诊断发展的主要方向, 但拾音器和声源的相对运动造成的多普勒效应使得声学信号的频谱发生了畸变, 从而无法准确地反映设备状态。目前还没有合适的校正多普勒效应带来的频谱畸变的方法, 而信号畸变的校正又是列车滚动轴承声学故障诊断的关键所在。本文提出一种等频偏重采样方法, 首先通过外部条件获得信号频偏变化曲线, 其次选择合适的参数对该曲线按频偏等分处理, 选取每段的频偏基准点, 最后重采样后得到校正后信号, 从而解决了列车滚动轴承声学信号多普勒畸变问题, 并通过仿真实验验证了该方法的有效性。

关键词: 多普勒畸变; 等频偏; 重采样; 声信号; 故障诊断

## Doppler shift correcting for acoustic signals using resampling technique

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### Abstract:

To on-line diagnose faults of train bearings, the wayside approach based on acoustic signal analysis is one of the most important development directions in this filed. However, the Doppler Effect due to relative motion between microphone and acoustic source would cause the acoustic signal spectrum distorted, which is not beneficial to accurately reflect health conditions of equipment. Now there is not an appropriate method to correct the Doppler shift although this is a key technique in acoustic fault diagnosis. The paper proposes a signal resampling method based on uniform frequency shift, which can effectively solve the above problem of distorted spectrum for acoustic signals of train bearings caused by the Doppler Effect. Firstly, the curve of frequency shift was figured out with known conditions under measurement; secondly the frequency shift curve was used to divide the acoustic signal to be N local segments by suitable parameter; lastly the resampling technique was conducted in every segment after finding each segment point of resample. The effectiveness of the proposed method is verified by simulation and experiment.

Keywords: Doppler shift uniform frequency shift resampling acoustic signal fault diagnosis

收稿日期 2012-04-24 修回日期 2012-06-14 网络版发布日期 2012-09-25

DOI:

基金项目:

国家自然科学基金(编号: 51005221和51075379)

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