

论文

基于改进EMD的多绳摩擦提升机载荷信息特征提取

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摘要:

为解决多绳摩擦提升机有效提升载荷的间接识别问题, 提出了一种基于振动信号分析处理的特征提取方法。该方法以主轴装置轴承处水平振动信号为对象, 利用改进的经验模式分解 (EMD) 方法将振动信号分解为若干有效固有模态函数 (IMFs), 改善了经典EMD方法模态混叠与端点效应现象, 选取各阶IMF的能量、方差贡献率与能量矩作为特征值, 探讨了特征值与提升机有效载荷之间的内在联系。结果表明, 该方法中分析信号的获取不改变提升机主轴系统结构, 不影响提升机正常运行, 易于实现长期在线监测, 便于大量基础数据的采集, 为提升载荷定量识别积累了样本数据。所选取的3个特征值从大小、权重及分布的角度较好地反映了提升载荷特征信息。

关键词: 改进EMD; 提升载荷; 特征提取; 振动分析

Feature extraction for hoisting load of multiple rope friction hoist based on improved EMD

Abstract:

In order to indirectly identify the payload of multi-rope friction hoist, a feature extraction method was proposed based on analysis of horizontal vibration signal which was collected from bearing caps of spindle device. Firstly, improved empirical mode decomposition(EMD) that can restrain the mode mixing phenomenon and reduce the boundary effect was used to decompose the signal into several intrinsic mode functions(IMFs), then the energy, contribution rate of variance and energy moment of IMFs were calculated as characteristic parameters. The intrinsic relationship between the characteristic parameters and the payload of hoist were discussed. The method of signal acquisition didn't change the structure of spindle system and had no effect on normal operation of hoist. A long-term online monitoring was apt to accomplish, the basic data was easy to obtain, furthermore, a large amounts of sample datum were accumulated for quantitative identification of actual load. It is shown that the characteristic parameters proposed could sensitively reflect the load characters in terms of magnitude, weight and distribution.

Keywords: improved EMD; hoisting load; feature extraction; vibration analysis

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