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基于集合经验模态分解敏感固有模态函数选择算法的滚动轴承状态识别方法

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Condition Recognition Method of Rolling Bearing Based on Ense Decomposition Sensitive Intrinsic Mode Function Selection Alg

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摘要 参考文献 相关文章

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摘要 为了更有效地提取滚动轴承各状态振动信号的特征，该文提出了一种基于集合经验模态分解(EEMD)的敏感固有模态函数(IMF)选
该算法对振动信号经EEMD分解后得到的固有模态函数采用峭度值、相关系数相结合的方法自动提取其敏感分量，以此获得振动信号的
征。再运用奇异值分解和自回归(AR)模型方法得到滚动轴承各状态振动信号的特征向量，并将其输入到改进的超球多类支持向量机中进
别，从而实现滚动轴承的正常状态，不同故障类型及不同性能退化程度的各状态识别。实验结果表明，相比基于经验模态分解结合自回
奇异值分解的特征提取方法，该方法可更有效地提取滚动轴承故障特征信息，且识别精度更高。

关键词： 信号处理 状态识别 非平稳信号 集合经验模态分解(EEMD) 敏感固有模态函数(IMF)

Abstract： In order to extract effectively the characteristics of each condition vibration signal for rolling bearing, sensitive Intrinsic Mode Function (IMF) selection algorithm which based on Ensemble Empirical Mode Decomposit (EEMD) is proposed. First, for obtaining the initial characteristics of the vibration signal, the vibration signal is decomposed by using EEMD, and the sensitive components of obtained IMFs are extracted automatically by usin kurtosis combined with correlation coefficient. Then, the feature vectors of each condition vibration signal of rolli bearing are obtained by using Singular Value Decomposition (SVD) and AutoRegressive (AR) model. The obtaine vectors are regarded as the input of the improved hyper-sphere multi-class Support Vector Machine (SVM) for int recognition. Thereby, the condition recognition of normal state, different fault types and different degrees of performance degradation of rolling bearing can be achieved. The experimental results show that, the proposed can effectively extract fault characteristics information of rolling bearing more than EMD combined with AR model EMD combined with SVD method, and the recognition rate is higher.

Keywords： Signal processing Condition recognition Nonstationary signal Ensemble Empirical Mode Decomp (EEMD) Sensitive Intrinsic Mode Function (IMF)

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