

车辆振动信号的特征提取方法比较

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摘要 针对用于车辆振动信号分析的常用方法: 小波分析方法和Hilbert-Huang变换方法, 以及作者新近提出的时序多相关-经验模式分解方法, 通过仿真对比分析了它们各自的特点以及它们在振动信号特征提取中的适用性。非线性信号的仿真分析表明, 在没有噪声或分析对象背景噪声较小的情况下, 后两种方法能提取到特征信号, 小波分析不适合非线性信号的分析; 在强背景噪声下, 前两种方法均不能得到满意的特征信息, 而时序多相关-经验模式分解方法能提取到所需的目标信息。最后将时序多相关-经验模式分解方法用于某特种车辆特征信号的提取, 得到了满意的结果, 验证了该方法在车辆振动信号特征提取中的有效性。

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Comparison of feature extraction methods of vehicle vibration signal

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Abstract The vibration signals of a vehicle always carry the dynamic information of the vehicle. These signals are very useful for the health monitoring and fault diagnosis. However, in many cases, because these signals have very low signal-to-noise ratio (SNR), to extract feature components becomes difficult and the applicability of information drops down. The characters of feature extraction of vibration signal were compared, among the two popular methods named wavelet analysis (WA) and Hilbert-Huang translation (HHT) and the multi-correlation of time series and empirical mode decomposition (MCTS-EMD), via simulation. And the applicability of them was analyzed using the simulation signal. The HHT and MCTS-EMD can extract the feature signal in no interference of noise or the SNR is a large number, while the WA is not suit for the feature extraction of nonlinear signal. In the strong background noise, the WA and HHT can not work well, contrasting them; the MCTS-EMD can extract the wanted object information. At last, The MCTS-EMD method was used to extract the feature signal of some special vehicle, a satisfactory result can be get, this validity of MCTS-EMD was validated in the feature extraction of vehicle vibration signal.

Key words [information processing](#); [vibration signal](#) [feature extraction](#) [wavelet analysis](#) [Hilbert-Huang translation](#) [multi-correlation of time series](#) [empirical mode decomposition](#)

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