

形态非抽样小波在主减器振动特征提取中的应用 Feature Extraction Methods of Vibration Signal in Automobile Main Reducer Based on Morphological Un-decimated Wavelet

林勇 杨友东 刘健

浙江工业大学

关键词: 故障诊断 特征提取 主减器 形态小波 非线性 Hilbert包络

摘要: 针对形态小波分解过程的抽样引起信号长度逐层递减的问题, 提出一种基于多尺度形态开闭级联滤波的形态非抽样小波构造方法。利用形态非抽样小波的一般框架, 采用形态开闭级联滤波作为形态非抽样小波分解的近似信号的分析算子, 使形态小波分解过程中信号长度保持不变, 从而保证了形态分析时所需的信息量。主减器振动信号特征提取试验验证了该方法能够有效提取非线性振动信号的特征, 较原形态非抽样小波和线性小波有更好的滤波效果, 较Hilbert包络方法有更好的解调效果。In order to explore methods that can process effectively nonlinear signals, the nonlinear wavelet, morphological wavelet (MW) was introduced into the field of vibration signal processing. Because of the decline of decomposition signal layer by layer, one kind of morphological un-decimated wavelet construction method based on the cascade of morphological opening and morphological closing was proposed. According to the general structure of morphological un-decimated wavelet (MUDW), the filtered signal, filtering by the cascade of morphological opening and morphological closing, constructed the approximate signal, and detail signal was equal to the original signal subtract the approximate signal. Obviously through the process of decomposing, the approximate signal or detailed signal of current layer and low level layer had the same data length to avoid information leaking and provide enough information for signal processing. The method was used in the feature extraction of vibration signal in automobile main reducer. Results showed that the mentioned MUDW had better filtering effect than the existing MUDW and linear wavelet (sym8 wavelet), and it also had better demodulation effect than Hilbert envelope analysis. The mentioned MUDW can extract the feature from nonlinear vibration signal effectively and have good application value.

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