

形态小波降噪方法在齿轮故障特征提取中的应用 Application of Morphological Wavelet De-noising in Extracting Gear Fault Feature

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关键词: 故障诊断 齿轮 特征提取 形态小波 软阈值降噪

摘要: 针对齿轮故障特征往往被强背景噪声淹没的问题, 采用形态小波降噪方法来提取故障特征。形态小波降噪方法适合于对具有一定形态特征的齿轮故障信号进行特征提取。首先采用形态小波对信号进行分解, 然后对各层的细节系数进行软阈值降噪处理, 最后根据处理得到的小波系数重构信号以提取故障特征。仿真与实例证明, 该方法可有效地提取隐含在噪声中的齿轮故障特征。形态小波降噪算法只涉及加减和极大、极小运算, 运算简单且执行高效, 适合于齿轮故障的在线监测与诊断。 Fault feature is always hidden by strong noise background in gear fault signal. Based on morphological wavelet de-noising, a novel method was proposed to extract gear fault feature. Morphological wavelet de-noising has a good performance in extracting morphological feature in signal. Firstly, the signal was decomposed by morphological wavelet. Secondly, detail coefficient in each level was processed using soft threshold de-noising. Finally, fault feature was extracted by reconstructing original signal. Simulation and experiment results showed that this method is effective in gear feature extraction. Morphological wavelet de-noising algorithm includes addition, subtraction, maximum and minimum operations, and does not involve multiplication and division. It is suitable for on-line monitor and gear fault diagnosis.

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