Blade Fault Diagnosis Using Empirical Mode Decomposition Based Feature Extraction Method

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Abstract

Blade fault diagnosis had become more significant and impactful for rotating machinery operators in the industry. Many works had been carried out using different signal processing techniques and artificial intelligence approaches for blade fault diagnosis. Frequency and wavelet based features are usually used as the input to the artificial neural network for blade fault diagnosis. However, the application of others time-frequency based feature extraction technique and artificial intelligence approach for blade fault diagnosis is still lacking. In this study, a novel blade fault diagnosis method based on ensemble empirical mode decomposition and extreme learning machine was developed. Bandpass filtering was applied to the raw vibration signals and integrated with the high pass filter to obtain the velocity signal. Synchronous time averaging was then applied to the velocity signals. Three ensemble empirical mode decomposition based feature extraction methods were proposed: direct statistical parameters extraction, intrinsic mode functions averaging statistical parameters extraction and features averaging statistical parameters extraction. The effectiveness of different feature vector sets for blade fault diagnosis was examined. Feature vector set of intrinsic mode functions averaging statistical parameters extraction was found to be more effective for blade fault diagnosis. With the novel proposed method, blade fault diagnosis could be more accurate and precise.