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# Adaptive parameterless empirical wavelet transform based time-frequency analysis method and its application to rotor rubbing fault diagnosis

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**Abstract:** Empirical wavelet transform (EWT) is a novel method for analyzing the multi-component signals and is proposed based on the classical wavelet transform. To fulfill an adaptive separation of Fourier spectrum in EWT, the adaptive parameterless EWT (APEWT) method is proposed in this paper. To overcome the shortcomings of Hilbert transform in estimating the instantaneous frequency and amplitude, a quadrature derivative based normalized Hilbert transform (QDNHT) is put forward. In this paper the proposed time-frequency analysis method consisting of APEWT and QDNHT are compared with empirical mode decomposition (EMD), ensemble empirical mode decomposition (EEMD) and local characteristic-scale decomposition (LCD) and the comparison results have demonstrated the effectiveness of the proposed method. Finally, the proposed method is applied to the fault diagnosis of rotor system with local rubbing and the analysis results of experiment data indicate that the proposed method could effectively fulfill the fault diagnosis of rotor rubbing and show a better effect than EMD and EEMD methods.

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