

Rolling Bearing Faults Diagnosis Based on Empirical Mode Decomposition: Optimized Threshold De-noising Method

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Abstract— The faults of rolling bearings frequently occur in rotary machinery, therefore the rolling bearings fault diagnosis is a very important research project. The vibration signal is usually noisy and the information about the fault in the early stage of its development can be lost. A threshold de-noising method based on Empirical Mode Decomposition (EMD) is presented in this paper. Firstly, the signal is decomposed into a number of IMFs using the EMD decomposition. Secondly the algorithm based on the energy to determine the trip point is designed for IMF selection, then, by comparing the energy of the selected IMFs with excluded IMFs, singular selected IMFs are treated with soft threshold function, and finally the de-noised signal is obtained by summing up the selected IMFs, it is proved that the best IMFs can be summed up and properly de-noised by the proposed method. The results show the effectiveness of the proposed technique in revealing the bearing fault impulses and its periodicity and amelioration the sensibility of scalar indicator for real rolling bearing vibration signals.

Keywords—*bearing fault detection; EMD; threshold Denoising; IMF selection; Singular IMF.*