

Abstract

Hilbert-Huang Transform (HHT) has been renowned for its capacity to reveal fault indicating information issue from vibration signals. It uses Empirical Mode Decomposition (EMD) to decompose a signal accordingly to its contained information into a set of Intrinsic Mode Functions (IMFs). Then, the instantaneous frequencies are performed of each IMF using Hilbert Transform (HT). However, the HHT has some disadvantages which are caused by the EMD technique. The EMD has the mode mixing problem that may occur between IMFs, it causes the End Effect phenomenon, which leads to a wrong instantaneous values at both sides of the signal. Furthermore, its lack of mathematical basis. To overcome the HHT inherent problems, we propose the use of the Empirical Wavelet Transform (EWT) which designs an appropriate wavelet filter bank fully depends on the processed signal with HT in the early detection and condition monitoring of tooth crack fault. In this paper, we develop a dynamic model describing a single stage spur gear in normal and abnormal functioning. Results of analyzing the pinion's vibration displacement show that the proposed approach denoted (HEWT) successfully detect the tooth crack at a much earlier stage of damage development even though in noisy environment. Performance evaluation and comparison between HEWT and HHT methods show that the HEWT is better sensitive to tooth crack fault detection in gearbox systems.