World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:9, No:08, 2015

Analysis and Modeling of Vibratory Signals Based on LMD for Rolling Bearing Fault Diagnosis

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Abstract : The use of vibration analysis has been established as the most common and reliable method of analysis in the field of condition monitoring and diagnostics of rotating machinery. Rolling bearings cover a broad range of rotary machines and plays a crucial role in the modern manufacturing industry. Unfortunately, the vibration signals collected from a faulty bearing are generally non-stationary, nonlinear and with strong noise interference, so it is essential to obtain the fault features correctly. In this paper, a novel numerical analysis method based on local mean decomposition (LMD) is proposed. LMD decompose the signal into a series of product functions (PFs), each of which is the product of an envelope signal and a purely frequency modulated FM signal. The envelope of a PF is the instantaneous amplitude (IA) and the derivative of the unwrapped phase of a purely flat frequency demodulated (FM) signal is the IF. After that, the fault characteristic frequency of the roller bearing can be extracted by performing spectrum analysis to the instantaneous amplitude of PF component containing dominant fault information. the results show the effectiveness of the proposed technique in fault detection and diagnosis of rolling element bearing.

Keywords : fault diagnosis, local mean decomposition, rolling element bearing, vibration analysis
Conference Title : ICRME 2015 : International Conference on Robotics and Mechanical Engineering
Conference Location : Paris, France
Conference Dates : August 27-28, 2015