웨이브렛변환을 이용한 기어결함의 진단

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The Detection of Gear failures Using Wavelet Transform

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Key Words : Wavelet Transform, DWT, CWT, Denoise, Fourier Transform, local defect, GMF

Abstract : This paper presents that the Wavelet Transform can be used to detect the various local defects in a gearbox. Two types of defects which are broken tooth and localized wear, are experimented and the signals are collected by accerometer and acoustic sensors and analyzed. Because of the complecity of the signals acquired form sensors, it is needed to identify the interesting signal. The natural frequencies of shafts and the gear mesh frequency(GMF) is calculated theretically. DWT, CWT and the Denoise Method are applied to extract a gear-localized defect feature from the vibration signal of the gearbox with the defective gear. The results shows the transform is more effective to detect the failures than the Fourier Transform.

충격 햄머 실험에서 다자유도 주파수 응답 스펙트럼의 개선

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An Enhancement of Multi-Dof Frequency Response Spectrum from Impact Hammer Testing

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Key Words : Impact Hammer Test(충격햄머시험), Impulse Response Spectrum(충격응답스펙트럼), Frequency Response Function(주파수응답함수), Record Length(신호획득시간), Leakage Error(누설오차), Finite Record Length Error(유한획득시간오차), Optimization Method(최적화방법)

Abstract : The spectrum of impulse response signal from an impulse hammer testing is widely used to obtain frequency response function(FRF) of the structure. However the FRFs obtained from impact hammer testing have not only leakage errors but also finite record length errors when the record length for the signal processing is not sufficiently long. The errors cannot be removed with the conventional signal analyzer which treats the signals as if they are always steady and periodic. Since the response signals generated by the impact hammer are transient and have damping, they are undoubtedly non-periodic. It is inevitable that the signals be acquired for limited recording time, which causes the finite record length error and the leakage error. In this paper, the errors in the frequency response function of multi degree of freedom system are formulated theoretically. And the method to remove these errors is also suggested. This method is based on the optimization technique. A numerical example of 3-dof model shows the validity of the proposed method.