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# Time-Frequency Modelling and Analysis of Faulty Rotor

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**Abstract :** In this paper, de Laval rotor system has been characterized by a hinge model and its transient response numerically treated for a dynamic solution. The effect of the ensuing non-linear disturbances namely rub and breathing crack is numerically simulated. Subsequently, three analysis methods: Orbit Analysis, Fast Fourier Transform (FFT) and Wavelet Transform (WT) are employed to extract features of the vibration signal of the faulty system. An analysis of the system response orbits clearly indicates the perturbations due to the rotor-to-stator contact. The sensitivities of WT to the variation in system speed have been investigated by Continuous Wavelet Transform (CWT). The analysis reveals that features of crack, rubs and unbalance in vibration response can be useful for condition monitoring. WT reveals its ability to detect non-linear signal, and obtained results provide a useful tool method for detecting machinery faults.

**Keywords :** Continuous wavelet, crack, discrete wavelet, high acceleration, low acceleration, nonlinear, rotor-stator, rub
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