ESTIMATION OF CORRELATION FUNCTIONS BY THE RANDOM DECREMENT TECHNIQUE

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Abstract

The Random Decrement (RDD) Technique is a versatile technique for characterization of random signals in the time domain. In this paper a short review of the theoretical basis is given, and the technique is illustrated by estimating auto-correlation functions and cross-correlation functions on modal responses simulated by two SDOF ARMA models loaded by the same bandlimited white noise. The speed and the accuracy of the RDD technique is compared to the Fast Fourier Transform (FFT) technique. The RDD technique does not involve multiplications, but only additions. Therefore, the technique is very fast - in some case up to 100 times faster that the FFT technique. Another important advantage is that if the RDD technique is implemented correctly, the correlation function estimates are unbiased. Comparison with exact solutions for the correlation functions show that the RDD auto-correlation estimates suffer from smaller estimation errors than the corresponding FFT estimates. However, in the case of estimating cross-correlations functions for stochastic processes with low mutual correlation, the FFT technique might be more accurate.

IMPROVED FREQUENCY RESPONSE FUNCTION ESTIMATION BY DATA DEPENDENT SYSTEMS

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ABSTRACT

This paper presents a method for frequency response function (FRF) estimation based on modeling of the measured input and output time domain data by Data Dependent Systems (DDS) methodology. The modal parameters and FRF can be evaluated directly from the model parameters, so modeling or curve-fitting in frequency domain is not needed. This method also has the advantages of better resolution, no leakage, less data needed and especially less bias errors, compared to the normal FFT based methods. The method can be readily applied to multi-input multi-output (MIMO) cases by vector models. Some examples are given to illustrate the advantages of the method