

Cyclostationary Gaussian Linearization for Analyzing Nonlinear System Response Under Sinusoidal Signal and White Noise Excitation

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Abstract : A cyclostationary Gaussian linearization method is formulated for investigating the time average response of nonlinear system under sinusoidal signal and white noise excitation. The quantitative measure of cyclostationary mean, variance, spectrum of mean amplitude, and mean power spectral density of noise is analyzed. The qualitative response behavior of stochastic jump and bifurcation are investigated. The validity of the present approach in predicting the quantitative and qualitative statistical responses is supported by utilizing Monte Carlo simulations. The present analysis without imposing restrictive analytical conditions can be directly derived by solving non-linear algebraic equations. The analytical solution gives reliable quantitative and qualitative prediction of mean and noise response for the Duffing system subjected to both sinusoidal signal and white noise excitation.

Keywords : cyclostationary, duffing system, Gaussian linearization, sinusoidal, white noise

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