The method of separation for evolutionary spectral density estimation of multi-variate and multi-dimensional non-stationary stochastic processes

Abstract:
The method of separation can be used as a non-parametric estimation technique, especially suitable for evolutionary spectral density functions of uniformly modulated and strongly narrow-band stochastic processes. The paper at hand provides a consistent derivation of method of separation based spectrum estimation for the general multi-variate and multi-dimensional case. The validity of the method is demonstrated by benchmark tests with uniformly modulated spectra, for which convergence to the analytical solution is demonstrated. The key advantage of the method of separation is the minimization of spectral dispersion due to optimum time- or space-frequency localization. This is illustrated by the calibration of multi-dimensional and multi-variate geometric imperfection models from strongly narrow-band measurements in I-beams and cylindrical shells. Finally, the application of the method of separation based estimates for the stochastic buckling analysis of the example structures is briefly discussed.

Stichworte:
Method of separation, non-stationary stochastic processes and random fields, evolutionary power spectrum estimation, spectral representation, stochastic buckling analysis

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