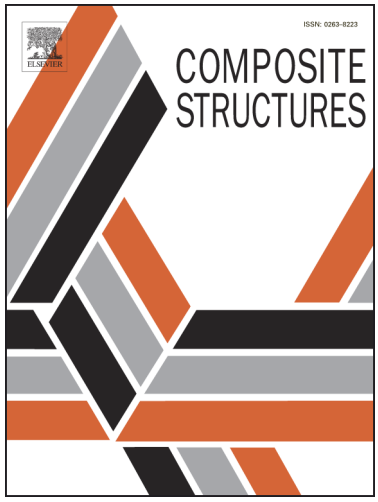

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Uncertain natural frequency analysis of composite plates including effect of noise – A polynomial neural network approach

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Abstract

This paper presents the quantification of uncertain natural frequency for laminated composite plates by using a novel surrogate model. A group method of data handling in conjunction to polynomial neural network (PNN) is employed as surrogate for numerical model and is trained by using Latin hypercube sampling. Subsequently the effect of noise on a PNN based uncertainty quantification algorithm is explored in this study. The convergence of the proposed algorithm for stochastic natural frequency analysis of composite plates is verified and validated with original finite element method (FEM). Both individual and combined variation of stochastic input parameters are considered to address the influence on the output of interest. The sample size and computational cost are reduced by employing the present approach compared to direct Monte Carlo simulation (MCS).

Keywords. uncertainty quantification; polynomial neural network; stochastic natural frequency; Latin hypercube; composite plate