Robust design of nonlinear systems : model reduction and uncertainty propagation

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Résumé : *To design large-scale systems in presence of parametric uncertainties and localized nonlinearities, it is necessary to combine robust model reduction and uncertainty propagation methods. The implementation of the generalized Polynomial Chaos Expansion (gPCE) to propagate uncertainties requires high computational cost. In fact, the non-intrusive regression method used to compute the gPCE coefficients is based on the successive Latin Hypercube Sampling (LHS) evaluations for which the numerical cost depends on the size of FE models, the number of uncertain parameters and nonlinearities. To overcome this issue, we propose to propagate uncertainties through a robust reduced order model which is based on the enrichment of the standard condensation basis using static residuals taking into account the stochastic aspect and the localized nonlinear effect. This model is extended to the Craig-Bampton component mode synthesis approach. The efficiency, in terms of accuracy and time consuming, of the proposed method is evaluated on the nonlinear time response of a periodic structure composed of several coupled-beams containing localized nonlinearities and stochastic design parameters.*

Mots-clés : NaN