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A UNIFIED RESPONSE SURFACE FRAMEWORK FOR THE INTERVAL AND STOCHASTIC FINITE ELEMENT ANALYSIS OF STRUCTURES WITH UNCERTAIN PARAMETERS

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Abstract

In this paper, finite element analysis of structures with uncertain properties is addressed within both a probabilistic and non-probabilistic framework. Specifically, uncertainties affecting structural parameters are modelled either as interval or random variables. In both cases, uncertainty propagation analysis is performed by applying a ratio of polynomial *response surface* which enables to derive approximate closed-form expressions of the main descriptors of interval and random response variability by requiring just a few deterministic analyses at selected sampling points. A unified *response surface* framework for interval and stochastic finite element analysis is thus developed which allows comparisons of structural response variability under different uncertainty models. Numerical results focusing on the comparison between the interval and stochastic response of structures with uncertain Young's modulus are presented.

Keywords: Finite Element Method; interval uncertainties; random uncertainties; Improved interval analysis; response surface method; Monte Carlo simulation.

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