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A VRF-BASED SPARSE SSFEM OF NON-GAUSSIAN STOCHASTIC FIELDS

Dimitris G. Giovanis[1*] , Vissarion Papadopoulos[1] and George Stavroulakis[1]

[1] National Technical University of Athens, Institute of Structural Analysis and AntiSeismic Research,Iroon Polytechniou 9, Zografou Campus, Athens 15780, Greece,
moonwalkerd@hotmail.com, vpapado@central.ntua.gr

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The present paper describes a methodology that utilizes the concept of variability response function (VRF) in the framework of spectral stochastic finite element method (SSFEM) in order to achieve an a priori low-cost estimate of the spatial distribution of the statistical second-order error of the response, as a function of the truncation order of the Karhunen-Loève (KL) decomposition. This way the optimal encapsulation of the information contained in the correlation structure of the random input is achieved through a spatial variation of the truncated KL terms. The criterion for selecting the number of KL terms at different parts of the structure is the uniformity of the spatial distribution of the second-order error. As a consequence, an increase of sparsity of the coefficient matrix of the corresponding linear system of equations is achieved, leading to a reduction of the computational cost of the method. The computational efficiency of the proposed method is demonstrated in a numerical test involving a two-dimensional field that follows the log-normal distribution.

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