Solving Stochastic Eigenvalue Problem of Wick Type

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Abstract : In this paper we study mathematically the eigenvalue problem for stochastic elliptic partial differential equation of Wick type. Using the Wick-product and the Wiener-Ito chaos expansion, the stochastic eigenvalue problem is reformulated as a system of an eigenvalue problem for a deterministic partial differential equation and elliptic partial differential equations by using the Fredholm alternative. To reduce the computational complexity of this system, we shall use a decomposition-coordination method. Once this approximation is performed, the statistics of the numerical solution can be easily evaluated.

Keywords : eigenvalue problem, Wick product, SPDEs, finite element, Wiener-Ito chaos expansion
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