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Abstract

Efficiency Analysis on Element Decomposition
Method for Stochastic Finite Element Analysis

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Until 1980's, all applications of the finite element methods were limited to the case where loading conditions and material properties of the structures to be analyzed were both deterministic, in spite of the fact that they intrinsically involve randomness and uncertainty to a considerable degree. Then, several approximate analytical and numerical methods have been developed to address this problem, such as perturbation method, Neumann expansion method and Monte Carlo simulation method. However, with those conventional analytical methods, a lot of computation effort is needed, especially, when higher order moments or large number of elements are involved unacceptable computational effort is needed.

A new analytical method called the element decomposition method proposed by Guo Kang Er and Vai Pan Iu that is expected to reduce the computational effort significantly. Programs are written and numerical analysis is carried out for the plane beam, plane stress and plate bending problems with both methods in order to compare the computational effort between perturbation method and element decomposition method.