

**Random vibration analysis of structures  
with uncertain-but-bounded parameters**

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Random vibration response of structures with uncertain-but-bounded parameters under random process excitation is investigated in this paper. The interval natural frequencies, interval mean square displacements and stresses are analysed under the framework formed by the theories of structural dynamics and interval analysis. The lower and upper bounds of structural dynamic characteristics and random responses are determined by solving optimization problems. An improved particle swarm optimization algorithm, namely lower sequence initialized high-order nonlinear particle swarm optimization algorithm, is adopted to find their exact change ranges. Three numerical examples are provided to demonstrate the feasibility of the presented method. Quasi-Monte Carlo and Monte Carlo methods are also used to assess the effectiveness of the method.

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