Solution of the Wave Equation
with Interval and Random Parameters

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Abstract

Wave equation is an important mathematical tool for modeling of vibrations of engineering structures. Approximate solution can be found by using many known numerical analysis techniques. It is possible to apply the Finite Difference Method, the Finite Element Method, and the Fourier series. In the case when we know probability distribution of the input parameters and the interval parameters it is possible to calculate upper and lower bounds for the probabilistic characteristics of the solution. In particular, it is possible to calculate the interval probability of failure. Probabilistic solution can be calculated by using the Monte Carlo simulations. If the interval solution depends only on one combination of parameters then it is possible to calculate upper and lower probability of different events including probability of failure. In order to compute the interval solution it is possible to apply different optimization techniques. Gradient of the solution can be found by using the numerical methods for solution of the wave equation and appropriate differentiation techniques.