

Sampling-Based Design Optimization in the Presence of Interval Variables

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This paper proposes a methodology for sampling-based design optimization in the presence of interval variables. Assuming that an accurate surrogate model is available, the proposed method first searches the worst combination of interval variables for constraints when only interval variables are present or for probabilistic constraints when both interval and random variables are present. To calculate sensitivities of the constraints and probabilistic constraints with respect to interval variables by the sampling-based method, behavior of interval variables at the worst case is defined by the Dirac delta function. Then, Monte Carlo simulation is applied to calculate the constraints and probabilistic constraints with the worst combination of interval variables, and their sensitivities. Numerical results indicate that the proposed method can search the worst case probability of failure with both efficiency and accuracy and that it can perform design optimization with mixture of random and interval variables by utilizing the worst case probability of failure search.

Keywords: Interval Variables, Sampling-Based Method, Dirac Delta function, Monte Carlo simulation, Surrogate model