

Solving Constrained Optimization Problems via Subset Simulation

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Abstract

This paper is devoted to extend the application of an advanced Monte Carlo reliability algorithm called subset simulation (SS) (Au & Beck, 2001; Au & Beck, 2003) to constrained optimization problems. The idea using reliability analysis method to solve an optimization problem is based on the fact that an extreme event (optimization problem) can be viewed as a rare event (reliability problem). The SS algorithm for optimization is a population-based stochastic global optimization approach realized with Markov Chain Monte Carlo and a simple evolutionary strategy, and so it does not require initial guess or gradient information. In the proposed method, the constraints are handled as a priority-based fitness function according to their violation similar to the study by Dong et al 2005. Based on this fitness function, a new double-criterion sorting algorithm has been designed to generate new candidate solutions in Markov Chain, which can guarantee that the fitness function values of the feasible solutions are always better than those of infeasible solutions. Four test problems taken from the literature are presented to demonstrate the efficiency and robustness of the proposed method. Comparison is also made with other well-known stochastic optimization algorithms, such as genetic algorithm and evolutionary strategy.

References

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