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On the Weibull cost estimation of building frames designed by simulated annealing. (English)

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Summary: This paper proposes a general methodology to determine the number of numerical tests required to provide a solution for a heuristic optimization problem with a user-defined accuracy as compared to a global optimal solution. The methodology is based on the extreme value theory and is explained through a problem of cost minimization for reinforced concrete building frames. Specifically, 1000 numerical experiments were performed for the cost minimization of a two-bay and four-floor frame using the Simulated Annealing (SA) algorithm. Analysis of the results indicates that (a) a three-parameter Weibull distribution function fits the results well, (b) an objective and general procedure can be established to determine the number of experiments necessary to solve an optimization problem with a heuristic which generates independent random solutions, and (c) a small number of experiments is enough to obtain good results for the structural engineer.

MSC:

62P30 Applications of statistics in engineering and industry; control charts

Keywords:

optimization; reinforced concrete; Weibull distribution; extreme value theory

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