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Reliability-based optimization of structural systems. (English) Zbl 0896.90104
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Summary: A method to carry out a reliability-based optimization (RBO) of especially nonlinear structural systems is introduced. Statistical uncertainties involving both structural and loading properties are considered. The concept is based on the separation of structural reliability analyses and the optimization procedures. Two approaches are discussed, depending on the interaction of reliability analysis and mathematical programming and the way of representation of the limit state functions (LSF) of the structure. As, for cases of practical significance, the LSF is known only pointwise it is approximated by response surfaces (RS). For the response calculations finite element (FE) procedures are utilized. Failure probabilities are determined by applying variance reducing Monte Carlo simulation (MCS) techniques such as importance sampling (IS). Following the reliability analysis, the optimization procedure is controlled by the NLPQL algorithm. A numerical example in terms of a template ocean platform exemplifies the procedures.

MSC:

- 90B25 Reliability, availability, maintenance, inspection in operations research
- 74P99 Optimization problems in solid mechanics
- 90C90 Applications of mathematical programming
- 90C30 Nonlinear programming
- 62P30 Applications of statistics in engineering and industry; control charts

Cited in **22** Documents

Keywords:

reliability-based optimization; nonlinear structural systems; response surfaces; Monte Carlo simulation; ocean platform

Software:

COSSAN

Full Text: [DOI](#)

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