Evaluation of Inconsistent Engineering data

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Abstract

In this paper options for a realistic evaluation of engineering data characterized by inconsistency regarding uncertainty and imprecision are discussed. The proposed methods take account of the following situation. The usefulness of the results from an engineering analysis depends significantly on the realistic modeling of the input parameters. Shortcomings, in this regard, may lead to biased computational results, wrong decisions, and serious consequences. This applies, in particular, if the data are characterized by uncertainty and imprecision. A variety of mathematical models have been formulated to take account of the available information as realistically as possible [1, 2]. The usefulness and capabilities of these models have already been demonstrated in the solution of engineering problems [3]. A major issue in view of practical applicability is the numerical efficiency of the associated computational algorithms. These must enable the analysis of large structures including dynamical and nonlinear behavior. For the stochastic uncertainty model, algorithms for a numerically efficient structural and reliability analysis have already been developed up to a considerable level. This concerns, specifically, Monte-Carlo simulation and further developments thereof [4, 5]. In engineering practice uncertainty frequently appears in a mixed stochastic/non-stochastic form. Uncertainty models for an appropriate quantification, in those cases, must be partly linked to traditional stochastics. It is then possible to take advantage of the capabilities of the well-developed stochastic methods in subsequent engineering computations. In the paper respective quantification options are discussed which avoid the introduction of unwarranted information.

References

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