OPTIMIZATION OF TRUSSES WITH RANDOM LOADS

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In this talk, we show that a problem of finding the truss of minimum expected compliance under stochastic loading conditions is equivalent to the dual of a special convex minimax problem, and therefore may be efficiently solved. This equivalence makes it possible to provide classic multiload compliance minimization problems with interpretations in a probabilistic setting. In fact, we prove that minimizing the expected compliance amounts to solving a multiload like problem associated with a particular finite set of loading scenarios, which depends on the mean and the variance of the perturbations. Several numerical examples are presented.

The stochastic setting introduced in this talk allows to consider other variants for the optimal design problem. We then consider the minimum variance-compliance problem, where the variance of the compliance is included in the model. We show that this stochastic problem is equivalent to a mathematical programing problem. The variance formulation introduces a non convex term that makes this type of problems harder to solve numerically than the minimum expected compliance model. To solve numerically this optimization problem, we consider a hybrid optimization method based on a steepest-descent algorithm. We valid the variance-compliance model on a 3-D benchmark test case and compare obtained results with this given by the expected compliance model. We obtain a truss with a low risk level.

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