STRUCTURAL DESIGN UNDER FUZZY RANDOMNESS

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In this paper a procedure for designing structures under uncertainty is presented. Randomness, fuzziness, and fuzzy randomness of structural parameters are accounted for simultaneously. Algorithms of fuzzy structural analysis and fuzzy probabilistic safety assessment [1] are used to compute uncertain structural responses, and uncertain safety prognoses, which are the backbone of fuzzy cluster design.

Fuzzy structural analysis and fuzzy probabilistic safety assessment are numerically performed with the aid of α-level optimization [1]. Therein, a modified evolution strategy is combined with a repeated solution of the associated optimization problem. In this manner randomly specified vectors are distributed over the space of the input parameters. Comparing fuzzy structural responses and the fuzzy safety level with permissible values, permissible and non-permissible parameter vectors are identified. Subsequent clustering with the aid of a fuzzy cluster analysis algorithm yields the clue for generating uncertain structural design parameters.

The developed concept can be combined with arbitrary fundamental solutions for deterministic and probabilistic structural safety analyses. For instance, well developed algorithms of Monte Carlo simulation [2] and codes of nonlinear structural analysis can be incorporated in the procedure.

In the full paper the theoretical developments of fuzzy cluster design will be presented in detail and will be supplemented by numerical examples.

Acknowledgments

References
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