

## **ABSTRACT**

### **Reliability-Based Topology Optimization Using Single-Loop Single-Vector Approach**

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In the design optimization process the design variables are selected in the deterministic way though those have uncertainties in nature. To consider variances in design variables reliability-based design optimization problem is formulated by introducing the probability distribution function.

The concept of reliability has been applied to the topology optimization based on a reliability index approach or a performance measure approach. Since these approaches, called double-loops single vector approach, requires the nested optimization problem to obtain the most probable point in the probabilistic design domain, the time for the entire process makes the practical use infeasible.

In this work, new reliability-based topology optimization method is proposed by utilizing single-loop single-vector approach, which approximates searching the most probable point analytically, to reduce the time cost and dealing with several constraints to handle practical design requirements.

The density method in topology optimization including SLP algorithm is implemented with object-oriented programming. To examine uncertainties in the topology design of a structure, the modulus of elasticity of the material and applied loadings are considered as probabilistic design variables. The results of design examples such as MBB beam and 10-bar truss show that the proposed method provides efficiency curtailing the time for the optimization process and accuracy satisfying the specified reliability.