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Plate/Shell Topological Optimization Subjected to Linear Buckling Constraints by Adopting Composite Exponential Filtering Function

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Abstract

In this paper, a model of topology optimization with linear buckling constraints is established based on Independent, Continuous and Mapping (ICM) method to minimize the plate/shell structure weight. Composite Exponential Function (CEF) is selected as filtering functions for element weight, element stiffness matrix and element geometric stiffness matrix which recognize the design variables, and to implement the changing process of design variables from "discrete" to "continuous" and back to "discrete". The buckling constraints are approximated as explicit formulations based on the Taylor expansion and the filtering function. The optimization model is transformed to a dual programming and solved by the dual sequence quadratic programming algorithm. The optimal program is developed on the platform of MSC.Patran & Nastran by MSC.Patran Command Language (PCL). Finally, two numerical examples applying Power Function (PF) and Composite Exponential Function (CEF) are analyzed and discussed to demonstrate the feasibility and efficiency of the proposed method.