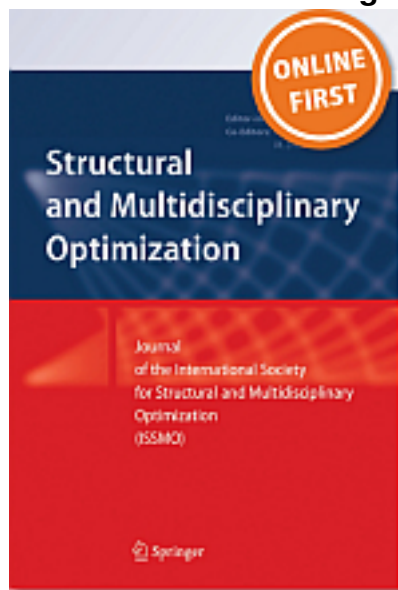


A stress-based formulation of the free material design problem with the trace constraint and multiple load conditions.



S. Czarnecki, T.Lewiński,

Structural and Multidisciplinary Optimization, 2014 in press

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The paper deals with minimization of the weighted sum of compliances related to the load cases applied non-simultaneously. The design variables are all components of the Hooke tensor, subject to the isoperimetric condition bounding the integral of the sum of the Kelvin moduli. This free material design problem is reduced to an equilibrium problem – in two formulations – of an effective body with locking. The stress-based formulation reduces to minimization of an integral of a certain norm of stress fields over the stress fields which equilibrate the given loads. The equivalent displacement-based formulation involves a locking locus defined by using a norm being dual to the previous one. The optimal Hooke tensor is determined by using the stress fields solving the auxiliary locking problem. To make the optimal Hooke tensor positive definite one should consider at least 3 load conditions in the 2D case and not less than 6 load conditions in the 3D case.