
Comput. Methods Appl. Mech. Engrg.

The stiffest designs of elastic plates: Vector optimization for two loading conditions

The stiffest designs of elastic plates: Vector optimization for two loading conditions, S. Czarnecki, T. Lewiński

Comput. Methods Appl. Mech. Engrg. 200 (2011) 1708–1728

Read online>>

The paper deals with optimal design of linearly elastic plates of the Kelvin moduli being distributed according to a given pattern. The case of two loading conditions is discussed. The optimal plate is characterized by the minimum value of the weighted sum of the compliances corresponding to the two kinds of loads. The problem is reduced to the equilibrium problem of a hyperelastic mixture of properties expressed in terms of two stress fields. The stress-based formulation (P) is rearranged to the displacement-based form (P^*). The latter formulation turns out to be well-posed due to convexity of the relevant potential expressed in terms of strains. Due to monotonicity of the stress–strain relations the problem (P^*) is tractable by the finite element method, using special Newton's solvers. Exemplary numerical results are presented delivering layouts of variation of elastic characteristics for selected values of the weighting factors corresponding to two kinds of loadings.