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Optimal Layout of Two Materials within the Core Layer of a Sandwich Plate. Relaxed Formulation and Its Computiational Algorithm

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The paper deals with the minimum compliance problem of a sandwich plate with soft core. The aim is to find an optimal layout of two isotropic materials within the core layer. The relaxed formulation, derived by using homogenization, involves the non-linear hyperelastic constitutive relationships between shear forces and transverse shear deformations. In the numerical treatment of the relaxed formulation the core layer is modelled by a 2nd rank laminated composite. The effective transverse shear stiffnesses are determined by the formula of Tartar, applied iteratively. The equilibrium problem is solved with using the new DSG finite element, developed recently by Bletzinger et al. Additionally a proof is given that this element satisfies the Strang convergence criteria of consistency. The optimization has been performed with using COC. The optimal layouts of the area fractions and the underlying microstructures compare favorably with 3D layouts found within the relevant relaxed formulation by homogenization, according to the 3D algorithm by Czarnecki and Lewiński presented at the recent WCSMO-5.

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