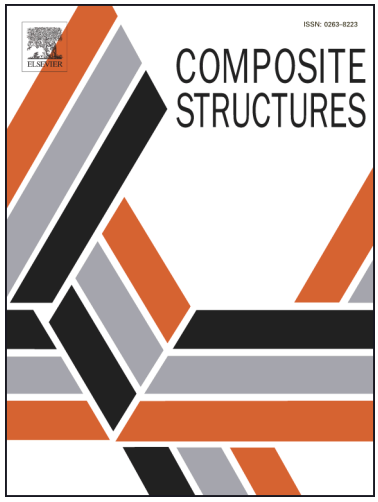

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A level-set-based strategy for thickness optimization of blended composite structures

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Abstract

An approach is presented for the thickness optimization of stiffened composite skins, which guarantees the continuity (blending) of plies over all individual panels. To fulfill design guidelines with respect to symmetry, covering ply, disorientation, percentage rule, balance, and contiguity of the layup, first a stacking sequence table is generated. Next, a level-set gradient-based method is introduced for the global optimization of the location of ply drops. The method aims at turning the discrete optimization associated with the integer number of plies into a continuous problem. It gives the optimum thickness distribution over the structure in relation to a specific stacking sequence table. The developed method is verified by application to the well-known 18-panel Horseshoe Problem. Subsequently, the proposed method is applied to the optimization of a composite stiffened skin of a wing torsion box. The problem objective is mass minimization and the constraint is local buckling.

Keywords: composite panel, blending, level-set method, buckling optimization, stacking sequence table (SST)

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