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13th World Congress on Computational Mechanics

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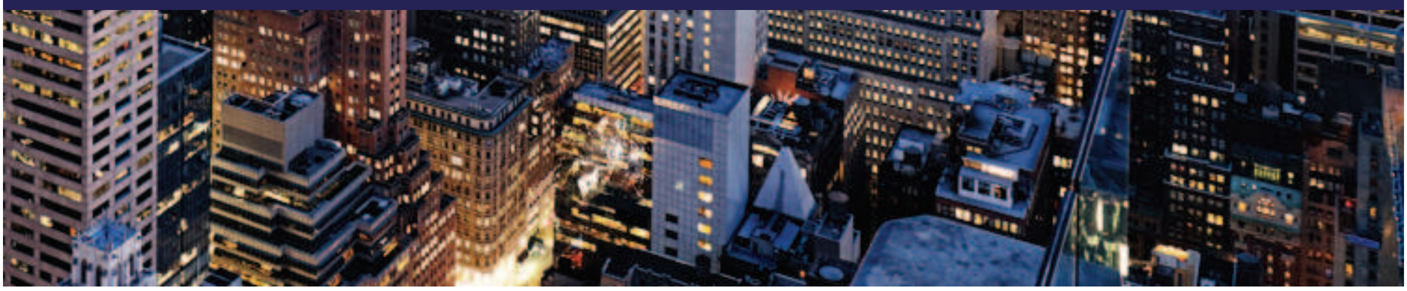

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ABSTRACTS

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The abstracts are in order of the presenting author.

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Demonstration of a Computationally Efficient Method for Stacking Sequence Blending of Composite Laminates

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ABSTRACT

Stacking sequence optimisation can be used to increase the strength or stiffness of a composite laminate, or to reduce its weight subject to a strength or stiffness constraint. Optimisation of larger composite structures consisting of multiple panels may result in stacking sequences of adjacent panels that are incompatible with one another. The act of enforcing stacking sequence continuity to ensure structural integrity and manufacturability of a laminated composite laminate is known as blending. This term was first introduced by Zabinsky (1994). In literature, many methods can be found to implement structural continuity by means of stacking sequence blending in one way or another. The complexity of the problem makes the blending of a structure with a large number of adjacent design regions, and thus stacking sequences, prohibitive. This work introduces a computationally efficient method for stacking sequence blending of composite laminates. The presented method is inspired by cellular automata (CA) and relies on the application of a set of simple rules to solve the blending problem. The presented method is demonstrated using the benchmark 18-panel horseshoe blending problem, Soremekun et al. (2002). Each panel is initialized using a genetic algorithm (GA). The result is fed into the CA-scheme. The obtained results are equal to or better than those reported in the literature and were obtained requiring very little operations. This can be attributed to the increased design space of the presented method compared to literature. The computational efficiency makes the presented method especially interesting for composite structures with a large number of design regions. An outlook on the scalability of the presented method and its limits will be given. Soremekun, G. A., Gürdal, Z., Kassapoglou, C. and Toni, D. (2002), 'Stacking sequence blending of multiple composite laminates using genetic algorithm', Composite Structures 56(1), 53–62. Zabinsky, Z. B. (1994), 'Global optimization for composite structural design', Monthly technical progress report, under contracts NAS1-18889 (report No. 58) and NAS1-20013, task 2 (report 4).