

Application of Additive Manufacturing for Production of Optimum Topologies

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Abstract : Optimal topology of components leads to the maximum stiffness with the minimum material use. For the generation of these topologies, normally algorithms are employed, which tackle manufacturing limitations, at the cost of the optimal result. The global optimum result with penalty factor one, however, cannot be fabricated with conventional methods. In this article, an additive manufacturing method is introduced, in order to enable the production of global topology optimization results. For a benchmark, topology optimization with higher and lower penalty factors are performed. Different algorithms are employed in order to interpret the results of topology optimization with lower factors in many microstructure layers. These layers are then joined to form the final geometry. The algorithms' benefits are then compared experimentally and numerically for the best interpretation. The findings demonstrate that by implementation of the selected algorithm, the stiffness of the components produced with this method is higher than what could have been produced by conventional techniques.

Keywords : topology optimization, additive manufacturing, 3D-printer, laminated object manufacturing

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