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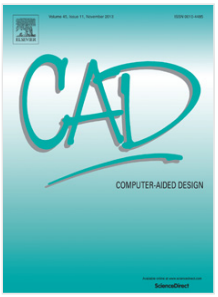

Bidirectional Evolutionary Structural Optimization (BESO) based design method for lattice structure to be fabricated by additive manufacturing

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Bidirectional Evolutionary Structural Optimization (BESO) based design method for lattice structure to be fabricated by Additive Manufacturing

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Abstract

Unlike traditional manufacturing methods, additive manufacturing can produce parts with complex geometric structures without significant increases in fabrication time and cost. One application of additive manufacturing technologies is the fabrication of customized lattice-skin structures which can enhance performance of products while minimizing material or weight. In this paper, a novel design method for the creation of periodic lattice structures is proposed. In this method, Functional Volumes (FVs) and Functional Surfaces (FSs) are first determined based on an analysis of the functional requirements. FVs can be further decomposed into several sub-FVs. These sub-FVs can be divided into two types: FV with solid and FV with lattice. The initial design parameters of the lattice are selected based on the proposed guidelines. Based on these parameters, a kernel based lattice frame generation algorithm is used to generate lattice wireframes within the given FVs. At last, traditional bidirectional evolutionary structural optimization is modified to optimize distribution of lattice struts' thickness. The design method