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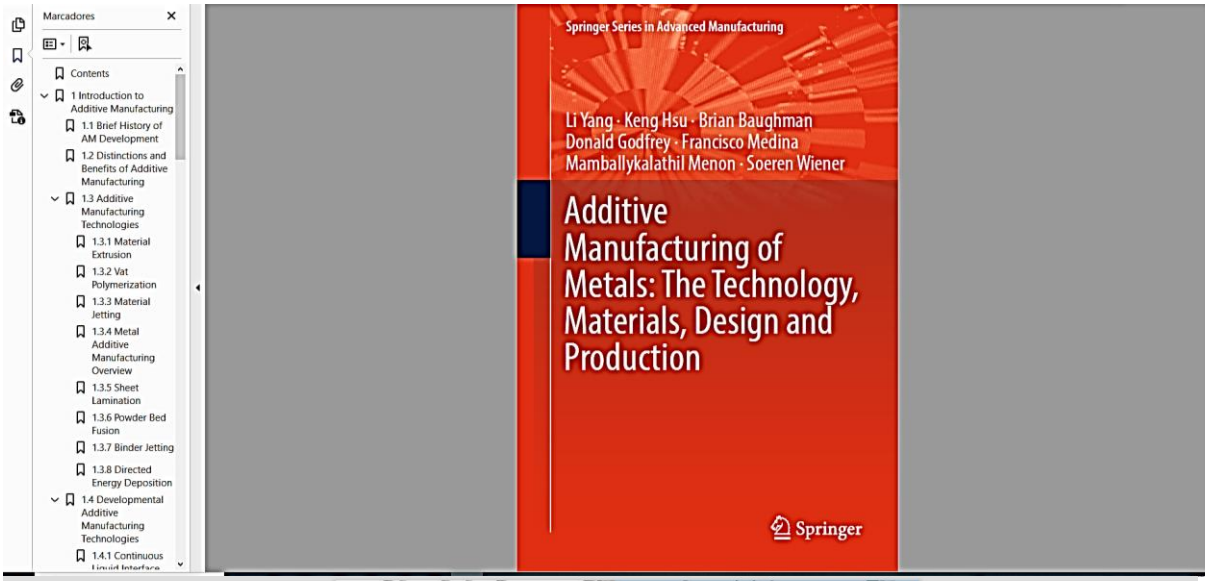

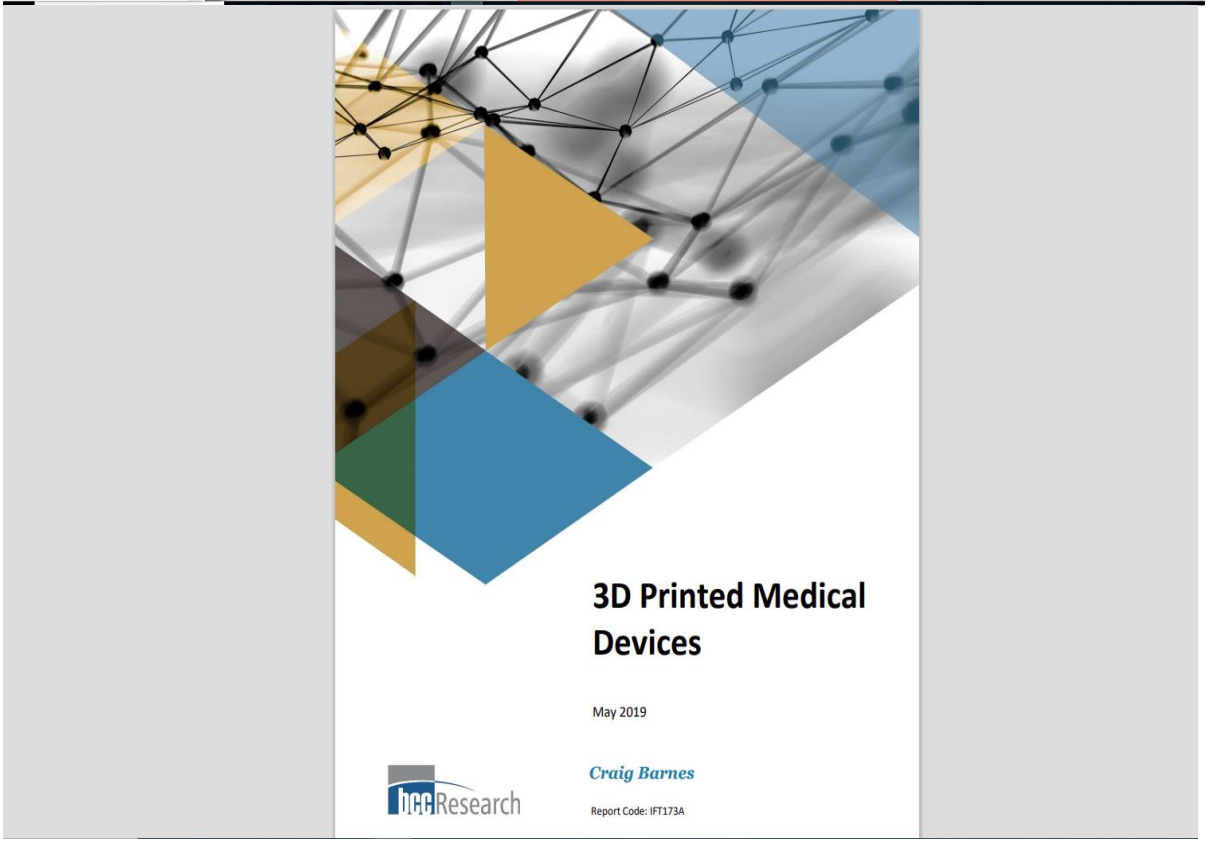

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Generative design method for lattice structure with hollow struts of variable wall thickness

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Abstract

Additive manufacturing technology can make products of arbitrary shapes, greatly expanding the design space of lattice structures. Compared with traditional solid lattice structures, the lattice structures with hollow struts have higher flexural strength, which arouses interests of designers recently. However, owing to the more complex shapes of structures, the model generation and design are facing more challenges. In this article, a novel generative design method for the creation of lattice structures with hollow struts is proposed. This method consists of three stages: initialization, analysis, and optimization. First of all, a ground structure is generated automatically based on initial conditions. Then, the finite element analysis is used to get the stress and coordinate information of finite element nodes as well as deformation information of the ground structure. At last, a rapid optimization method is presented based on the idea of mapping the strut equivalent stress to the strut wall thickness to optimize materials distribution. The proposed method is validated through a case study, demonstrating that this method can enhance performance of products while reducing the complexity of the optimization problem.

Keywords

Generative design, hollow struts, lattice structure, optimization, additive manufacturing

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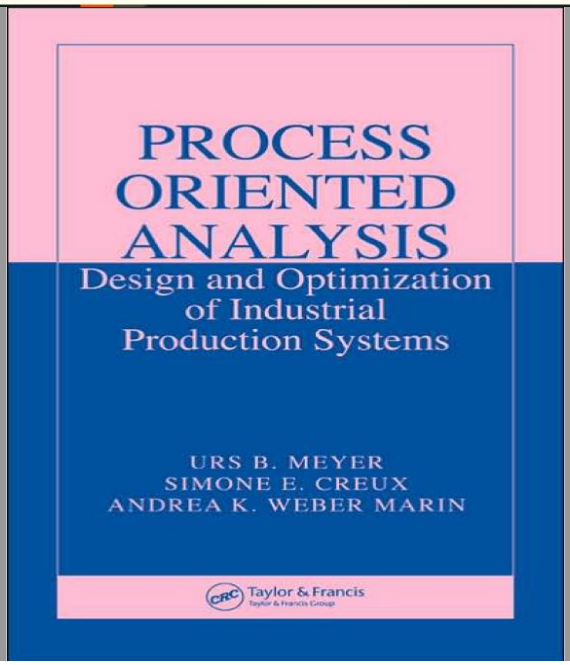

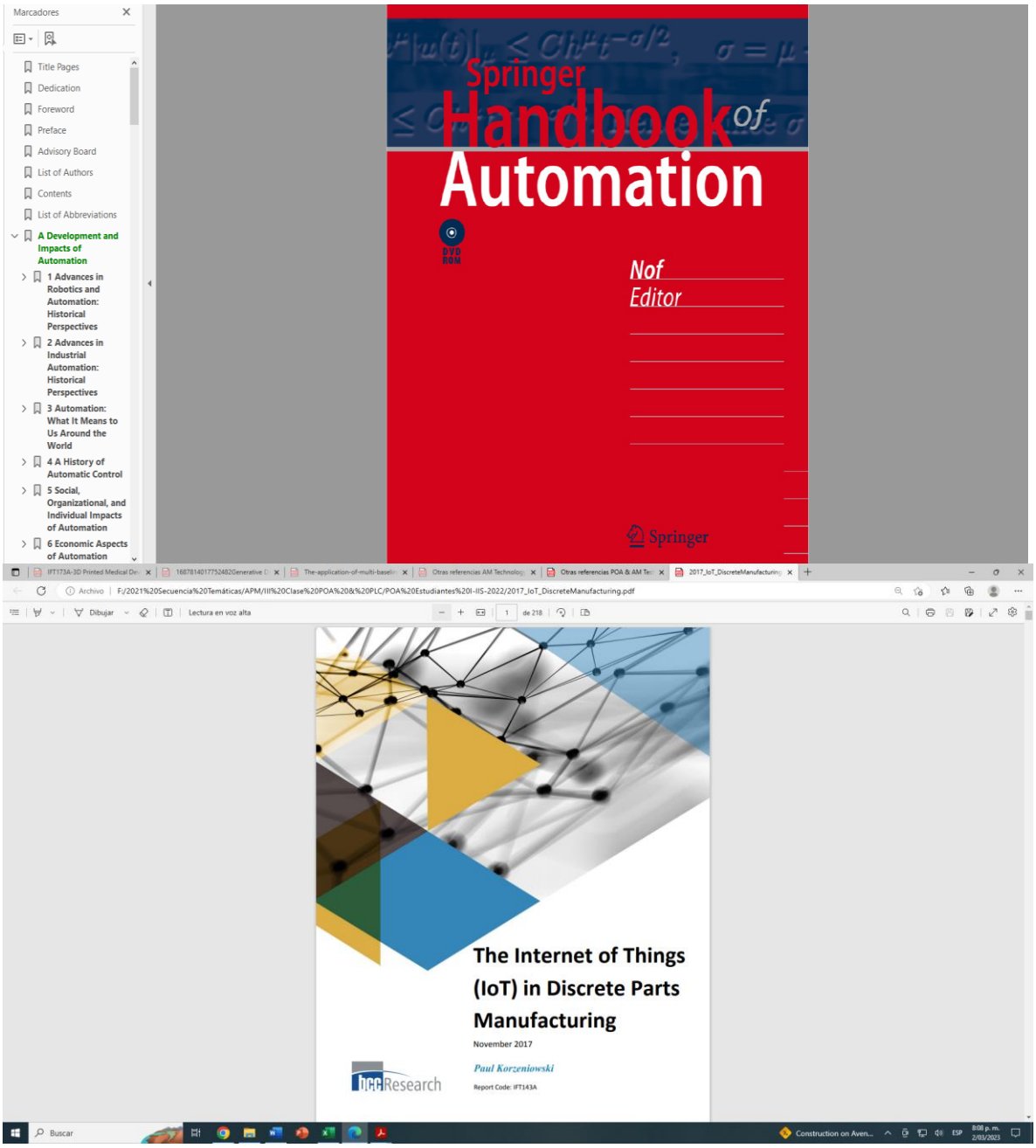
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