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TOPOLOGY OPTIMIZATION OF COMPOSITE STRUCTURE CONSIDERING ELASTOPLASTIC DEFORMATION

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The present study proposes topology optimization of composite structure considering elastoplastic deformation. The energy absorption capacity which is measured by the area below the load-displacement curve is maximized by combining different two kinds of plastic materials and by optimizing the material distribution. It is assumed that one material is soft and shows relatively large plastic hardening and the other is stiff and shows gentle hardening slope. These contrary material behavior is modeled based on a linear isotropic elastoplasticity and then a SIMP-like material model is proposed for optimization. The proposed material model is extension of the multiphase material optimization [1, 2] to the elastoplastic material model.
A gradient-based optimization strategy is applied for optimization. The accuracy of sensitivity analysis is significant matter for reliable optimization solution. Thus, the derivation of the sensitivity and its accuracy are intensively discussed in this study . It will be verified from a series of numerical examples that the proposed method has great potential for design process of composites considering elastoplastic deformation.

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