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Topology Optimization of the Geometrically Nonlinear Structures Made of Rubber-Like Material

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This paper presents a brief review of the topology optimization of the geometrically nonlinear plate made of a highly nonlinear elastic rubber-like material. So the material is assumed to be incompressible hyperelastic subjected to the plane stress. Typically most structural topology optimization cases are based on the linear elastic assumption. But investigating initially linear structures the optimized final structure may be nonlinear as well the structures subjected to the large deformations. So the topics of the nonlinear computational mechanics, FEM discretization and the solving procedure of the topology optimization in this type of problem are presented. The topology problem is solved iteratively by a sequential convex approximation method and the structural response using the nonlinear quasi-static FEM based on N-R iteration. The mean compliance is chosen as objective and the sensitivity analysis is derived using the adjoint method which is rather straightforward despite specially the material nonlinearity.

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