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Numerical Homogenization of a Locally Hyperelastic Constitutive Law

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A lot of results are available in theoretical homogenization of nonlinear integral functionals. However not much has been done to develop and adapt the numerical counterpart of that multiscale theory in order to compute locally nonlinear composites. First one recalls the main results in nonlinear homogenization that can be applied to energy functionals. Then a multiscale strategy which is designed to deal with large deformations and nonlinearities is presented. Numerically testing the convergence rate of a sequence which is theoretically prooved to converge, one can define the size of a kind of representative volume. Knowing this size, it is possible to validate the numerical strategy. A first test is the computation of a composite material made of two rubbers forming a chessboard microstructure.

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