Optimal design of Kirchhoff-Love plates under the low-contrast assumption

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Homogenization theory is one of the most successful approaches for dealing with optimal design problems, that consists in arranging given materials such that obtained body satisfies some optimality criteria, which is mathematically usually expressed as minimization of some (integral) functional under some (PDE) constrains.

We consider optimal design problems in the setting of the Kirchhoff-Love equation describing an elastic, thin, symmetric plate, which is a fourth order elliptic equation, and we restrict ourselves to domains filled with two isotropic elastic materials. The optimization method is based on the small amplitude, or small contrast, approximation for homogenization. Since the classical solution usually does not exist, we use relaxation by the homogenization method in order to get a proper relaxation of the original problem.

Numerical results are presented for compliance minimization, i.e., maximizing the global stiffness of the plate, and for minimizing the integral of the square of the deflection in a subset of the plate.

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