Nonsmooth Problems with Applications in Mechanics
Bedlewo, Poland, June 17-22, 2023

An Optimal Control Problem for a Vibrating Elastic Plate in a Contact with a Rigid Obstacle

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Abstract: We deal with an optimal design problem governed by an initial-boundary value problem for a hyperbolic variational inequality describing the perpendicular vibrations of a simply supported anisotropic elastic plate against a rigid obstacle. A variable thickness of a plate plays the role of a control variable. The set of admissible states for the design problem consists of solutions of a state problem gained as limits of the sequences of functions solving penalized problems. It enables us to receive an optimal thickness of a plate as a limit of a sequence of optimal thicknesses solving penalized optimal control problems. We assume the generalized penalized function $u \mapsto \eta^{-1}\beta\left(u - \frac{1}{2}e - \Phi\right)$ with a deflection u, a thickness function e and an obstacle function Φ. In the case of a differentiable function β it is possible to derive generalized optimality conditions.