

Differentiation of the Functional in an Optimization Problem for Coefficients of Elliptic Equations with Unbounded Nonlinearity

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Abstract : We consider an optimal control problem in the higher coefficient of nonlinear equations with a divergent elliptic operator and unbounded nonlinearity, and the Dirichlet boundary condition. The conditions imposed on the coefficients of the state equation are assumed to hold only in a small neighborhood of the exact solution to the original problem. This assumption suggests that the state equation involves nonlinearities of unlimited growth and considerably expands the class of admissible functions as solutions of the state equation. We obtain formulas for the first partial derivatives of the objective functional with respect to the control functions. To calculate the gradients the numerical solutions of the state and adjoint problems are used. We also prove that the gradient of the cost function is Lipschitz continuous.

Keywords : cost functional, differentiability, divergent elliptic operator, optimal control, unbounded nonlinearity

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