

A multigrid approach for a class of quasilinear PDEs arising in optimization problems*

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Abstract

In this work, we study a multigrid algorithm for the finite element solution of a class of quasilinear PDEs arising in the numerical solution of several optimization problems. In particular, we focus on optimality systems associated to optimal control problems of equations involving the p -Laplacian operator and PDEs characterizing the solution of a class of quasilinear variational inequalities of the second kind. We analyze the performance of smoothers based on semismooth Newton algorithms and preconditioned descent algorithms, and we discuss the convergence properties of the multigrid algorithm linked to these smoothing algorithms. Finally, several numerical experiments are carried out to show the main features of the proposed method.

Key words: Multigrid methods. Quasilinear PDEs. Variational inequalities. Optimal control problems.

Mathematics subject classifications (1991): 65M55, 49J20, 35J92, 65K15.

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