

# Convergence of Adaptive Finite Element Methods for nonlinear PDEs

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We consider the homogeneous Dirichlet Problem for the  $p$ -Laplacian,  $p \in (1, \infty)$ , embedded in the more general theory of Orlicz-spaces. We propose an adaptive algorithm with continuous piecewise affine finite elements and prove an error reduction rate of approximate solutions to the exact one. We improve the a posteriori estimations for quasi-norms and generalize the error reduction property of the linear case to an energy reduction property in the nonlinear case. For adaptive refinement we use a marking strategy incorporating error estimators and oscillation. Thus we obtain a reduction of energy differences. Since these are proportional to the error measured in quasi-norms we get a strict error reduction in each step. This in turn implies convergence.

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