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Abstract

Additive multilevel methods offer an efficient way for solving Ritz-Galerkin equations arising from discretization of elliptic boundary value problems. These solution methods are based on norm equivalences for the associated bilinear form using a suitable subspace decomposition. From these preconditioners for the stiffness matrix can be derived. For the robustness of the resulting iteration schemes it is crucial that the constants in the equivalence do not or only weakly depend on the ellipticity constants of the problem. After a short review we address here this question for the model problem $\nabla \cdot \omega \nabla u = f$ with scalar weight $\omega(x)$. We introduce suitable weighted projectors and prove corresponding **Jackson- and Bernstein-inequalities** in order to derive "robust" norm equivalences. The lower bound is completely robust being independent of the weight ω whereas the upper bound is established under rather weak conditions.