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Convergence analysis of variational and non-variational multigrid algorithms for the Laplace-Beltrami operator

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Keywords: Convergence analysis; Variational and non-variational multigrid algorithms; Laplace-Beltrami operator

Review text:

The authors design and analyze variational and non-variational multigrid algorithms for the Laplace-Beltrami operator on a smooth and closed surface. In both cases, a uniform convergence for the V -cycle algorithm is obtained provided the surface geometry is captured well enough by the coarsest grid. The main argument hinges on a perturbation analysis from an auxiliary variational algorithm defined directly on the smooth surface. In addition, the vanishing mean value constraint is imposed on each level, thereby avoiding singular quadratic forms without adding additional computational cost. Numerical results supporting the analysis are reported. In particular, the algorithms perform well even when applied to surfaces with a large aspect ratio.

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