

**THE ANALYSIS OF INTERGRID TRANSFER
OPERATORS AND MULTIGRID METHODS FOR
NONCONFORMING FINITE ELEMENTS***

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Abstract. In this paper we first analyze intergrid transfer operators and their iterates for some nonconforming finite elements used for discretizations of second- and fourth-order elliptic problems. Then two classes of multigrid methods using these elements are considered. The first class is the usual one, which uses discrete equations on all levels which are defined by the same discretization, while the second one is based on the Galerkin approach where quadratic forms over coarse grids are constructed from the quadratic form on the finest grid and the iterates of intergrid transfer operators, which we call the Galerkin multigrid method. The properties of these intergrid transfer operators are utilized for the analysis of the first class, while the properties of their iterates are exploited for the second one. Convergence results available for these two classes of multigrid methods are summarized here.

Key words. multigrid methods, nonconforming and mixed finite elements, second and fourth-order problems, intergrid operators.

AMS subject classifications. 65N30, 65N22, 65F10.

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