EXACT DE RHAM SEQUENCES OF FINITE ELEMENT SPACES ON AGGLOMERATED ELEMENTS

PANAYOT S. VASSILEVSKI

ABSTRACT. In this talk we introduce new finite element spaces that can be constructed for agglomerates of standard elements in 3–d. The agglomerates are assumed to have certain regular structure in the sense that they share faces with closed boundaries composed of 1-d edges. The spaces are subspaces of a originally given de Rham sequence of respective H^1-conforming, $H(\mathbf{curl})$–conforming, $H(\mathbf{div})$–conforming and piecewise constant spaces. The procedure can be recursively applied so that a sequence of nested de Rham complexes can be constructed. As an application, we use the sequence of nested counterparts of the respective piecewise linears, the lowest order Nédélec, and the lowest order Raviart–Thomas spaces, to construct V–cycle multigrid as preconditioners in the conjugate gradient method. The latter AMGe (element agglomeration algebraic multigrid) methods appear to perform very similarly to the geometric MG in the case of uniformly refined meshes.

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CENTER FOR APPLIED SCIENTIFIC COMPUTING, UC LAWRENCE LIVERMORE NATIONAL LABORATORY, P.O. BOX 808, L-560, LIVERMORE, CA 94551, U.S.A.
E-mail address: panayot@llnl.gov

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