Adaptive refinement for mortar discretizations

Barbara Wohlmuth

Math. Inst., Universität Stuttgart, email: wohlmuth@mathematik.uni-stuttgart.de

The framework of mortar methods provides a powerful tool to analyze domain decomposition techniques based on the coupling of different discretization schemes or of nonmatching triangulations along interior interfaces. Strong pointwise continuity conditions are replaced by weak integral conditions without loosing the optimality of the a priori bounds for the discretization errors. In contrast to standard mortar techniques, we use dual Lagrange multipliers. As a consequence, the locality of the support of the nodal basis functions in the nonconforming constrained spaces is preserved, and the stiffness matrix associated with the positive definite formulation can be easily assembled by a local postprocessing step. Examples for dual Lagrange multiplier spaces are given for the lowest order case in 2D and 3D and for higher order cases in 2D.

Numerical results illustrate the discretization errors in the L^2-norm, the H^1-norm and a weighted L^2-norm for the Lagrange multiplier. Here, we introduce a new setting and work with nested constrained spaces. The advantage is that standard multigrid method can be applied directly,

and the natural embedding can be used to define the transfer operators. We illustrate the convergence rates and the influence of the choice of the mortar side on the adaptive refinement process. The adaptive refinement process is controlled by an a posteriori error estimator which takes into account the nonconforming situation at the interface. Two additional terms reflecting the jumps in the discrete solution have to be included.