A stabilized three field domain decomposition formulation for advection-diffusion problems

G. Rapin
University of Göttingen, NAM, D-37083 Göttingen

Based on the ideas of [2] a stabilized three field formulation for advection-diffusion problems is presented. Due to the stabilization it is possible to choose the discrete function spaces almost arbitrary. The stability and an a priori estimate are proven for the scheme. By minimizing the right hand side of the a priori estimate a suitable choice of the stabilization parameter is given.

Then two iterative substructuring methods are derived from the three field formulation. The first one is a nonmatching variant of the nonoverlapping Schwarz alternating method of [3] (cf. [4]). The second one is a simplified version of the preconditioned Schur complement method [1] using a Richardson iteration and no coarse space. Finally a short comparison of both algorithms is given.

References

[1] Y. Achdou, P. Le Tallec, F. Nataf, and M. Vidrascu. A domain decomposition preconditioner for an advection-diffusion problem. *Comput. Meth. Appl. Mech. Engrg*, 184:145–170, 2000.

[2] C. Baiocchi, F. Brezzi, and L.D. Marini. Stabilization of Galerkin methods and applications to domain decomposition. In *Future Tendencies in Computer Science, Control and Applied Mathematics*, pages 345–355. Springer-Verlag, 1992.

[3] G. Lube, L. Müller, and F.C. Otto. A non-overlapping domain decomposition method for the advection-diffusion problem. *Computing*, 64:49–68, 2000.

[4] P. Le Tallec and T. Sassi. Domain Decomposition with nonmatching grids: Augmented Lagrangian Approach. *Math. Comp.*, 64:1367–1396, 1995.