

Optimized Robin transmission conditions for anisotropic diffusion on arbitrary meshes

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We study the performance of a discrete nonoverlapping optimized Schwarz method based on the Discrete Duality Finite Volume discretization for anisotropic diffusion problems and Robin transmission conditions. The efficiency of the method is known to depend on the choice of the parameters in the transmission condition. Recent research efforts have led to optimized parameters at the continuous level, and also for discretizations on Cartesian grids. We derive here a closed form asymptotic expression that links all these results in one common formula, and allows us to explain their similarities and differences. We show that the discretized optimized parameters are essential for good performance in the highly anisotropic cases on uniform meshes, and they remain important for best performance even if the mesh sizes are adapted locally to the anisotropy. We also test the method on very general, non Cartesian grids, which shows that the optimized parameters for Cartesian grids still perform close to the best possible ones in these cases. We can thus give for the first time guidelines for their choice in practice for best performance with highly anisotropic diffusion problems.