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Title: A Parallel Multilevel Incomplete LU Factorization Preconditioner that Exploits Block Matrix Structures

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Abstract: Sparse matrices arising from many applications often hold a block structure when several unknown physical quantities are associated with the same grid point. For this particular type of matrices, it is natural to develop block-wise solver to exploit the block structure and improve the computation performance. In this context, we developed a Variable Block Variant of the Algebraic Recursive Multilevel Solver (VBARMS) which is already presented in our previous paper.

We describe a novel parallel MPI-based implementation of pVBARMS for distributed memory computers based on the block Jacobi, the additive Schwarz and the Schur-complement methods.
Furthermore, in context of distributed parallel computing, graph partitioning strategy plays a very important role. So we also proposed two graph partitioning strategies, one uses Zoltan library to refine the distributed graph the other one partitions the serial graph on one processor and broadcasts to other processors.

At the end, we report results of the pVBARMS package for
solving general linear sytems and also turbulent Navier-Stokes equations on a suite of two- and three-dimensional test cases.

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