Parallel Implementation of Elasticity Solvers in Material Science Applications

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We consider the modeling, simulation, and implementation of parallel solution methods for design of microstructural materials whose behavior is governed by the elasticity equations. The materials are obtained by biotemplating and find various important applications in material science and engineering. The mechanical macroscopic model corresponding to our composite materials comes from the homogenization theory. The computation of the effective elasticity coefficients requires simultaneously numerical solvers in the microscopic periodicity cell which can be parallelized. We compare the performance of the incomplete Cholesky decomposition and the algebraic multigrid method as preconditioners of the stiffness matrix. The parallel code is developed by MPI and tested on modern parallel architectures.