Implementation of a parallel conjugate gradient method for simulation of elastic light scattering

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Computers in Physics, vol. 6, p. 323, August 1992.

We simulate elastic light scattering with the coupled dipole method. The kernel of this method is a large set of linear equations. The n×n system matrix is complex, symmetric, full, and diagonally dominant. This application is a typical example of problems arising in computational electromagnetics. The matrix equations are usually solved with (preconditioned) conjugate gradient methods. For realistic problems the size of the matrix is very large ($n \sim 10^4$ to 10^6). In that case sustained calculation speeds in the Gflop/s range are required to keep execution times acceptable.We introduce a methodology to parallelize the conjugate gradient method for this type of problems, with emphasis on coarse grain distributed memory implementations. We present results for an implementation on a transputer network.