Parallel Solution of the 3-D Laplace Equation Using a Symmetric-Galerkin Boundary Integral Approximation

The primary goal of this project is to develop the techniques for the parallel implementation of a 3-D Symmetric-Galerkin boundary integral method. The techniques developed will apply to any boundary integral formulation, and thus the Laplace equation, the simplest example, will be investigated. In a Symmetric-Galerkin approximation, two boundary integral equations, one for surface potential and one for surface flux are employed. Discretizing the two equations results in a finite system of linear equations (Ax = b) which can then be solved using ScaLAPACK linear algebra routines. The matrix construction procedure is divided into a one-dimensional block-row distribution consisting of (number of process rows * number of process columns) rows. The matrix elements are then redistributed to a two-dimensional, block-cyclic distribution to prepare for the ScaLAPACK matrix solver routine PDGESV. In addition to ScaLAPACK, the implementation uses the PVM parallel libraries. Calculations to test the parallel implementation will be conducted.

Category: Computer Science and Mathematics

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