

Large-Scale Linear Dynamic Analysis Based on Domain Decomposition Method Using Local Schur Complement and Inverse of Coarse Matrix

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In this work, performance tuning approaches of a structural analysis code based on the hierarchical domain decomposition method (HDDM) for peta-scale massively parallel supercomputers are presented. First, a new subdomain local FE solver, DS-LSC, using explicit evaluation of local Schur complement, is introduced. Next, the coarse grid correction step in BDD pre-conditioner is accelerated by the explicit evaluation of the inverse of the coarse matrix. These approaches are effective for a linear dynamic analysis, where a linear equation with the constant coefficient matrix has to be solved repeatedly. As a preliminary benchmark result, more than 20 % of peak FP performance is obtained on RIKEN K Computer using 20000 nodes. The implementation will be introduced to the future version of open-source CAE system, ADVENTURE.

Keywords: Parallel Processing, Supercomputing, Domain Decomposition Method, BDD, Local Schur Complement, Coarse Grid Correction