
Parallel adaptive cross approximation for the multi-trace formulation of scattering problems

Michal Kravcenko^{1,2}, Jan Zapletal^{1,2}, Xavier Claeys³, Michal Merta^{1,2}

¹IT4Innovations, VŠB - Technical University of Ostrava, Czech Republic

²Department of Applied Mathematics,

VŠB - Technical University of Ostrava, Czech Republic

³Jacques-Louis Lions Laboratory, Sorbonne Université, France

michal.kravcenko@vsb.cz

We present a highly parallel version of the boundary element method accelerated by the adaptive cross approximation for the efficient solution of scattering problems with composite scatterers. Individual Calderón projectors are treated independently, i.e. the boundary of every homogeneous subdomain is decomposed into clusters of elements defining a block structure of the local matrix. The blocks are distributed across computational nodes by a graph algorithm providing a load balancing strategy. The intra-node implementation further utilizes threading in shared memory and in-core SIMD vectorization to make use of all features of modern processors. The suggested approach is validated on a series of numerical experiments presented in the paper.

Keywords: boundary element method, adaptive cross approximation, multi-trace formulation, distributed parallelization.