

Hierarchical Fast Boundary Element Method for 2-D SH Wave Propagation in Time-Domain

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This paper presents an acceleration of the convolution quadrature boundary element method (CQ-BEM) for 2-D SH wave propagation. In general, the CQ-BEM requires much computational time and memory. Therefore, it is essential to develop an efficient convolution quadrature boundary element method for large-scale problems. In the proposed method, hierarchical matrix structures with adaptive cross approximation (ACA) are applied to the efficient calculations for assembly of matrices and matrix-vector products for the retarded potential in time-marching procedures of the CQ-BEM. The accuracy and computational efficiency of the proposed method are checked by solving problems of an incident plane wave scattered by cavities. In addition, a large-scale multiple scattering problem of 2-D SH waves with several hundred million degrees of freedom is demonstrated by the proposed method.

Keywords: Time-domain boundary element method, Hierarchical matrix, Adaptive cross Approximation, Convolution quadrature method