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A Local Wave Tracking Strategy for Solving High-Frequency Helmholtz Problems

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the presentation deals about a procedure for selecting basis function orientation to improve the e?fficiency of solution methodologies that employ local plane-wave approximations. The proposed adaptive approach consists of a local wave tracking strategy. Each plane-wave basis set within considered elements of the mesh partition is individually or collectively rotated to best align one function of the set with the local propagation direction of the field.

Systematic determination of the approximated local direction of the field inside the computational domain is formulated as a minimization problem.

To illustrate the salient features and evaluate the performance of the proposed wave tracking approach, error estimates as well as numerical results are presented for the case of a least-squares method (LSM) using plane-wave based approach. The numerical results obtained for the case of a two-dimensional rigid scattering problem indicate that (a) convergence was achievable to a prescribed level of accuracy, even upon initial application of the tracking wave strategy outside the pre-asymptotic convergence region, (b) the proposed approach reduced the size of the resulting system by up to two orders of magnitude, depending on the frequency range, with respect to the size of the standard LSM system

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