Abstracts

Optimal finite-difference sub-gridding techniques applied to the Helmholtz equation

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Since the spatial resolution of a uniform grid determines in part the accuracy of a given simulation, it must be judiciously chosen. In some small region of the computation domain, a fine grid density may be needed, while in the remainder of the domain, a coarser grid is acceptable. It would be preferable if a coarse resolution could be used over the majority of the computational domain, while locally using a finer resolution around the problem areas. In this presentation, a systematic method is presented that shows how to optimally choose the finite-difference coefficients for the transition region from a coarse to a fine grid. Results are presented for two-dimensional problems and for specific stencils. The ideas can then be applied to any dimension and any desired stencil in a straightforward manner. The sub-gridding methods are verified for accuracy through a study of scattering from curved geometries and propagation through dense penetrable materials.

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