Radiation boundary conditions for waves: extensions and open problems

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The radiation of energy to the far field is a central feature of wave physics. As such efficient, convergent domain truncation algorithms are a necessary component of any wave simulation software. For the scalar wave equation and equivalent systems such as Maxwell's equations in a uniform dielectric medium, Complete Radiation Boundary Conditions (CRBC), which are optimized local radiation boundary condition sequences, provide a satisfactory solution: spectral convergence, rapid parameter selection based on sharp *a priori* error estimates, and effective corner/edge closures. Issues that arise in extending the method to more general problems include the treatment of so-called reverse modes, waves whose group and phase velocities are misaligned relative to the normal direction at the radiation boundary, as well as problems with inhomogeneities and nonlinearities. Here we will explore a number of ideas for constructing reliable and efficient domain truncation algorithms in these more difficult settings:

- Modifications of the CRBC recursions to handle reverse modes - this approach is successful for problems with single wave families;
- Rigorous *a priori* error analysis and optimization of *ad hoc* damping/stretching layers;
- Application of kernel compression/reduced order modeling to nonlocal formulations.

Specific applications to dispersive models of electromagnetic waves, the elastic wave equation, as well as waves in inhomogeneous media will be given.