Time domain boundary integral methods for acoustic scattering

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Discretizing the wave equation in time by a multistep or Runge-Kutta method results in a discrete convolution equation. In the case of acoustic scattering in a homogeneous medium, the solution is given as a discrete convolution of boundary integral operators and boundary densities which are to be computed. We thereby obtain the convolution quadrature method. To obtain a fully discrete system we use the Galerkin boundary element method in space.

We will discuss efficient techniques to solve the resulting block lower triangular Toeplitz system on a parallel computational architecture. Using the convolution quadrature theory, it is possible to give complete stability and convergence results for A-stable time discretizations. Numerical results will be given for BDF and trapezoid multistep methods and for Radau IIa Runge-Kutta methods. We will discuss the relative merits of these methods for problems of acoustic scattering and further applications.

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