Time-Domain Boundary Integral Equations

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We consider the numerical solution of time dependent scattering problems in unbounded domains using time-domain boundary integral equations. We use a Galerkin method to discretize these problems in space and time. This usually leads to difficulties in the computation of the matrix entries since the integration domains have to be intersected with discrete light cones. We circumvent this problem by introducing infinitely smooth basis functions in time with compact support. These functions also allow us to handle variable stepsizes in time. We test the choice of our basis functions by considering a special case of the wave equation on the sphere which boils down to a univariate problem in time. This special case is solved analytically to obtain exact solutions and compared to the numerical solution using the new basis functions.

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