Absorbing boundary conditions in discrete time domain and convolution quadrature BEM–FEM for transient waves

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Resumen

The convolution quadrature method was developed in the mid eighties by Christian Lubich as a devise for constructing new methods for convolution equations and also to analyze already existing methods for some partial differential equations. Among its many applications, the approximation of retarded integral equations offer attractive features, and the method is able to deal very easy and effectively with the scattering of waves around obstacles.

For the scattering of waves with penetrable obstacles (possibly with non–homogeneous properties), the convolution quadrature method allows to construct a family of discretizations by using a traditional variational formulation in the bounded non–homogeneous domain and retarded integral equations to express the exact absorbing boundary conditions in time. We show that the use of CQ methods based upon multistep or Runge–Kutta methods for the coupled interior–exterior problem leads to a time–stepping method for the interior domain with a discrete version of the retarded equation as a discrete convolutional system.

We will also give conditions guaranteeing stability of the method depending on the way the boundary integral system is written and discretized in space.

Sección en el CEDYA 2007: AN

Referencias

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