ERROR ANALYSIS OF ACOUSTIC WAVE EQUATION WITH NON-CONSTANT COEFFICIENTS BY SPECTRAL ELEMENT METHODS

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ABSTRACT. We present the error analysis of the spectral element solution of the two-dimensional wave equation in acoustic media with non-constant coefficients in a bounded domain, generalizing the work of [1], [2, 3], and [4].

The spectral element method basis is based on Gauss-Lobatto-Legendre (GLL) collocation points for the domain discretization and the time discretization is based on the explicit Newmark's second order scheme. As usual, the GLL points are also employed in the numerical quadrature, so that the mass matrix is diagonal and the resulting algebraic scheme is explicit.

The analysis provided an a priori estimate which depends on the time step (Δt), the element length (h) and the degree of polynomial used in quadrature rule (p). Numerical tests illustrate the validity of the estimate.

Keywords: Spectral element method; Wave equation; Error estimation

Mathematics Subject Classifications (2010): 65R20, 65M70, 35L05

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