ICNAAM 2022
14th Symposium on Recent Trends in the Numerical Solution of Differential Equations

Energetic BEM for the numerical solution of 2D elastodynamics interior problems

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Abstract

Elastodynamics plays an important role in many physical and engineering applications, involving both linear and nonlinear problems. Hence, Energetic Boundary Element Method (BEM), originally introduced in [1] in the context of scalar (acoustics) wave propagation, has been recently extended to be used for the numerical solution of vector problems, in particular related to 2D elastodynamics scattering, i.e. exterior problems with Dirichlet boundary conditions [2, 3].
The present contribution aims at considering the more difficult situation of interior problems, describing the principal steps needed to rewrite the assigned elastodynamics PDE, equipped by trivial initial conditions and boundary conditions of Dirichlet, Neumann and mixed types, in terms of space-time boundary integral equations (BIEs) involving the fundamental solution of the 2D elastodynamics operator. The BIEs will be set in the so-called energetic weak form to be successively discretized by a Galerkin type approach. For the construction of the entries of the Energetic BEM linear system matrix, a careful subdivision of integration domains has to be taken into account, due to the presence of two wavefronts propagating primary and secondary waves, together with quadrature schemes for kernels singularities, see [4].
Several numerical results will be presented and discussed, showing the optimal performance of the considered discretization technique.

References

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