# Algorithmic aspects of time-domain Energetic BEM for Elastodynamics

**Alessandra Aimi[1], Luca Desiderio[1], Giulia Di Credico[1,*] and Chiara Guardasoni[1]**

[1] Department of Mathematical, Physical and Computer Sciences,
Parco Area delle Scienze 53\A, 43124, Parma, University of Parma, Italy, https://smfi.unipr.it/en,
alessandra.aimi@unipr.it;
luca.desiderio@unipr.it;
giulia.dicredico@unipr.it;
chiara.guardasoni@unipr.it;

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The purpose of this contribution is to study, from the computational point of view, the application of the Energetic Boundary Element Method (Energetic BEM) to the resolution of elastodynamic problems with propagation in exterior or interior domains, characterized by a Lipschitz boundary. The method is based on a boundary integral representation formula of the differential problem solution, which naturally incorporates the propagation at infinity. We consider a time-domain approach and a Galerkin type discretization of the Boundary Integral Equations (BIEs), obtainable exploiting the assigned boundary conditions in the representation formula.

Energetic BEM has been already theoretically analysed and efficiently implemented for the resolution of scalar wave propagation problems [1,2] and it has also been introduced for soft scattering elastodynamics in [3], showing how the link of the weak energetic formulations with the energy of the system leads to accurate and stable numerical results.

In this contribution, we will expose the computational details of the method, which requires an accurate study of the numerical evaluation of the double space integrals which compose the entries of the matrix representing the discretized energetic weak formulation, once the analytical time integration has been performed. The use of suitable quadrature formulas apt to treat the spatial singularities of the integrand functions is fundamental for the precise computation of this matrix. Further its block Toeplitz structure allows to run a fast parallel implementation. Therefore, we will focus on the time scalability of this process, which will be performed by the execution of Fortran codes on the HPC facility of University of Parma. To moreover optimize the Energetic BEM, considerations about compression algorithms, apt to reduce the computational cost and memory requirements of the elastodynamics discretized problems, will be done and numerous numerical examples of 2D/3D elastodynamics wave propagation will be presented and discussed.

## REFERENCES

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