

# RECENT ADVANCES ON BOUNDARY ELEMENT METHODS BASED ON HIGH-ORDER AND ENRICHED APPROXIMATION SPACES FOR WAVE PROPAGATION PROBLEMS: ANALYSIS, IMPLEMENTATION AND APPLICATIONS

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## ABSTRACT

Solving wave propagation problems plays a crucial role in many industrial fields such as telecommunications, imaging techniques, seismology, non-destructive testing and radar-cross section computation. Addressing such a wide range of applications requires accurate, fast and practical simulation tools.

Wave propagation phenomena are often modeled with boundary integral equation methods, whose discretizations are known as Boundary Element Methods (BEM). By requiring only the boundary of the physical domain to be meshed, these methods simplify the simulation setup and reduce the number of degrees of freedom compared with volume-based discretization approaches. However, BEM gives rise to dense linear systems, resulting in substantial memory requirements and computational costs that can be prohibitive for industrial-scale applications. Therefore, significant opportunities remain for advancing BEM methodologies to address the associated computational challenges. One research direction is the development of high-order discretization schemes to reduce the size of the linear system to be solved.

The main goal of the Mini-symposium is to bring together experts and young researchers in the fields of numerical analysis and scientific computing, from both academic and industrial research groups, to discuss the most recent advances and current open challenges in innovative high-order BEM strategies. Application areas

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covered include, but are not limited to, elastodynamics, acoustics and electromagnetism. The Mini-symposium will focus on high-order BEM, both recent and traditional ones: h-, p- and hp-BEM, Isogeometric Analysis BEM (IgA-BEM), Virtual element approximation-based BEM (V-BEM), spectral BEM, etc.

## SPEAKERS

1. Edouard Demaldent, CEA, France: "*Local h and p refinement of the BEM applied to Eddy current testing*"
2. Luca Desiderio, University of Messina, Italy: "*Fast and accurate IgA-BEM for 3D wave propagation problems*"
3. Bernd Hofmann, Standford University, USA: "*Construction of a high-order dual basis to precondition the electric field integral equation*"
4. Carlos Jerez-Hanckes, KTH, Sweden: "*High-Order and Operator-Preconditioned Boundary Element Methods for Wave Scattering*"
5. Claire de Lachaux, CEA, France: "*Towards a curved virtual element approximation-based boundary element method for the electric field integral equation*"
6. Pierre Marchand, INRIA, France: "*Convergence rates of curved boundary element methods for the 3D Laplace and Helmholtz equations*"
7. Jakob Tore Kammeyer Nielsen, TICRA, Denmark: "*Coupling of Higher-Order FEM and BEM on Non-Conforming Meshes for Maxwell's Equations*"
8. Maria Lucia Sampoli, University of Siena, Italy: "*TBD, topic on Splines-based BEM*"