ISOGEOMETRIC BOUNDARY ELEMENT METHODS

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ABSTRACT

Boundary Element Methods (BEM) have historically offered engineers an alternative technique to Finite Elements for certain classes of problems including infinite domains as found in acoustic scattering or those involving discontinuous and singular fields in fracture mechanics. The emergence of the isogeometric approach - see for instance [1] for some recent advances - has recently led also to a renewed interest in BEMs, see [2] for a general introduction. BEMs rely on a boundary integral formulation of the problem, which can be derived whenever the fundamental solution of the associated differential operator is known. Hence, they require only the definition of a mesh on the boundary of the domain, which is a much easier task especially in the IgA context, where the CAD representation of the boundary is available. In the IgA paradigm, the boundaries of the computational domains are represented in parametric form as Non-Uniform Rational B-Splines (NURBS), since this is the standard representation in CAD systems. In IgA, the same representation is employed to define shape basis functions for the expression of the BIE approximate solution. This type of approach allows to deal with functional spaces more regular and more flexible than those used by traditional schemes. This can be achieved by using spline functions which can have also different regularity at different inter-elements.

The Isogeometric Boundary Element method (IgA-BEM) approach has given promising results in the numerical solution of several problems, ranging from acoustic to potential flow, electromagnetic scattering, elastostatic and steady incompressible flow. Collocation IgA-BEM has been applied to many different two- and three-dimensional problems. Recently, also Galerkin conformal approximation in IgA-BEM has been employed for three-dimensional problems.

The aim of the present mini-symposium is to present recent achievements and developments in the context of IgA-BEM, regarding both the theoretic aspects and implementational aspects, like the efficiency, versatility and adaptivity.

REFERENCES (Not mandatory, maximum 2 references)

[1] C. Manni, H. Speleers, eds. *Geometric challenges in Isogeometric Analysis*. Vol. 49. Springer Nature, 2022.

[2] G. Beer, B. Marussig, C. Duenser: *The Isogeometric Boundary Element Method*, Springer, 2020.