

On Fast Isogeometric Boundary Element Methods

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ABSTRACT

Boundary element methods are frequently used in industrial applications, in particular for the simulation of acoustic and electromagnetic wave propagation in unbounded domains. Since the corresponding system matrices are usually dense, compression techniques are employed to allow for linear or almost linear scaling with respect to the number of unknowns. Most of these compression techniques can be formulated in the abstract framework of hierarchical matrices. However, the common way to employ hierarchical matrices is based on a per degree of freedom based numerical quadrature, where the common way for efficient numerical integration for higher order schemes is an element based numerical quadrature.

In this talk, we discuss how element based numerical quadrature can be maintained also when fast boundary element methods, in particular hierarchical matrices, are employed. We further discuss a variant of the fast multipole method based on interpolation of the fundamental solution on the reference domain of the isogeometric mappings which fits into the presented framework. We point out several simplifications of the fast multipole method which is due to the special structure of the reference domains of the isogeometric surfaces. Numerical examples to demonstrate the feasibility of the proposed method are presented.

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