An adaptive isogeometric Galerkin BEM model based on novel quadrature schemes

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Boundary Element Method (BEM) is a numerical method to solve PDEs, in which the original problem is reformulated as a system of integral equations defined only on the boundary of the domain. The main advantages of the method are a reduced dimension of the computational domain and the simplicity to solve external problems. One of the important challenges in this topic is to accurately and efficiently solve singular integrals that arise from the BEM formulation.

In this talk we present an efficient adaptive Galerkin BEM model for elliptic problems. Local refinability of the approximated solution of the problem is achieved by using hierarchical B-spline spaces [3]. Exploiting the uniformity of the knot sequences of the spline spaces for every level allows us to reduce the time complexity of the model. Adaptivity is achieved by using local refinement strategies with a residual based error estimator.

To solve BEM integrals accurately and efficiently, B-spline tailored quadrature schemes are employed in our model. The schemes for singular integrals have been introduced in [1] and further developed in [2], introducing a more local approach that is based on a quasi-interpolation operator.

At the end, some numerical examples for 2D elliptic problems on open and closed domains are presented.

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References

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