Quadrature Schemes for 2D and 3D Isogeometric Boundary Element Methods

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Boundary Element Methods (BEMs) are techniques used to numerically solve differential problems by using Boundary Integral Equations (BIEs) [1]. Such BIEs present singular kernels, hence, designing accurate and efficient quadrature schemes is of fundamental importance.

In this talk, quadrature rules based on spline quasi-interpolation (QI) are presented. In particular, results regarding the evaluation of hypersingular integrals will be shown. The Hermite QI operator [2] approximates the regular part of the integrand, providing a B-spline representation. Thereafter, the product recursive formula [3] and the computation of suitable modified moments for B-splines provide the final evaluation of the considered integrals. Convergence is studied with the respect to quadrature nodes, for integrand functions of different type of smoothness. This scheme has been applied to the Galerking discretization of 2D pure Neuman and mixed Laplace problems.

The proposed quadrature schemes are also extended to the numerical evaluation of BIEs in case of 3D problems. The singular kernels are first regularised to obtain at least C^0 integrand functions, for the resulting regular part, and simpler kernels, for the remaining singular side. Then, suitable double modified moments for B-splines are computed. At the end some numerical simulations will follow to validate the proposed quadrature rules.
This is a joint work with Aimi, Calabrò, Giannelli, Kanduč, Sampoli and Sestini.

References

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