A hierarchical Hermite spline quasi-interpolant

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In [1] a 1D Hermite quasi-interpolation (QI) scheme based on B-splines with optimal approximation order was introduced. In [2, 3] a tensor-product 2D generalization of this scheme was constructed, and the tests proved the robustness of this approach in the bivariate setting. Here we present a hierarchical extension of such quasi-interpolant, which allows to reduce the computational cost of the approximation. This hierarchical generalization is obtained by applying the general framework recently introduced in [4] to construct hierarchical quasi-interpolants, which is based on the truncated basis defined in [5]. This approach also allows to use uniform grids at each refinement level, and then to precompute the analytic expression of the linear functionals defining the hierarchical QI operator with corresponding computational advantages.

References

[1] F. Mazzia, A. Sestini, The BS Class of Hermite Spline Quasi-interpolants on Nonuniform Knot Distributions, BIT Numer. Math. 49, 611-628, 2009.

[2] A. Iurino, BS Hermite Quasi-Interpolation Methods for Curves and Surfaces, PhD thesis, XXVI ciclo, Univ. di Bari, 2014.

[3] A. Iurino, F. Mazzia, The C library QIBSH for Hermite Quasi-Interpolation of Curves and Surfaces, Dipartimento di Matematica, Univ. di Bari, report 11/2013, submitted.

[4] H. Speleers, C. Manni, Effortless Quasi-Interpolation in Hierarchical Spaces, Report TW 647, Katholieke Universiteit Leuven, 2014, submitted.

[5] C. Giannelli, B. Jüttler, H. Speleers, THB-splines: the Truncated Basis for Hierarchical Splines, Comput. Aided Geom. Design 29, 485-498, 2012.