Fast interpolation and cubature at the Padua points

Marco Caliari, Stefano De Marchi
Dept. of Computer Science, University of Verona (Italy)

Alvise Sommariva, Marco Vianello†
Dept. of Pure and Applied Mathematics, University of Padova (Italy)

Abstract

The Padua points are the first known example of optimal polynomial interpolation points in two variables, with a Lebesgue constant increasing like log square of the degree. Moreover, they generate a nontensorial Clenshaw-Curtis-like cubature formula, which is competitive with the tensor-product Gauss-Legendre formula and even with the few known minimal formulas, on integrands that are not “too regular”. Here we compare in Matlab two fast algorithms for interpolation and cubature at the Padua points, based on representation in the bivariate Chebyshev orthogonal basis via matrix products or via the FFT. The former turns out to be superior up to degree $n = ?$, and thus an hybrid algorithm comes out as the most reasonable choice.

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† Corresponding author: e-mail: marcov@math.unipd.it