High dimensional Interpolating Cubature rules on transformed Lattice grid

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In this talk we present a new way to construct s-dimensional interpolatory cubature rules of given algebraic polynomial degree, d, By design the new rules have the desired polynomial degree. Our focus is therefore to construct rules with positive weights and low Legesgue number. We will provide some numerical evidence of the quality of the new rules.

The idea is to apply a cosine transform to an integration lattice and assign the appropriate weights to make the cubature rule having the desired degree. This is similar to constructing the 1d Clenshaw-Curtis rules by a cosine transform of the trapezoidal rule.

Integration lattices form the abscissa set for Lattice rules [1] , which are, like the trapezoidal rule, known to be of high trigonometric degree and thus excellent for periodic function. While Clenshaw-Curtis rules, although of polynomial degree only N, has recently been shown to as good as the celebrated Gauss-Legendre rules with equal number of abscissas [2].

References

[1] Sloan, I.H., Joe, S.: Lattice methods for multiple integration. Oxford University Press (1994)

[2] Trefethen, L. Nick.: Is Gauss quadrature better than Clenshaw-Curtis? Siam Review **50(1)**, 67–87 (2008)