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Optimal cubature formulas related to tomography for certain classes of functions defined on a cube

Vladyslav Babenko, Sergiy Borodachov and Dmytro Skorokhodov

Abstract

We study the problem of constructing an optimal cubature formula for approximate integration over the cube $[0, 1]^d$. Our construction uses the information given by n integrals along intersections of $[0, 1]^d$ with shifts of coordinate subspaces of a given codimension k , $0 < k < d$. We find a family of optimal formulas of this type for the class of functions defined on $[0, 1]^d$ which controls the modulus of continuity with respect to the max-norm in \mathbb{R}^d . When the majorant ω for the moduli of continuity of functions in the class is strictly increasing the family we find describes the set of all optimal cubature formulas.

Keywords: cubature formula, Radon transform, packing problem, modulus of continuity.

MSC: Primary 41A55, 41A63; Secondary 65D30, 65D32.

§1. Setting of the problem and review of known results

The problem considered in this paper is related to the following type of questions arising in computerized tomography. Assume that we have a square S with unknown distribution

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Kirill A. Kopotun

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