Maz'ya, Vladimir; **Schmidt, Gunther**
On quasi-interpolation with non-uniformly distributed centers on domains and manifolds.
(English) ⧉ Zbl 0976.41004
J. Approximation Theory 110, No. 2, 125-145 (2001).

Summary: The paper studies quasi-interpolation by scaled shifts of a smooth and rapidly decaying function. The centers are images of a smooth mapping of the $h\mathbb{Z}^n$-lattice in $\mathbb{R}^s$, $s \geq n$, and the scaling parameters are proportional to h. We show that for a large class of generating functions the quasi-interpolants provide high order approximations up to some prescribed accuracy. Although in general the approximants do not converge as h tends to zero, the remaining saturation error is negligible in numerical computations if a scalar parameter is suitably chosen. The lack of convergence is compensated by a greater flexibility in the choice of generating functions used in numerical methods for solving operator equations.

Reviewer: Yuly Makovoz (Lowell)

MSC:

41A05 Interpolation in approximation theory

Cited in **3** Reviews
Cited in **16** Documents

Keywords:

quasi-interpolation; cubature formulas; shift-invariant spaces

Full Text: DOI

References:

[1] Abramowitz, M.; Stegun, I.A., Handbook of mathematical functions, (1970), Dover New York · Zbl 0515.33001

[2] Beatson, R.K.; Light, W.A., Quasi-interpolation in the absence of polynomial reproduction, (), 21-39 · Zbl 0832.41011

[3] de Boor, C.; Ron, A., Fourier analysis of the approximation power of principal shift-invariant spaces, Constr. approx., 8, 427-462, (1992) · Zbl 0801.41027

[4] Buhmann, M.D.; Dyn, N.; Levin, D., On quasi-interpolation by radial basis functions with scattered centres, Constr. approx., 11, 239-254, (1995) · Zbl 0824.41010

[5] Ivanov, T.; Maz'ya, V.; Schmidt, G., Boundary layer approximate approximations and cubature of potentials in domains, (1998), WIAS Berlin

[6] Karlin, V.; Maz'ya, V., Time-marching algorithms for non-local evolution equations based upon "approximate approximations", SIAM J. numer. anal., 18, 736-752, (1997) · Zbl 0872.65081

[7] Maz'ya, V., A new approximation method and its applications to the calculation of volume potentials, Randelementmethoden, (1991), Schloß Reisensburg, p. 18

[8] Maz'ya, V., Approximate approximations, (), 77-104 · Zbl 0827.65083

[9] Maz'ya, V.; Schmidt, G., On approximate approximations using Gaussian kernels, IMA J. numer. anal., 16, 13-29, (1996) · Zbl 0838.65005

[10] Maz'ya, V.; Schmidt, G., "approximate approximations" and the cubature of potentials, Rend. mat. acc. lincei, s. 9, 6, 161-184, (1995) · Zbl 0845.65008

[11] Maz'ya, V.; Schmidt, G., Approximate wavelets and the approximation of pseudodifferential operators, Appl. comput. harm. anal., 6, 287-313, (1999) · Zbl 0932.65149

[12] Ron, A., The \textit{L}2-approximation orders of principal shift-invariant spaces generated by a radial basis function, (), 245-268 · Zbl 0820.41014

[13] Schaback, R., Multivariate interpolation and approximation by translates of a basis function, (), 491-514 · Zbl 1139.41301

[14] Schaback, R.; Wu, Z., Construction techniques for highly accurate quasi-interpolation operators, J. approx. theory, 91, 320-331, (1997) · Zbl 0904.41012