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Optimal recovery of the operators of the divided difference of the inaccurately given sequence by the Fourier transform. (Russian. English summary) Zbl 1463.65155

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Summary: In various applications, it is often necessary to reconstruct some characteristic of an object from some information (usually incomplete or inaccurate) about its other characteristics. There are various approaches to solving similar problems. In this paper, we used an approach based on the ideas of Andrei Nikolaevich Kolmogorov concerning the best means of approximation by finite-dimensional subspaces. The essence of the method lies in the fact that the best means of approximation on the whole class is sought. We consider the problem of simultaneous recovery of operators of divided differences of a sequence of all orders from 1 to $(n-1)$th inclusive, in a class of sequences with bounded nth divided difference. The Fourier transform of this sequence is known inaccurately at a certain interval sequence in the mean square norm. A family of optimal recovery methods is constructed. Among the methods found are those that use minimal sequence information, pre-smoothing it. The exact value of the optimal error of recovering divided-difference operators is found. The passage to the limit from the obtained results implies a continuous case.

MSC:

65K10 Numerical optimization and variational techniques

Keywords:

optimal recovery; operator of divided difference; Fourier transform

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References:

[1] Smolyak S. A., #On Optimal Recovery of Fuctions and Functionals of them, Candidate dissertation, Moscow State University, 1965 (in Russian)

[2] Magaril-Il'yaev G. G., Osipenko K. Y., "Optimal Recovery of Functions and Their Derivatives from Inaccurate Information about the Spectrum and Inequalities for Derivatives", #Functional Analysis and Its Applications, #37:3 (2003), 203-214 · Zbl 1048.41007 · doi:10.1023/A:1026084617039

[3] Magaril-Il'yaev G. G., Osipenko K. Yu., "Optimal Recovery of Operators from Inaccurate Information", #Studies on the Convex Analysis, Mathematical Forum. Review of Science: Southern Federal District, #2, 2009, 158-192 (in Russian)

[4] Unuchek S. A., "Optimal Reconstruction of Divided Differences from an Inaccurate Sequence", #Differential Equations, #51:7 (2015), 948-954 · Zbl 1331.65032 · doi:10.1134/S0012266115070125

[5] Unuchek S. A., "On Optimal Recovery of the Operator of \(k\)-th Divided Difference from its Inaccurately Given Fourier Transfor", #Vladikavkaz Mathematical Journal, #17:3 (2015), 84-92 (in Russian) · Zbl 1474.42003 · doi:10.23671/VNC.2017.3.7268

[6] Magaril-Il'yaev G. G., Osipenko K. Yu., How Best to Recover a Function from its Inaccurately Given Spectrum?, #Mathematical Notes, #92:1 (2012), 51-58 · Zbl 1268.90125 · doi:10.1134/S0001434612070061