Derivative plane sampling and weighted differential operator

Tibor K. Pogány [a,b]

[a] Faculty of Maritime Studies, University of Rijeka (Croatia)
tibor.poganj@uniri.hr
[b] Institute of Applied Mathematics, Óbuda University, Budapest (Hungary)
pogany.tibor@nik.uni-obuda.hu

The Whittaker–type derivative plane sampling reconstruction formula was established about three decades ago by J. R. Higgins in [1]. The speaker confirmed Higgins' result by another method and extended it for the stochastic processes class $L^\alpha(\Omega, \mathfrak{F}, \mathsf{P});\ 0 \leq \alpha \leq 2$ in the α–mean and almost sure sense, when the input processes possess spectral representation. Here the (p,q)–order weighted differential operator's Whittaker–Higgins type reconstruction formula is established for entire functions coming from Leont'ev functions space $[2, \pi\psi/2], \psi > 0$, applying the circular truncation error's upper bound, which vanishes with exponential rate. Special cases are also presented.

Keywords: (p,q)–order weighted differential operator; Leont'ev spaces of entire functions; circular truncation error; derivative sampling; truncation error upper bounds; Weierstraß sigma–function; Whittaker–type plane sampling reconstruction.

References

[1] J. R. Higgins, *Sampling theorems and the contour integral method*, Appl. Anal. **41** (1991), 155–171.

[2] A. F. Leont'ev, *Generalization of Series of Exponentials*, Nauka, Moscow, 1981. (in Russian)

[3] Z. A. Piranashvili, T. K. Pogány, *On generalized derivative sampling series expansion*, in H. Dutta, Lj. Kočinac, H. M. Srivastava (Eds.), *Current Trends in Mathematical Analysis and its Interdisciplinary Applications*, Birkhäuser Verlag, Springer Basel AC, 2019, 491–519.

[4] T. Pogány, *Derivative uniform sampling via Weierstraß $\sigma(z)$. Truncation error analysis in $[2, \pi q/(2s^2))$*, Georgian Math. J. **8** (2001), 129–134.

[5] T. Pogány, *Local growth of the Weierstraß σ–function and Whittaker–type derivative sampling*, Georgian Math. J. **10** (2003), 157–164.

[6] T. K. Pogány, *Whittaker-type derivative sampling reconstruction of stochastic $L^\alpha(\Omega)$-processes*, Appl. Math. Comput. **187** (2007), No. 1, 384–394.

[7] E. T. Whittaker, *Note on a function analogous to Weierstrass' sigma–function*, *The Messenger Math.* **31** (1902), 145–148.

[8] J. M. Whittaker, *Interpolatory Function Theory*, Cambridge University Press, Cambridge, 1935.