



Multivariate Max-Min Sampling Operators: Theory and Applications in Image Processing

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Abstract

The approximation of functions using sampling-based operators has emerged as a prominent research area within approximation theory, with potential applications in signal analysis and image processing. We introduce and present a comprehensive study on the family of multivariate sampling operators based on max-min structure, and their utility in real-life applications of image processing. Theoretically, the approximation properties have been established for functions in space of all continuous functions and the Orlicz spaces. The Orlicz spaces are extension of the Lebesgue spaces and consist of several interesting spaces, for instance, the *Exponential space* and the *Logarithmic space*. Further, the utility of our proposed operators have been demonstrated through successful applications in image processing, in particular, image reconstruction, image upscaling and image inpainting, and the performance has been evaluated using PSNR, SSIM and EPI. Our findings demonstrate the effectiveness of our proposed operators over some existing family of operators and certain well-known state-of-the-art methods in image processing tasks.