PSEUDO CHEBYSHEV WAVELETS IN TWO DIMENSIONS AND THEIR APPLICATIONS IN THE THEORY OF APPROXIMATION OF FUNCTIONS BELONGING TO LIPSCHITZ CLASS

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Abstract: In 2022, the concept of one-dimensional pseudo Chebyshev wavelets was introduced by the authors. Building upon this research, the present article extends the study to two-dimensional pseudo Chebyshev wavelets. It defines and verifies the two-dimensional pseudo Chebyshev wavelet expansion for a functions of two variables. The paper proposes a novel algorithm utilizing the two-dimensional pseudo Chebyshev wavelet method to address computation problems in approximation theory. To demonstrate the validity and applicability of the results, the methods are illustrated through an example and compared with well-known Chebyshev wavelet methods. The research includes error analysis and convergence analysis for signals f belonging to the $\text{Lip}_{\Omega^2}^{(\alpha,\beta)}(\mathbb{R})$, where Ω^2 is a finite connected domain in $\mathbb{R}^2$, classes using these wavelets. Furthermore, the paper estimates the error of approximation for a functions in the Lipschitz class using orthogonal projection operators of the two-dimensional pseudo Chebyshev wavelets. These findings represent significant advancements in wavelet analysis.