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APPROXIMATION OF FUNCTIONS BELONGING TO $C^{M,\alpha}[0,1)$ CLASS AND SOLUTION OF CHANDRASEKHAR'S WHITE DWARFS AND PANTOGRAPH DIFFERENTIAL EQUATION BY GENOCCHI WAVELETS

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Abstract. In this paper, the approximation of the solution function f for Chandrasekhar's white dwarfs and the Pantograph differential equation of class $C^{M,\alpha}[0,1)$ by the $(2^{k-1},M)^{th}$ partial sums of their Genocchi wavelet expansion in the interval $[0,1)$ has been estimated. The Genocchi wavelet technique has been employed to determine the solution of Chandrasekhar's white dwarfs and the Pantograph differential equation. The solution obtained through the Genocchi wavelet method approaches their exact solution and is compared to the Chebyshev wavelet method, Legendre wavelet method, and ODE-45 method. This represents an achievement of wavelet analysis in this research article.

1. Introduction

Wavelet theory stands out as a versatile tool widely utilized across diverse fields such as engineering, biotechnology, physics, viscoelastic materials, experimental physics, biosciences, and statistical mechanics [3], [9], [12], [10], [21], [26], [29], [30]. Its applications extend to solving real-world challenges, including the detection of submarines and airplanes. This theory is an integral part of the expanding realm of numerical studies, where functions are systematically broken down into smaller versions of a basic wavelet for in-depth analysis [32], [6]. In tandem with wavelet theory, Fourier analysis plays a crucial role in the approximation process. Fourier analysis employs trigonometric polynomials and commonly complements the methodology discussed earlier (Debnath [7], Meyer [19], Zygmund [32]). Together, these analytical tools

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