

Poincare Journal of Analysis & Applications Vol. 10, No. 1 (2023), 193-213 ©Poincare Publishers DOI: 10.46753/pjaa.2023.v010i01.014

## APPROXIMATION OF A FUNCTION HAVING BOUNDED DERIVATIVES UPTO THE SECOND ORDER BY SINE-COSINE WAVELET EXPANSION AND ITS APPLICATIONS

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## Date of Receiving : 03. 01. 2023 Date of Acceptance : 21. 06. 2023

**Abstract.** In this paper, sine-cosine wavelet has been introduced and the approximation errors of the function f(t) whose first and second derivatives are bounded have been estimated using this wavelet and it is used to solve some linear differential equations. Solution obtained by this method is compared with Euler's method and with exact solution. We observe that the solution obtained by this method is better than the solution given by the Euler's method which shows the usefulness of this method.

## 1. Introduction

Different types of orthogonal functions are widely used in approximation theory. In which some of the well known basic orthogonal functions are the walsh function, blockpulse functions, Laguerre, Chebyshev, Legendre polynomials, Jacobi polynomials, etc. Also, in the Fourier Analysis, we use sine-cosine functions as orthogonal functions. Due to the continuous nature of the orthogonal polynomials and sine-cosine functions, the approximations obtained using these types of function are better than the approximation obtained by piecewise constant functions. Various problems of the dynamical systems have been solved by using these orthogonal functions. When we use these techniques to solve these types of problems then the problems are changed into system of algebraic equations. This is the beauty of this technique.

The authors like Chen and Hsiao 1975 [1], Chen et al. [15], Hwang and shish [2], Chang and Wang [3], Horng and Chou [4], Razzaghi and Razzaghi [5], Paraskevopoulos

<sup>2010</sup> Mathematics Subject Classification. 42C40, 42C15, 65T60, 65L10, 65L60, 65R20.

 $K\!ey\ words\ and\ phrases.$  Sine-Cosine wavelet, wavelet approximation, operational matrix of integration, orthonormal set.

Communicated by. Ashish Pathak

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