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NUMERICAL SOLUTION OF LINEAR FREDHOLM INTEGRAL EQUATIONS SYSTEM BY LINEAR LEGENDRE MULTI-WAVELETS

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Abstract. A new computational method based on Linear Legendre multi-wavelets is proposed for solution of the system of Linear Fredhlom integral equation. For this an operational matrix of integration for Linear Legendre multi-wavelets is obtained. Using approximation of Linear Legendre multi-wavelets method, the system of Linear Fredhlom integral equation is reduced to algebraic equations which can be solved simply to obtain an approximate solution. Further, Illustrative examples are produced below to show the applicability and accuracy of the technique. Comparison of outcome has been done with Rational Haar wavelet and it shows that the accuracy of these results is higher.

1. Introduction

Wavelet theory is quite new and is the developing phase in mathematical research. Wavelets have establish their approach into different area of science and engineering. Wavelet analysis is also very well-known due to successful applications in signal and image Processing [4, 10, 16].

Integro-differential equations (IDEs) arise in a wide range of scientific and engineering applications, including viscoelasticity, biological systems, control theory, and population dynamics. The inherent combination of differential and integral operators within these equations often posses significant analytical and numerical challenges, particularly when dealing with complex boundary conditions or non-linear terms.

Despite the popularity of classical wavelet families such as Haar, Chebyshev and CAS wavelets these methods inherent some limitations. Haar wavelets while computationally efficient are piecewise constant and fail to accurately approximate smooth signals.

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