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ON S-ELEMENTARY WAVELETS IN $\mathbb{R}$ AND THEIR APPLICATIONS IN SOLVING INTEGRAL EQUATIONS

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Abstract. In this paper, we introduce a class of s-elementary wavelets as the basis functions and use them to present an operational computational method for solving nonlinear Fredholm and Volterra integral equations. For presenting the methods, first, operational matrices for the s-elementary wavelets are derived. Then, the s-elementary wavelets bases along with these operational matrices are applied for solving integral equations. Convergence analysis of the s- elementary wavelets basis are investigated. To reveal the accuracy and efficiency of the proposed method some numerical examples are included and the obtained results are compared with some references.

1. Introduction

The word wavelet was first introduced by Haar in 1909 and it was developed by Chui [5], Daubechies [9], Dai and Lu [8], Meyer[22], Fang and Wang [10] and Hernandez and Weiss [14]. A special type of wavelet that is called s-elementary wavelet, first introduced by Dai and Larson [6] also, Gabardo and Yu [11] and Benedetto and Sumetkijakan [2], have come up with new and different ways to build these wavelet sets.
In recent years, integral theory has attracted much more attention from physicists and mathematicians. In fact there are many problems in physics, mechanics, chemistry and biology that are in the form of partial differential equations, linear and nonlinear integral equations. There are several methods for solving these types of equations as the polynomial approximation [28], linear multistep methods [3], modified homotopy perturbation [12, 29], wavelets [31], triangular functions [27], Newton–Kantorovich method [24] and the Haar wavelet method and the higher order Haar wavelet method

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