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NUMERICAL SOLUTION OF INTEGRO-DIFFERENTIAL EQUATIONS USING FLATLET OBLIQUE MULTIWAVELETS

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Abstract

This paper is concerned with the construction of biorthogonal multiwavelet basis in the unit interval to form a biorthogonal flatlet multiwavelet system. Next a method to calculating derivatives of the dual flatlet multiwavelets by multiplying some matrices is suggested. The system is then used to integro-differential equations. The biorthogonality and high vanishing moments properties of this system result in efficient and accurate solutions. Finally, numerical results for some test problems with known solutions are presented and the absolute errors are compared with the errors resulting from B-spline bases.

Keywords: Flatlet, Oblique multiwavelets, Biorthogonal system, Operational matrix of derivative.

1 Introduction

The advantages of multiwavelets, as extensions from scalar wavelets and their promising features have resulted in an increasing trend to study them. Features such as orthogonality, compact support, symmetry, high order vanishing moments and simple structure make multiwavelets useful both in theory and in applications such as signal compression and denoising[10, 12, 19, 21]. Multiwavelet basis can be successfully used for representing differential operator modeling to solve partial differential equations [2, 1, 6]. In fact the use of multiwavelet basis leads to sparse representation for a wide class of differential, integral and integro-differential operators due to moments of the simple functions involved. In some works such as [3], representations of operators