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Solution of 2D Fractional Order Integral Equations by Bernstein Polynomials Operational Matrices

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Abstract: In this paper, we construct a new two-dimensional Bernstein polynomials operational matrix for solving 2-dimensional fractional order Volterra integral equations (2DFOVIE). By using this operational matrix, we reduce the original problem to a linear or nonlinear system of algebraic equations. We present some numerical examples to show the efficiency of the proposed method.

Keywords: *two-dimensional fractional integral equations; two-dimensional Bernstein polynomials; block pulse operational matrix; operational matrix of integration.*

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1 Introduction

In the last few decades, various engineering and scientific problems involving fractional calculus were discussed. For example, electrochemical process [1, 2], earthquakes [3], economics [4], bioengineering [5], orthogonal splin collocation [6] and fractional optimal control problems [7, 8]. There are several analytical and numerical methods for solving one-dimensional and two-dimensional differential and integral equations of fractional order such as the Adomian decomposition [9], Variational iteration method [10, 11], Transform method [12], Homotopy perturbation method [13], and the methods of Harr and Chebyshev wavelet [14, 15] and Bernstein polynomials [16, 17].

The Bernstein polynomials play a conspicuous role in several areas of mathematics. These polynomials have been commonly used in the solution of differential equations,

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