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NONLINEAR QUADRATIC INTEGRAL EQUATIONS USING MÜNTZ-LEGENDRE WAVELETS

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Abstract. In this paper, we introduce a new computational method for solving nonlinear quadratic integral equations. We use the Müntz-Legendre wavelets and construct its operational matrix of integration for solving nonlinear quadratic integral equations. This method reduces the nonlinear quadratic integral equations to a system of nonlinear algebraic equations, which can be solved by using Newton's method. Error analysis of the proposed method is presented. This method is used to solve some nonlinear quadratic integral equations. Numerical experiments show that the proposed technique is accurate and efficient.

1. Introduction

Integral equations arise in many science and technology problems. Integral equations of different types play an important role in many areas of functional analysis and their applications in physics, economics, and other areas. Mathematical physics, including diffraction problems, conformal mapping, scattering in quantum mechanics, water waves, etc., have led to the development of integral equations. Since integral equations are widely used and in many cases no exact solutions are available, researchers, therefore have developed many numerical method to find the approximate the solution of these equations [12, 18, 1, 4, 24]. Expressing solution of these equations as linear combination of of orthogonal or nonorthogonal basis functions, polynomials, and wavelets is a novel algorithm [22, 19, 17, 27, 25].

Mathematical modeling of several real-world problems leads to a special kind of integral equations called quadratic integral equations (QIEs). Many researchers have recently studied QIEs, which has become one of the most enticing and fascinating areas of research for integral equations [2, 6, 9, 11, 5, 3]. QIEs are useful for explaining different real-world events and problems. QIEs, for instance, are applicable in queuing theory,

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