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A new method for error analysis in generalized Volterra integral equations in L^p space

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Abstract

In this paper, with a new simple proof, an important inequality for a contraction integral equation is obtained. From a practical programming point of view, this inequality allows to express iterative algorithm with a "for loop" rather than a "while loop". The main tool used in this paper is the fixed point theorem in the Lebesgue space.

Keywords: Integral operator; Successive approximation method; Approximation error.
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1 Introduction

The solutions of integral equations play a major role in the fields of science and engineering. Usually, physical events are modeled by a differential equation, an integral or an integro-differential equation, or a system of these. Since few of these equations can not be solved explicitly, it is often necessary to resort to numerical techniques [3]. There are several numerical methods for solving integral equations, such as the method of Galerkin, Collocation, Taylor series, Legendre wavelets, Jacobi polynomials, homotopy perturbation, expansion, and recently, Chebyshev polynomials. On the other hand, investigations on existence theorems for diverse functional-integral equations have been presented in other references such as [1, 2, 4]. It seems that the presented method used in our study is the best stopping rule for iterative algorithm in integral equation comparison with other researches.

At the first we need to some preliminaries, and so in the next Section, by using the weighted norm method, a contraction mapping is obtained. Thereafter at the continue, by a simple technique, the stopping rule for our iterative algorithm has been introduced. Finally, we report numerical results and demonstrate the efficiency and accuracy of the proposed numerical scheme by considering some numerical example. In this paper, we intend to prove the existence and uniqueness of solutions of the nonhomogeneous nonlinear

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