



Optimal Quadrature Rules for Numerical Solution of the Nonlinear Fredholm Integral Equations

Manochehr Kazemi^a, Mohammad Reza Doostdar^b

^aDepartment of Mathematics, Ashlian Branch, Islamic Azad University, Ashlian, Iran

^bDepartment of Mathematics, Zaranj Branch, Islamic Azad University, Zaranj, Iran

Abstract. In this paper, an iterative method of successive approximations to the approximate solution of nonlinear Hammerstein- Fredholm integral equations using an optimal quadrature formula for classes of functions of Lipschitz types is provided. Also, the convergence analysis and numerical stability of the proposed method are proved. Finally, some numerical examples verify the theoretical results and show the accuracy of the method.

1. Introduction

In this investigation, we propose a numerical method for the following nonlinear Hammerstein- Fredholm integral equation of the second kind

$$x(t) = f(t) + \lambda \int_a^b K(t, s)g(s, x(s))ds, \quad t \in [a, b], \quad (1)$$

where $x(t)$ is an unknown function on $[a, b]$ and also, $f(t)$, $K(t, s)$ are known functions on $[a, b]$, $[a, b] \times [a, b]$, respectively.

The mathematical modeling of physical phenomena, many problems in applied mathematics, engineering, mechanics, mathematical physics and many other fields can be transformed into the second-kind of integral equations [8, 11, 15, 21, 22, 24]. There are many numerical methods for solving these equations. The Galerkin and collocation methods are the two commonly used methods for the numerical solutions of these equations [2, 9]. Numerical solutions of linear and nonlinear integral equations have been presented, including, block-pulse functions (BPFs)[7, 17], degenerate kernel method [1], triangular functions (TFs)[10], Chebyshev polynomials [31], Taylor-series expansion method [16], Least squares approximation method[28], operational matrices [27], Bernoulli polynomials [4], B-spline wavelets [19] and wavelet method [3, 20]. Classical theorems on the existence and uniqueness of the solution of nonlinear integral equations can be found in [11, 29]. Existence results for functional integral equations are obtained using the measure of noncompactness and Darbo conditions in [14] and [18] respectively. The method of

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Corresponding author: Manochehr Kazemi

Email addresses: univer_kaz@yahoo.com (Manochehr Kazemi), mrdoostdar@yahoo.com (Mohammad Reza Doostdar)

Optimal Solution Of Nonlinear Equations

André Girard



Optimal Solution Of Nonlinear Equations:

Optimal Solution of Nonlinear Equations University of Utah. Dept. of Computer Science. (UTAHCS), K. Sikorski, 1985

Optimal Solution of Nonlinear Equations Krzysztof A. Sikorski, 2001 *Optimal Solution of Nonlinear Equations* is a text monograph designed to provide an overview of optimal computational methods for the solution of nonlinear equations fixed points of contractive and noncontractive mapping and for the computation of the topological degree It is of interest to any reader working in the area of Information Based Complexity The worst case settings are analyzed here Several classes of functions are studied with special emphasis on tight complexity bounds and methods which are close to or achieve these bounds Each chapter ends with exercises including computer exercises and open ended research based exercises Optimal

Solution of Nonlinear Equations Krzysztof Aleksander Sikorski, 1982 **Optimal Solution of Nonlinear Equations**

Satisfying a Lipschitz Condition K. Sikorski, 1983 Scientific Computing with MATLAB Dingyu Xue, YangQuan Chen, 2018-09-03 *Scientific Computing with MATLAB* Second Edition improves students ability to tackle mathematical problems It helps students understand the mathematical background and find reliable and accurate solutions to mathematical problems with the use of MATLAB avoiding the tedious and complex technical details of mathematics This edition retains the structure of its predecessor while expanding and updating the content of each chapter The book bridges the gap between problems and solutions through well grouped topics and clear MATLAB example scripts and reproducible MATLAB generated plots Students can effortlessly experiment with the scripts for a deep hands on exploration Each chapter also includes a set of problems to strengthen understanding of the material **Industrial**

Engineering, Computation and Information Technologies Prasad Yarlagadda, 2014-12-05 Selected peer reviewed papers from the 2014 2nd International Conference on Mechatronics and Information Technology ICMIT 2014 October 18 19 2014 Chongqing China *Evolutionary Multi-Criterion Optimization* Kalyanmoy Deb, Erik Goodman, Carlos A. Coello Coello, Kathrin Klamroth, Kaisa Miettinen, Sanaz Mostaghim, Patrick Reed, 2019-02-28 This book constitutes the refereed proceedings of the 10th International Conference on Evolutionary Multi Criterion Optimization EMO 2019 held in East Lansing MI USA in March 2019 The 59 revised full papers were carefully reviewed and selected from 76 submissions The papers are divided into 8 categories each representing a key area of current interest in the EMO field today They include theoretical developments algorithmic developments issues in many objective optimization performance metrics knowledge extraction and surrogate based EMO multi objective combinatorial problem solving MCDM and interactive EMO methods and applications **Scientific and Technical Aerospace Reports**, 1968 Economic Model Predictive Control Matthew Ellis, Jinfeng Liu, Panagiotis D. Christofides, 2016-07-27 This book presents general methods for the design of economic model predictive control EMPC systems for broad classes of nonlinear systems that address key theoretical and practical considerations including recursive feasibility closed loop stability closed loop performance and computational efficiency

Specifically the book proposes Lyapunov based EMPC methods for nonlinear systems two tier EMPC architectures that are highly computationally efficient and EMPC schemes handling explicitly uncertainty time varying cost functions time delays and multiple time scale dynamics The proposed methods employ a variety of tools ranging from nonlinear systems analysis through Lyapunov based control techniques to nonlinear dynamic optimization The applicability and performance of the proposed methods are demonstrated through a number of chemical process examples The book presents state of the art methods for the design of economic model predictive control systems for chemical processes In addition to being mathematically rigorous these methods accommodate key practical issues for example direct optimization of process economics time varying economic cost functions and computational efficiency Numerous comments and remarks providing fundamental understanding of the merging of process economics and feedback control into a single framework are included A control engineer can easily tailor the many detailed examples of industrial relevance given within the text to a specific application The authors present a rich collection of new research topics and references to significant recent work making Economic Model Predictive Control an important source of information and inspiration for academics and graduate students researching the area and for process engineers interested in applying its ideas *Handbook of Algorithms for Physical Design Automation* Charles J. Alpert,Dinesh P. Mehta,Sachin S. Sapatnekar,2008-11-12 The physical design flow of any project depends upon the size of the design the technology the number of designers the clock frequency and the time to do the design As technology advances and design styles change physical design flows are constantly reinvented as traditional phases are removed and new ones are added to accommodate changes in Applied Mechanics Reviews ,1980

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