

Editorial

Recent Theory and Applications on Numerical Algorithms and Special Functions

Ali H. Bhrawy,¹ Robert A. Van Gorder,² Dumitru Baleanu,³ and Guo-Cheng Wu⁴

¹*Department of Mathematics, Faculty of Science, King Abdulaziz University, Jeddah 21589, Saudi Arabia*

²*Department of Mathematics, University of Central Florida, Orlando, FL 32816, USA*

³*Department of Mathematics and Computer Sciences, Cankaya University, 06530 Ankara, Turkey*

⁴*College of Mathematics and Information Sciences, Neijiang Normal University, Neijiang 641100, China*

Correspondence should be addressed to Ali H. Bhrawy; alibhrawy@yahoo.co.uk

Received 23 December 2014; Accepted 23 December 2014

Copyright © 2015 Ali H. Bhrawy et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

In recent years, there has been extensive research activity on both the theory and application of efficient numerical methods for approximating the solutions of differential equations. Numerical algorithms and special functions have been a major thrust of this research and have numerous applications in science and engineering. Special functions play a tremendous role in mathematical analysis and in the development of new numerical techniques. In particular, they allow a broad refinement of spectral methods for solving several types of differential equations in both finite and infinite domains. This is useful, in that there is a strong need for efficient and easy-to-use scalable techniques for the numerical solution of large scale problems.

This special issue was focused on the analysis of numerical methods and special functions, while also addressing the practical nature of the two fields. In addition to the strong focus on computational mathematics, scientific computing, and theoretical physics, a special emphasis was given to orthogonal polynomials, the theory of numerical methods for solution of differential equations, and applications of these fields.

A modified generalized Laguerre-Gauss collocation scheme was reported for a class of fractional neutral differential equations on the half-line. Some efficient spectral algorithms were proposed for numerical solution third-order boundary value problems using novel operational matrices of generalized Jacobi polynomials. A mesh-free method for solving nonhomogeneous time-dependent problems

was presented. The homotopy perturbation technique was developed for solving the Hamilton-Jacobi-Bellman equation. A 2-point block method for nonstiff higher-order ordinary differential equations was investigated. New bilateral type generating function associated with I -function, certain class of generating functions for the incomplete hypergeometric functions, complex transmission eigenvalues in one dimension, and certain matrices of Bernoulli numbers were other topics of our special issue. Fast and stable implementation of Clenshaw-Curtis and Fejer-type quadrature rules was investigated. An efficient computation of effective ground range using an oblate earth model and the boundary value problem for bihypermonogenic functions in Clifford analysis were presented. The bivariate spectral homotopy analysis method for nonlinear evolution equations and the fractional Nagumo equation with nonlinear diffusion and convection were distinct topics of our special issue. A coupled system of fractional integrodifferential equations with m -point boundary conditions on the half-line and global regularity for the $\bar{\partial}_b$ -equation on CR manifolds of arbitrary codimension were analyzed.

Ali H. Bhrawy
Robert A. Van Gorder
Dumitru Baleanu
Guo-Cheng Wu



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

