Preface of the “Fifth Symposium on Recent Trends in the Numerical Solution of Differential Equations”

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We enclose below the list of extended abstracts of some of the talks presented in the fifth edition of the above symposium, which covers a wide range of topics related to the numerical solution of differential equations. In the sequel, we briefly describe the contents of the papers, listed in alphabetical order of the respective speakers.

Paper 1, by Teresa Diogo and Magda Rebelo. The paper deals with the numerical solution of two related nonlinear singular Volterra integral equations which arise in the context of a heat transfer problem. The authors consider product integration and collocation methods for both equations.

Paper 2, by Dana Černá and Václav Finěk. In this paper the authors propose a quadratic wavelet basis adapted to the interval [0;1] which preserves vanishing moments. This basis is well suited for the design of adaptive wavelet methods for solving differential equations.

Paper 3, by Annie Gorgey and Robert P.K. Chan. The authors study the process of symmetrization, carried out by taking the composition of two symmetric Runge-Kutta methods but with different weights. This is done still preserving the $h^2$-asymptotic error expansion and providing damping, in the case of stiff problems.

Paper 4, by Luigi Brugnano, Felice Iavernaro, and Tiziana Susca. In this paper, it is shown that Runge-Kutta Gauss collocation methods can be rewritten in many equivalent ways as low-rank Runge Kutta methods. Some of them, induce a corresponding efficient diagonal splitting for solving the generated discrete problems.

Paper 5, by Karel in ’t Hout. The paper concerns the numerical solution of time-dependent, multidimensional PDEs arising in financial option valuation theory. Splitting schemes of the Alternating Direction Implicit type are discussed.

Paper 6, by Somayeh Nemati, Pedro Lima, and Yadollah Ordokhani. In this paper, the authors consider a method for computing approximate solutions to systems of two-dimensional Volterra integral equations. In particular, the approximate solution is sought in the form of a linear combination of two-variable shifted Legendre functions.

Paper 7, by Lidia Aceto, Cecilia Magherini, and Paolo Novati. In this paper, the authors study the application of convolution quadratures for the numerical solution of initial value problems for fractional differential equations. Existing order barriers for LMMs are overcome by applying the schemes as Boundary Value Methods.

Paper 8, by Maria L. Morgado, Magda Rebelo, and Neville J. Ford. In this work, the authors are dealing with the numerical approximation of terminal (or boundary) value problems for fractional differential equations. The approach used is based on the equivalence between this kind of problem and a Fredholm integral equation.

Paper 9 by Sarah E. Reimer and Manfred R. Trummer. The paper concerns the issue of reliability of numerical algorithms by investigating the sensitivity and conditioning of spectral methods for solving boundary value problems. The sensitivity of those methods to perturbations or round-off errors is explored.

Paper 10, by Robert P.K. Chan, Shixiao Wang, and Angela Y.J. Tsai. In this paper two-derivatives Runge-Kutta methods are considered. In particular, the authors study both explicit and implicit methods on stiff ODE problems and extend their application to various partial differential equations.
Paper 11, by Gennadi Vainikko. The paper concerns linear system of singular ODEs. Necessary and sufficient conditions for the existence of a unique solution for any choice of the inhomogeneity, provided that it is suitably regular, are specified.

Luigi Brugnano

Luigi Brugnano is professor of Numerical Analysis at the University of Florence, Italy. He graduated “magna cum laude” at the University of Bari, Italy, in 1985. At the same university he started his scientific activities, under the guidance of professor Donato Trigiante and, in 1990, he became researcher at that university. In 1992 he moved to the University of Florence as an associate professor and, in 2001, he became full professor. His scientific interests have focused on several topics, such as numerical linear algebra, numerical methods for polynomial roots, numerical methods for differential equations, parallel computing, numerical software, and mathematical modelling. He is the author of about 90 scientific publications, including four monographs.

Ewa Weinmüller

Ewa B. Weinmüller has been a member of the Analysis and Scientific Computing Department at the Vienna University of Technology since 1975. She studied mechanical engineering at the University of Technology in Poznan, Poland, and obtained her MSc degree in 1974. After moving to Austria in 1975 she continued her studies in technical mathematics and physics at the University of Vienna and Vienna University of Technology and completed them in 1979 with a PhD degree advised by Hans J. Stetter. In 1987/88, she was a visiting professor at the Simon Fraser University in Burnaby BC, and in 1996 at the Imperial College in London. Since 2004 she is the coordinator and spokeswoman of the Research Unit "Numerics and Simulation of Differential Equations". Her research interests are analysis and numerical treatment of ordinary differential equations with singularities, especially a posteriori error estimates, defect correction algorithms, mesh adaptivity in the context of boundary value problems in ordinary differential equations and differential-algebraic equations and software development in Matlab. She is the author and co-author of more than 100 scientific publication.