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Preface [1]

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For a number of years this special issue of JNAIAM has been devoted to the proceedings of the ICNAAM Conference series. In particular the seventh conference, held in Rethymno, Crete (GR), from 18th to 22th September 2009, celebrates the 60th birthday of Professor Ernst Hairer. As is well known, Ernst is one of the leading experts in the numerical solution of ODEs. He has contributed substantially to the field, both in the theoretical analysis of numerical methods, and from the point of view of software development. He is coauthor of a number of monographs on this topic, as well as of some of the most reliable codes for stiff ODEs, based on Radau IIA formulae. One of the fields where he has been very involved in the last few years is that of geometric numerical integration, where he is coauthor, with Christian Lubich and Gerard Wanner, of one of the most comprehensive monographs on the subject.

The numerical solution of differential equations has been one of the central themes of the conference, both in the plenary lectures, among which we mention Ernst's one, and in many organized symposia. It is, therefore, not surprising that most of the papers collected in this volume deal with the numerical solution of differential equations. However, before passing to briefly introduce the papers, we wish to thank Professor Theodore Simos, and his collaborators, for the huge effort they have put in for the organization of the Conference. Across the years, their continuous efforts have made this series more and more interesting and succesfull.

The proceedings consit of 10 papers, which underwent a regular peer-review process. They are sketched below.

In the first paper, Amodio and Settanni study the stability properties of high-order schemes for second order ODEs; they also consider, for BVPs, a way of imposing the additional conditions required by the methods.

In the second paper, Brugnano, Iavernaro, and Trigiante, discuss a new class of numerical methods of arbitrarily high order, which are based on the concept of *discrete line integral*, able preserve energy for polynomial Hamiltonian dynamical systems; the case where the degree of the polynomial tends to infinity is also discussed.

In the third paper, Butcher surveys the use of B-series, which constitute an important tool for the study of numerical methods for evolutionary problems; in particular, their use for studying order conditions for Runge-Kutta methods is reviewed.

In the fourth paper, Faleichik studies stabilized explicit methods, for solving stiff problems with complex spectrum; such methods are based on a generalized Picard iteration.

In the fifth paper, Gear studies stochastic evolutionary problems whose instantaneous solutions are distributions on a manifold for which both the distribution and the manifold evolve slowly in time; the key idea is that of approximating as deterministic the slow modes.

In the sixth paper, Hairer studies high-order energy-preserving variants of collocation methods, able to preserve energy for general Hamiltonian systems; both symmetry and conjugate-

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symplecticity of the methods are investigated.

In the seventh paper, Celledoni, McLachlan, Owren, and Quispel review B-series that either represent symplectic or energy-preserving maps, or are conjugate to such maps; this yields four classes of B-series, whose interconnections are investigated.

In the eighth paper, Rihan investigates both the sensitivity and the robustness of neutral delay differential models to small perturbations in the parameters appearing in the models; this is done by using a variational approach.

In the ninth paper, Skeel studies the efficient *equilibration* of Monte Carlo methods, whose performance strongly relies on the initial starting values; in particular, a new definition of equilibrated Markov chain Monte Carlo method is provided.

In the tenth paper, Kitzhofer, Koch, Pulverer, Simon, and Weinmüller present the open domain MATLAB code `bvpsuite` for the efficient numerical solution of ODE-BVPs; the main focus is on singular BVPs in which singularities in the differential operator arise.

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Guest Editors