International Journal of Computer Mathematics, 2015
Vol. 92, No. 9, 1729–1732, http://dx.doi.org/10.1080/00207160.2015.1049010

EDITORIAL

New computational and statistical models in science and economics

Conferences are nowadays an indispensable tool for the interchange of ideas between researchers from different areas of knowledge. In these international forums, people from different countries can live together and gather in special sessions where they not only share research results but also past experiences and ideas for the future. There are lots of interdisciplinary meetings across the World and the 'International Conference of Computational and Mathematical Methods in Science and Engineering (CMMSE)' stands out among them since its start 15 years ago. Since the first edition in 2000 (Milwakee, WI, USA) and along the successive ones, it has become a worldwide reference for a large number of specialists in different areas of science such as Physics, Chemistry, Engineering, Statistics or Economics. This intertwining of different areas is, undoubtedly, one of its most enriching aspects and one of the most demanded by an increasingly globalized society.

For all those reasons, we are pleased to present the readers of the International Journal of Computer Mathematics with this special issue consisting of a careful selection of some of the contributions delivered at the CMMSE-2013, held at Almería, Spain, from June 23 to 27, 2013. This issue, thus, enlarges the (each time longer) list of CMMSE special issues. See, for example, and only from 2010: [2,3, 25–28].

In the first paper, Alba-Fernández *et al.* [1] propose a goodness-of-fit test for the Moran–Downton distribution, a frequently used bivariate exponential distribution. Large sample properties such as consistency against fixed and local alternatives are studied.

In *Perfect secret sharing scheme based on vertex domination set* [4], the authors present a method for protecting secret data. They introduce the novel idea of constructing a secret-sharing scheme using a graph G whose vertices represent the participants and the dominating set of vertices in G represents the minimal authorized set. They prove that the lower bound of the information rate of this new construction improves that of some well-known previous constructions.

Álvarez *et al.* [5] introduce a protocol based on blind signatures using elliptic curves that allows tracing those users of any service that share their legitimate licence with other people; this avoids the abuse or the unauthorized use of legal licences. The paper also provides an implementation showing its practical application.

In [6], the conservative method of calculating the Boltzmann collision integral for various types of gases is presented. A comparison with experimental and numerical data from other papers is reported and it is shown that the method under consideration allows solving the Boltzmann equation with high accuracy.

In their work, *Two weighted eight-order classes of iterative root-finding methods*, Artidiello *et al.* [7] design, by means of the weight function technique, two families of iterative schemes with order of convergence eight. They are applied to the problem of preliminary orbit determination by using a modified Gauss method and compare them with other known methods.

In *On $Z_2Z_2[u]$-additive codes* [8], the authors introduce a new class of additive codes, which are referred to as $Z_2Z_2[u]$-additive codes. These have been shown to provide a promising class with applications such as steganography. Further, some examples of optimal codes which are the binary Gray images of $Z_2Z_2[u]$-additive codes are presented.

Campos *et al.* [9] study the dynamics of the family of c-iterative methods for solving nonlinear equations on quadratic polynomials. They present a singular parameter space to show the complexity of the family, and this analysis allows them to find elements of the family that have bad convergence properties and also others with very stable behaviour.

The work *Reliable approximation of separatrix manifolds in competition models with safety niches* [10] designs algorithms for the detection and the refinement of points lying on the separatrix manifold partitioning the phase space. To reconstruct the separatrix curve and surface, the authors apply the method of Partitions of Unity, which makes use of Wendland's functions as local approximants.

In [11], an algorithmic procedure for computing abelian subalgebras and ideals of a given finite-dimensional Leibniz algebra, starting from the non-zero brackets in its law, is presented. The symbolic computation package MAPLE is used to implement the method, and a computational study of the implementation is also considered.

The major contribution of [12] is the study of a mechanism to reduce the size of concept lattices in the general fuzzy framework of multi-adjoint concept lattices. The authors use thresholds in the concept-forming operators, obtaining interesting properties and consequences.

The research by De Staelen *et al.* [13] presents a framework to deal with uncertainty quantification in the case where the ranges of variability of the random parameters are ill-known. The methodology used by the authors is based on Polynomial Chaos and on Bayesian inference. The direct Non Intrusive Spectral Projection method is employed and the paper demonstrates the effectiveness of this approach.

In their article *A numerical method based on the polynomial regression for the inverse diffusion problem* [14], Erdem studies two inverse problems relating to reconstruction of the diffusion coefficient, appearing in a linear partial parabolic equation. He derives relations for these inverse problems that permit the construction of an approximate solution based on polynomial regression.

In [15], a continuous-time predator–prey model of Leslie–Gower type considering a sigmoid functional response is analysed. Conditions for the existence of equilibrium points are established, and the existence of a separatrix curve dividing the behaviour of the trajectories is proved. No previous work exists analysing the model presented in this work.

Monotonic walks on a necklace and a colored dynamic vector [16] investigates stochastic and deterministic versions of a discrete dynamical system on a necklace. The behaviour of the model is stochastic only at the beginning and after a time, it becomes a pure deterministic system. The average velocity of particles and characteristics of the system are studied.

Lotfi *et al.* [17] attempt to put forward a new multipoint iterative method of sixth-order convergence for approximating solutions of nonlinear systems of equations. The authors use it as a predictor to derive a general multipoint method. Convergence error analysis, estimation of its computational complexity, a numerical implementation and several comparisons are presented.

The work in [18] studies the geodesic regression problem on Euclidean spheres. Contrary to the Euclidean situation, the normal equations turn out to be highly nonlinear. To overcome this difficulty, the work looks at the geodesic regression problem in the unit n-sphere as an optimization problem in the Euclidean space $\mathbb{R}^{n+1}$. MATLAB is used to solve it numerically.

The research underlying the article by Molina *et al.* [19] deals with a model for atmospheric pollutant transport considering an advection–diffusion–reaction equation. A scheme based on finite volume, finite difference and backward differentiation formulas is used for solving a problem.

In multi-adjoint logic programming (MALP) [20], each fuzzy logic programme is associated with its own multi-adjoint lattice, thus conforming constructs called adjoint pairs; it shows how the strong dependence of adjoint pairs can be largely weakened for an interesting 'sub-class' of MALP programmes.

Oztas and Siap [21] generalize the lifted polynomials which generate reversible codes over F_q. They construct examples of codes over F_8, F_9, F_{16} and F_{256} that have the best possible parameters or attain the Griesmer bound, hence they are optimal codes generated by lifted polynomials.

Protecting data: A fuzzy approach [22] proposes extending three classic measures (k-anonymity, l-diversity and t-closeness) for protected data using fuzzy sets instead of intervals or representative elements. The proposed approach is tested using the Energy Information Authority data set and different fuzzy partition methods.

Two algorithms for generating random variables with a rational probability-generating function are presented by Shmerling [23]. One of them implements the general range reduction method, and another is an extension of the alias algorithm. Possible ways of improving the complexity of the presented algorithms are also discussed.

In the last paper [24], Tunga aims to apply the enhanced multivariance product representation method to multivariate data modelling problems having orthogonal geometries. The numerical results show that the method can be successfully applied to the considered problems and the author obtains good representations in data modelling.

In summary, this collection of papers is presented to the readers in the hope that it is useful and serves as motivation for future works in which the connection among the different areas be each time more fruitful. Finally, I wish to end by thanking the authors and referees for their excellent job, without which this volume would not have been possible.

Disclosure statement

No potential conflict of interest was reported by the authors.

L. Bayón
Department of Mathematics, University of Oviedo, Spain.
Email: bayon@uniovi.es

R. García-Rubio
Department of Economy, University of Salamanca, Spain
Email: rgr@usal.es

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