

## Preface

This issue contains selected contributions presented at the 9<sup>th</sup> International Conference on Numerical Analysis and Optimization “JANO9” organized at the University of Hassan II- Mohammedia - Casablanca, Faculty of Sciences and Technology, Morocco, on December 17 – 19, 2008.

The conference was attended by about one hundred participants from different countries: Algeria, Belgium, Canada, France, Iran, Ivory Cost, Morocco, Portugal, Russia, Spain, Switzerland, Tunisia, USA, . The scientific program of the conference consisted of nine plenary lectures and 85 contributed talks, divided into several sessions: Numerical modelling, Approximation and iterative methods, A posteriori error analysis for PDE’s approximation, Control and optimization.

**Numerical modelling:** A paper by Y. Alhuri et al. uses the radial basis functions methods to simulate numerically the 2D shallow water equations with depth-averaged  $k - \varepsilon$  model. Numerical results are successfully compared with the experimental data. In paper by S. Boujena et al., the authors focus their interest on a multiple branching plants growth model. They used a variational reduction type method based on asymptotic partial decomposition to study the evolution of the nutrients and hormones concentrations. H. Mottaqui et al. present and discuss some techniques to define local parameterization in the asymptotic numerical method. They give some numerical comparisons of pseudo arc-length parameterization and local parameterization on nonlinear elastic shells problems. E. EL Guarmah et al. consider natural convection of an incompressible fluid in a laminar flow between two horizontal concentric coaxial cylinders. The numerical simulation of the flow is carried out by collocation-Legendre method. The influence of the Prandtl and Rayleigh numbers was investigated. The paper by A. Kaddar et al. is devoted to the study of global existence of periodic solutions of a delayed tumor-immune competition model. To illustrate the theoretical results, some numerical simulations are given.

Influence of vibrations on convective instability of reaction fronts in liquids is studied by K. Allali et al., the convective instability boundary is found depending on the amplitude and on the frequency of vibrations. N. Bessonov et al. investigate the evolution of cell populations with the method of dissipative particle dynamics, where each cell moves according to the balance of forces acting on it, or with partial differential equations, where cell population is considered as a continuous medium. They compare these two approaches for some model examples.

**Approximation and iterative methods:** Real Hankel matrix admits an approximate block diagonalization in which the successive transformation matrices are upper triangular Toeplitz matrices. S. Belhaj in his paper extended this approach to obtain the quotients and the remainders ap-

pearing in the Euclidean algorithm applied to two polynomials  $u(x)$ ,  $v(x)$  which  $\deg(v) < \deg(u)$ . M.N. Benbourhim et al. discuss the meshless polyharmonic reconstruction of vector fields from scattered data contaminated by noise. Explicit solution of the problem is given. O. Awono et al. outline an iterative method based on an infinite dimensional adaptation of the successive overrelaxation (SOR) algorithm for solving the 2-D neutron transport equation. An infinite dimensional adaptation of a SOR algorithm is then applied to solve the matrix operator equation. Theoretical and numerical results of convergence are studied.

**A posteriori error analysis for PDE's approximation:** In the paper by B. Achchab et al., a new a posteriori error estimator for nonconforming convection-diffusion approximation problem, which relies on small solutions of discrete problems in star-shaped domains, has been established. In the next paper the authors suggest a mesh refinement for stabilized convection-diffusion equations. A. Agouzal et al. consider an anisotropic adaptive method based on a metric related to the Hessian of the solution. They propose a metric targeted to the minimization of interpolation error gradient for a nonconforming linear finite element approximation of a given piecewise regular function on a polyhedral domain  $\Omega$  of  $\mathbb{R}^d$ ,  $d \geq 2$ . Analysis and numerical approximation of an electro-elastic frictional contact problem is studied by El. Essoufi et al. The existence of a unique weak solution of the model is established, finite elements approximation for the problem is presented, and error estimates of the solutions are derived. The paper of Yu. Vassilevski et al. present a new method for generating a  $d$ -dimensional simplicial mesh that minimizes the  $L^p$ -norm,  $p > 0$  of the interpolation error or its gradient. The method uses edge-based error estimates to build a tensor metric.

**Optimization:** In the paper by W. El Alem et al., a new hybrid simulated annealing algorithm for constrained global optimization is proposed. The authors develop a stochastic algorithm called ASAPSPSA that uses Adaptive Simulated Annealing algorithm (ASA) and Simultaneous Perturbation Stochastic Approximation (SPSA) method, for solving unconstrained optimization problems. Applicability of the algorithm on structural design was tested successfully. To solve the portfolio optimization problem, R. Aboulaiche al. use the Normal Boundary Intersection approach (NBI) based on the SASP method which is a new hybrid method based on the simulated annealing (SA) and the simultaneous perturbations (SP) to estimate the descent method.

The goal of the paper by M. Ettaouil et al. is to apply the Continuous Hopfield Networks (CHN) to the Placement of Electronic Circuit Problem (PECP). This assignment problem has been expressed as Quadratic Knapsack Problem (QKP). Some computational experiments solving the PECP are included. R. Mansi et al. propose two stages exact method for solving the Bilevel Knapsack Problem (BKP). In the first stage, a dynamic programming algorithm is used to compute the set of reactions of the follower. The second stage consists in solving an integer program reformulation of BKP. Numerical results show the efficiency of the method compared with those obtained by the algorithm of Moore and Bard.

In the paper by N. Moussaid et al., a general multiobjective optimization problem is stated as a Nash game. The so-called territory splitting problem is solved by means of an allocative approach. The authors propose two algorithms in order to find fair allocation tables. B. Radi et al. consider a typical topology optimization problem, the minimum compliance problem of a linear isotropic

elastic continuum structure, in which the constraints are the partial differential equations of linear elasticity. They consider the resulting problem as multilevel one and show that it can be written as one level problem. In the paper by A. Sedki et al., an artificial neural network (ANN) based on hybrid algorithm combining particle swarm optimization (PSO) with back-propagation (BP) is proposed to forecast the daily streamflows in a catchment located in a semi-arid region in Morocco.

**Optimal control:** The paper by L. Afifi et al. concerns an enlarged analysis of the problem of asymptotic compensation for a class of discrete linear distributed systems. The authors study the possibility of asymptotic compensation of a disturbance by bringing asymptotically the observation in a given tolerance zone and under convenient hypothesis. They show the existence and the unicity of the optimal control ensuring this compensation. A. Bernoussi presents some concepts recently introduced in the analysis and control of distributed parameter systems: spreadability, vulnerability and protector control. These concepts permit to describe many biogeographical phenomena, such as pollution, desertification or epidemics, which are characterized by a spatio-temporal evolution. L. Boudjnah et al. study the optimal control problem for a class of nonlinear time-delay systems via paratingent equation with delayed argument. They use an equivalence theorem between solutions of differential inclusions with time-delay and solutions of paratingent equations with delayed argument.

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On behalf of the organizing committee of JAN09 conference

**A. Taik**