Preface

For several years, the *Groupe de travail Numérique* has been organised in Orsay (Université Paris 11, Laboratoire de Mathématiques); its aim is to discover new results in the domains of modelling, numerical analysis and scientific computing. In 1999, it was re-organised; the chosen formula was thematic. Each trimester, a main scientific subject is chosen. In addition to the weekly *exposés*, "mini-courses" are organised. These courses consist of 6 to 10 hours lectures. In this volume, a selection of articles from talks and mini-courses given in 2004-2006 is proposed. The chosen themes were : Modelling of physic systems, Scientific computing and Fluids modelling.

Thirteen articles and three mini-courses have been selected. A first group of articles deal with analysis of numerical schemes:

- F. Boyer (see B. Andreianov, F. Boyer and F. Hubert, *Discrete Besov framework for finite volume approximation of the p-laplacian on non-uniform cartesian grids*), where authors present *a priori* estimations for the finite volumes approximation applied to the discretization of the p-Laplacian.
- M. Campos Pinto (see M. Campos Pinto, *Précision d'un schéma adaptatif semi-lagrangien pour l'équation de Vlasov*), who presents an adaptive semi-Lagrangian scheme for the resolution of the Valsov-Poisson equation.
- E. Deriaz (see E. Deriaz and V. Perrier, *Décomposition de Helmholtz par ondelettes : convergence d'un algorithme itératif*) describes the divergence free and rotational free wavelets basis to solve Helmoltz equation.
- F. Pascal (see F. Pascal, *On supra-convergence of the finite volume method for the linear advection problem*), explores a supra-convergence phenomenon for the finite volume scheme applied to the advction equation.
- K. Ramdani (see K. Ramdani, T. Takahashi, M. Tucsnak, *Semi-discrétisation en espace du problème de la stabilisation interne de l'équation des poutres*), on the semi discretization in space of the beam equation
- M. Vohralík (see M. Vohralík, *A posteriori error estimates for finite volume and mixed finite element discretizations of convection–diffusion–reaction equations*), on a unified a posteriori analysis of the finite volume and Raviart–Thomas mixed finite element methods.
- R. Zorgati (see R. Zorgati, W. van Ackooij and M. Lambert, *Stochastic Matrices and L_p Norms : New Algorithms for Solving Ill-conditioned Linear Systems of Equations*), on a new iterative algorithm for solving a system of linear equations.

A second group of articles deals with modelling of original problems in medicine, interaction between fluids and structures, crowd movement and interaction between laser and materials.

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- G. Chapuisat (see G. Chapuisat, *Discussion of a simple model of spreading depressions*), on medical modelling.
- V. Giovangigli (see V. Giovangigli *Asymptotics of Higher Order Entropies*), describing kinetic and high order entropy for fluids.
- A. Lefebvre (see A. Lefebvre, *Fluid-Particle simulations with FreeFem++*), on the movement of rigid particles in a newtonian fluid.
- B. Maury (see *A gluey particle model*), who presents a new model for the movement of rigid particles in viscous fluis.
- J. Venel (see B. Maury et J. Venel, *Un Modèle de Mouvements de Foule*), on a determinist Lagrangian model for crowd movement.
- O. Saut (see O. Saut, A. Bourgeade, *Propagation d'impulsions laser ultra-courtes dans un cristal non linéaire*), on the modelling of ultra short laser impulsions in a nonlinear crystal.

Three mini-courses have been selected. They propose a pedagogical introduction to active fields of research:

- D. Bresh (see D. Bresh, T. Colin, E. Grenier, B. Ribba, O. Saut, O. Singh and C. Verdier, *Quelques méthodes de paramètre d'ordre avec applications à la modélisation de processus cancéreux*) on methods with scalar order parameter and applications in cancerology,
- F. Dubois (see F. Dubois, *Une introduction au schéma de Boltzmann sur réseau*), on an elementary introduction to the lattice Boltzmann scheme,
- V. Perrier (see V. Perrier, A. Bilgot, O. Le Cadet and L. Desbat *Transformée en Ondelettes Continue Directionnelle :*
  applications en Imagerie Médicale), for an introduction on discrete and continuous wavelet's transformation and an application to medical imaging.

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