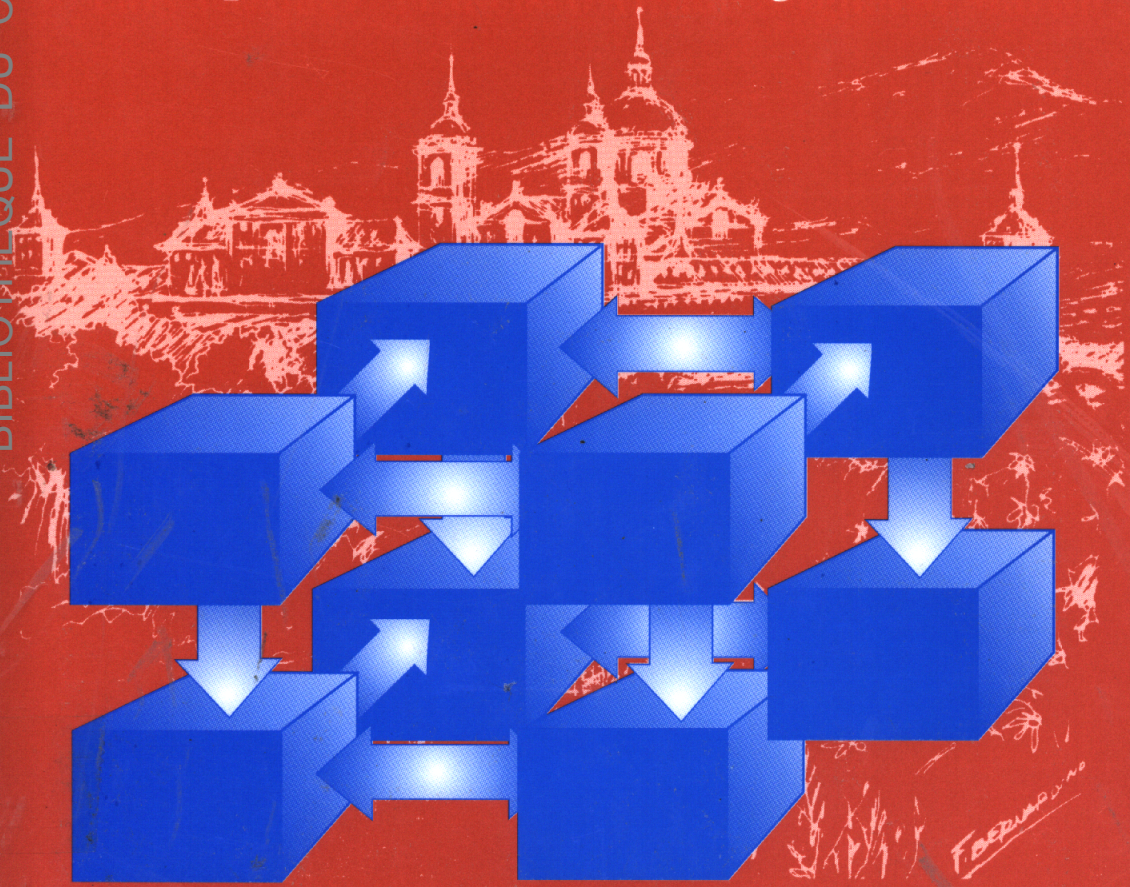
SUPERCOMPUTATION IN NONLINEAR AND DISORDERED SYSTEMS

ALGORITHMS, APPLICATIONS AND ARCHITECTURES

Editors

Luis Vázquez, Francisco Tirado & Ignacio Martín



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PREFACE

The Euroconference held at El Escorial, Spain, in September 1996, was the second of two aimed at addressing the issues of Nonlinearity and Disorder. The 1996 one was devoted to the simulation and parallel computing related to nonlinear problems. The Euroconference was organized around main lectures in each area to introduce the basic concepts and stimulate discussions.

The simulation studies covered a description of relevant topics in Physics from the dynamical problems in accelerators to molecular dynamics simulations through the numerical integration of stochastic differential equations. The parallel computing lectures analyzed the basic associated questions and methodologies associated with applications.

K. M. Decker presented the state of the art in Problem-Solving Environments (PSEs). After presenting a general definition of PSE, he analyzed the user requirements and presented the various steps involved in the problem-solving procedure.

S. McCormick presented methods for solving large-scale problems in fluid mechanics. The fundamental approach taken in the paper is to pose the fluid flow equations in their first order form, incorporate additional equations where they improve the character of the formulation, and define the objective as that of minimizing the L^2 norm of the defect of these equations.

The numerical methods based on the multigrid technique were presented by K. Stüben analyzing the parallel robust implementation of these methods. K Stüben also presented the results of Europort, a two-year ESPRIT initiative for porting industrial codes to parallel computers.

Several issues of program optimization on vector processor were described by M. Valero, in particular he presented measurement about degree of vectorization, vector length and operation use in SPECft92 programs.

The main issues raised during the parallelization of iterative and direct sparse solvers in distributed memory multiproccesors were addressed by E. L. Zapata.

R. Mannella made a deep and extensive presentation of the numerical algorithms for the integration of stochastic differential equations.

R.Vilela-Mendes presented the description of four relevant problems in Computational Physics: the boundary layer control; the stochastic ground state simulations; the methods to analyze non-Gaussian data and algorithms for particle track recognition.

In the context of the molecular dynamics simulations W.A.B. Evans described an NEMD method to determine the full dielectric properties of a simulated polar droplet confined within a spherical wall and perturbed by an external field.

G. Rickayzen presented a review of one particular approach to the molecular theory of fluids: that using a density functional for the determination of the structure of an inhomogeneous fluid.

The dynamical problems in accelerators were analyzed by M Giovannozzi and W. Scandale. They studied the case of the CERN-LHC. M. Giovannozzi reviewed the theory developed to compute the dynamic aperture, as well as the parallel implementation and performance of different algorithms. W. Scandale described the sorting procedure to correct the effects of the unavoidable random multipolar errors. A special sorting strategy is described: that based on the analysis of the 4 D betatron motion through the one turn map and its normal form.

Also the Proceedings contain different contributions that were presented in short talks as well as a summary of the different posters shown in the Euroconference .

We gratefully acknowledge the substantial financial support from the Euroconference grant CT940234 of the European Human Capital and Mobility Programme. We also thank the financial support received from the Dirección General de Investigación Científica y Técnica of Spain (grant APC95-0029) and the Comunidad Autónoma de Madrid .

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Special thanks are also due to Mr. A. Guisado of Florida Hotel which hosted the Euroconference for the continuous assistance that made the organization work easier. Finally, we are indebted to Mr. C. Peña for the photo and press covering of the Euroconference.

Luis Vázquez
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