Preface

This book is the final outcome of *VECPAR 2000 – 4th International Meeting on Vector and Parallel Processing.*

VECPAR constitutes a series of conferences, which have been organized by the Faculty of Engineering of the University of Porto since 1993, with the main objective of disseminating new knowledge on parallel computing.

Readership of This Book

The book is aimed at an audience of researchers and graduate students in a broad range of scientific areas, including not only computer science, but also applied mathematics and numerical analysis, physics, and engineering.

Book Plan

From a total of 66 papers selected on the basis of extended abstracts for presentation at the conference, a subset of 34 papers were chosen during a second review process leading to their inclusion in the book, together with the invited talks. The book contains a total of 40 papers organized into 6 chapters, where each may appeal to people in different but still related scientific areas. All chapters, with the exception of Chapter 6, are initiated by a short text, providing a quick overview of the organization and papers in the chapter.

The 13 papers in Chapter 1 cover the aspects related to the use of multiple processors. Operating systems, languages and software tools for scheduling, and code transformation are the topics included in this chapter, initiated by the talk on computing over the Internet, entitled *Grid Computing*, by Ian Foster.

Dieterich Stauffer's invited talk, *Cellular Automata: Applications*, opens Chapter 2, which deals mainly with problems of interest to computational physics. Cellular automata, algorithms based on the Monte-Carlo method, and simulation of collision-free plasma and the radial Schrödinger equation are the topics covered by the 6 selected papers in this chapter.

The majority of the papers in Chapter 3 are related to linear and non-linear algebra. The invited talk by Mark Stadtherr, *Parallel Branch-and-Bound for Chemical Engineering Applications: Load Balancing and Scheduling Issues*, addresses a common situation in the simulation of chemical process engineering, very often requiring the solution of highly nonlinear problems with many solutions. The 9 selected papers, though varying in their field of application cover, in general, variants of well-known algorithms, here taking advantage of the matrix structure and computer architecture.

In Chapter 4, Michael Duff reviews in his invited talk the years of research in image processing. Apart from the invited talk, *Thirty Years of Parallel Image Processing*, this chapter comprises 3 more papers on image processing, related

with a medical application, an algorithm for particle tracking in the experimental high-energy particle physics, and the design of an image processing parallel algorithm for orthogonal multiprocessors systems.

Chapter 5, centered on the finite/discrete element technique, includes the invited talk by David R. Owen, entitled *Finite/Discrete Element Analysis of Multi-fracture and Multi-contact Phenomena*, and 4 more papers also related to the finite/discrete element technique.

Chapter 6 is home to the invited talk, by Ugo Piomelli, entitled *Large Eddy Simulation of Turbulent Flows, from Desktop to Supercomputers*. Piomelli shows us new results, made possible by joint utilization of parallel processing and desktop computers. This brings the book to a closure.

Student Papers

The Student Paper Award, first included in the conference program in 1998, has given impetus to our objective of promoting the participation of students and providing them with the stimulus for a fulfilling research activity. It is our wish that the standards of quality achieved by the two recipients can be maintained for all their future years as researchers.

- Student Paper Award (First Prize)
  - *Parallel Image Processing System on a Cluster of Personal Computers* by Jorge Barbosa, and also co-authored by J. Tavares and A.J. Padilha (Portugal)
- Student Paper Award (Honourable Mention)
  - *Suboptimal Communication Schedule for GEN_BLOCK Redistribution* by Hyun-Gyoo Yook, and also co-authored by Myong-Soon Park (Korea)

We benefitted from the generous help of all scientific committee members and additional reviewers, in our efforts geared towards the assembling of a conference program and the edition of a post-conference book, which, we hope, can be of value for some years to come.

October 2000

José M.L.M. Palma,
Jack Dongarra,
and *Vicente Hernández*

Acknowledgments

This book and the *VECPAR 2000* Meeting were made possible by the efforts and contributions from many individuals and organizations, listed on the next pages.

However, this section would be incomplete without a special word of recognition for the excellent work performed by A. Augusto Sousa, the Chairman of the Organizing Committee.

Finally, we would like to mention Professor J. C. Marques dos Santos, the Director of the Faculty of Engineering of the University of Porto (FEUP) during all four *VECPAR* conferences. Professor Marques dos Santos will soon conclude his last term as Director of FEUP, and we would not like him to leave without a word of gratitude for all his help in raising the good will of many colleagues and sponsors in support of the *VECPAR* series of conferences.

Committees

Organizing Committee

A. Augusto de Sousa (Chair)
José Couto Marques (Co-chair)
José Magalhães Cruz (Co-chair)

Local Advisory Organizing Committee

C. Costa
R. Delgado
J. Marques dos Santos
R. Moreira Vidal
F. Nunes Ferreira
L. Ribeiro
J. Silva Matos
P. Tavares de Castro

Scientific Committee

J. Palma (Chair)	Universidade do Porto, Portugal
J. Dongarra (Co-chair)	University of Tennessee, USA
V. Hernández (Co-chair)	Universidad Politécnica de Valencia, Spain
P. Amestoy	ENSEEIHT-IRIT, France
T. Barth	NASA Ames Research Center, USA
A. Campilho	Universidade do Porto, Portugal
G. Candler	University of Minnesota, USA
A. Chalmers	University of Bristol, England
B. Chapman	University of Houston, USA
A. Coutinho	Universidade Federal do Rio de Janeiro, Brazil
J.C. Cunha	Universidade Nova de Lisboa, Portugal
F. d'Almeida	Universidade do Porto, Portugal
M. Daydé	ENSEEIHT-IRIT, France
J. Dekeyser	Université des Sciences et Technologies de Lille, France
P. Devloo	Universidade Estadual de Campinas, Brazil
J. Duarte	Universidade do Porto, Portugal
I. Duff	Rutherford Appleton Laboratory, England, and CERFACS, France
D. Falcão	Universidade Federal do Rio de Janeiro, Brazil

J. Fortes	University of Purdue, USA
S. Gama	Universidade do Porto, Portugal
M. Giles	Oxford University Computing Laboratory, UK
L. Giraud	CERFACS, France
G. Golub	Stanford University, USA
D. Heermann	Universität Heidelberg, Germany
W. Janke	Universität Leipzig, Germany
M. Kamel	University of Waterloo, Canada
M.-T. Kechadi	University College Dublin, Ireland
D. Knight	Rutgers – The State University of New Jersey, USA
V. Kumar	University of Minnesota, USA
R. Lohner	George Mason University, USA
E. Luque	Universidad Autònoma de Barcelona, Spain
J. Macedo	Universidade do Porto, Portugal
P. Marquet	Université des Sciences et Technologies de Lille, France
P. de Miguel	Universidad Politécnica de Madrid, Spain
F. Moura	Universidade do Minho, Portugal
E. Oñate	Universitat Politécnica de Catalunya, Spain
A. Padilha	Universidade do Porto, Portugal
R. Pandey	University of Southern Mississippi, USA
M. Perić	Technische Universität Hamburg-Harburg, Germany
T. Priol	IRISA/INRIA, France
R. Ralha	Universidade do Minho, Portugal
M. Ruano	Universidade do Algarve, Portugal
D. Ruiz	ENSEEIHT-IRIT, France
H. Ruskin	Dublin City University, Ireland
J.G. Silva	Universidade de Coimbra, Portugal
F. Tirado	Universidad Complutense, Spain
B. Tourancheau	École Normale Supérieure de Lyon, France
M. Valero	Universitat Politécnica de Catalunya, Spain
A. van der Steen	Utrecht University, The Netherlands
J. Vuillemin	École Normale Supérieure, Paris, France
J.-S. Wang	National University of Singapore, Singapore
P. Watson	University of Newcastle, England
P. Welch	The University of Kent at Canterbury, England
E. Zapata	Universidad de Malaga, Spain

Best Student Paper Award (Jury)

Michel Daydé	ENSEEIHT-IRIT, France
Jack Dongarra	University of Tennessee, USA
Iain Duff	Rutherford Appleton Lab, UK and CERFACS, France
Michael Duff	University College, London, United Kingdom
José Fortes	University of Purdue, USA
Vicente Hernández	Universidad Politécnica de Valencia, Spain
José Palma	Universidade do Porto, Portugal
Rui Ralha	Universidade do Minho, Portugal
Heather Ruskin	Dublin City University, Ireland
Daniel Ruiz	ENSEEIHT-IRIT, France
Aad van der Steen	Utrecht University, The Netherlands

Also reviewing the final versions of the papers of candidates to the Best Student Paper Award, though not participating at the conference, we may list: Vipin Kumar (USA), Paul Watson (UK), Patrick Amestoy (France), Filomena d'Almeida (Portugal), Mike Giles (UK), Pedro de Miguel (Spain), Francisco Moura (Portugal), Thierry Priol (France), Lucien Lefebvre (France), Aurélio Campilho (Portugal), Álvaro Coutinho (Brazil), Mateo Valero (Spain), Philippe Marquet (France), J. C. Cunha (Portugal), and Ras Pandey (USA).

Sponsoring Organizations

FEUP - Faculdade de Engenharia da Universidade do Porto
UP - Reitoria da Universidade do Porto
FCT - Fundação para a Ciência e Tecnologia
EOARD - European Office of Aerospace Research and Development
FACM - Fundação Dr. António Cupertino de Miranda
FLAD - Fundação Luso Americana para o Desenvolvimento
FCCN - Fundação para a Computação Científica Nacional
FCG - Fundação Calouste Gulbenkian
CMP - Câmara Municipal do Porto
Internacional / British Council
INESC Porto - Instituto de Engenharia de Sistemas e
de Computadores do Porto
OE - Ordem dos Engenheiros
Porto Convention Bureau
ALCATEL
CISCO Systems
COMPAQ
MICROSOFT
NEC - European Supercomputer Systems
NORTEL networks
PT - Portugal Telecom
SIEMENS

Invited Lecturers

- Michael Duff
  University College London, UK

- Ian Foster
  Argonne National Laboratory and the University of Chicago, USA

- Roger David Owen
  University of Wales Swansea, UK

- Ugo Piomelli
  University of Maryland, USA

- Mark Stadtherr
  University of Notre Dame, USA

- Dietrich Stauffer
  Cologne University, Germany