

PARALLEL NUMERICS '05

Theory and Applications

Edited by
M. Vajteršic, R. Trobec,
P. Zinterhof, and A. Uhl

University of Salzburg, Austria
Jožef Stefan Institute, Ljubljana, Slovenia

Published by: University of Salzburg, Austria
and Jožef Stefan Institute, Ljubljana, Slovenia
Supported by: Central European Initiative
Technical editors: Rade Kutil and Marjan Šterk

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

519.6(082)
511(082)
004.942(082)

PARALLEL Numerics '05: Theory and Applications / edited
by M. Vajteršič ... [et al.]. – Ljubljana: Jožef Stefan Institute;
Salzburg: University of Salzburg, 2005

ISBN 961-6303-67-8
1. Vajteršic, Marian
219265280

Foreword

The *ParNum05* workshop can be seen as a continuation of the meeting series which started in Smolenice (Slovakia, 1994), followed by Sorrento (Italy, 1995), Gozd Martuljek (Slovenia, 1996), Zakopane (Poland, 1997), Salzburg (Austria, 1999), Bratislava (Slovakia, 2000) and Bled (Slovenia, 2002). This chain of meetings creates a tradition which allows to report newest results from members of participating research groups from CEI (Central European Initiative) countries.

The book contains accepted papers for the *ParNum05* workshop held in Portorož (Slovenia, April 20-23, 2005). It contains 16 papers which were submitted by research teams from Austria, Croatia, Slovakia, Slovenia, Ukraine and UK. Moreover, two papers and four abstracts from invited speakers are included. The papers report on actual work and give an overview on broad area of parallel processing with a focus to parallel numerical methods. New trends in numerics and parallelism were presented by invited speakers S. Akl (Kingstone), Z. Drmač (Zagreb), D. Janežič (Ljubljana) and U. Ruede (Erlangen).

We acknowledge the support from Slovenian Ministry of Higher Education, Science and Technology, Jožef Stefan Institute and University of Salzburg which made the workshop possible. Our special thanks are due to a generous financial support from the CEI (Central European Initiative) Fund. We are thankful to R. Kutil (Salzburg) and M. Šterk (Ljubljana) for their technical and editorial support concerning this book. We also thank to the organizing team from the Jožef Stefan Institute for creating a very stimulating professional and social framework for a smooth and very friendly run of the workshop.

April 2005

The Editors

Table of Contents

Abstracts of Invited Talks

S. G. Akl:	
<i>The Myth of Universal Computation</i>	5
Z. Drmač:	
<i>New Jacobi–Type Algorithm for Computing the SVD</i>	7
D. Janežič:	
<i>Large-Scale Molecular Dynamics Simulations on Parallel Clusters</i>	9
U. Rüde:	
<i>Experiences with Large Scale Numerical Simulation</i>	11

Matrix Algebra

G. Okša, M. Vajteršic:	
<i>Preconditioned Parallel Block–Jacobi SVD Algorithm</i>	15
P. Arbenz, M. Bečka, R. Geus, U. Hetmaniuk, T. Mengotti:	
<i>Parallel Maxwell Eigensolver Using Trilinos Software Framework</i>	25

Differential Equations

P. Purcz:	
<i>Theoretical Estimates of the Speed-up of One Parallel Algorithm</i>	37
V. Horak, P. Gruber:	
<i>Parallel Numerical Solution of 2-D Heat Equation</i>	47
M. Šterk, B. Robič, R. Trobec:	
<i>Mesh Free Method Applied to Diffusion Equation</i>	57

Integration

P. Zinterhof, C. Amstler:	
<i>On the Covariance of Sequences in General Spaces</i>	69
B. Hechenleitner, K. Entacher:	
<i>Selection of Good Lattice Points Utilizing a Cluster</i>	81

Optimization and Classification

X. Liu, O. Sýkora:	
<i>Algorithms for the Shortest Common Superstring Problem</i>	97
K. F. Doerner, R. F. Hartl, M. Lucka:	
<i>A Parallel Version of the D-Ant Algorithm for the VRP</i>	109
G. Topić, T. Šmuc, Z. Šojat, K. Skala:	
<i>Reimplementation of the Random Forest Algorithm</i>	119

Multimedia

F. Tischler, A. Uhl:	
<i>Limitations of Cluster Computing</i>	129
R. Kutil, P. Eder, M. Watzl:	
<i>SIMD Parallelization of Common Wavelet Filters</i>	141
A. Lutsyk, O. Lutsyk, O. Pelenskyy:	
<i>Parallel Image Processing on Configurable Computing Architecture</i>	151

Systems and Simulation

S. G. Akl:	
<i>The Myth of Universal Computation</i>	167
R. Trummer, P. Zinterhof, R. Trobec:	
<i>A High-Performance Data-Dependent Hardware Divider</i>	193
I. Rozman, R. Trobec, M. Šterk:	
<i>Tuning Communication in Gigabit Ethernet Cluster</i>	207
N. Pavković, K. Skala, V. Vidić, Z. Šojat:	
<i>Bioinformatics Application Oriented IT Deployment Model</i>	217
D. Janežič, U. Borštnik:	
<i>Large-Scale Molecular Dynamics Simulations on Parallel Clusters</i>	223
Author Index	233