

PROCEEDINGS
OF THE TWENTIETH SOUTH AFRICAN
SYMPOSIUM
ON
NUMERICAL MATHEMATICS

UMHLANGA ROCKS, 4-6 JULY 1994

**SANUM & THE
DEPT. OF COMPUTER SCIENCE
UNIVERSITY OF NATAL
DURBAN**

Proceedings of the twentieth South African

**SYMPOSIUM
ON
NUMERICAL MATHEMATICS**

Umhlanga Rocks, 4-6 July 1994

Edited by
C J Wright

Sponsored partially by FRD

Published by the Department of Computational & Applied Mathematics
University of the Witwatersrand, Johannesburg 1995

Preface

The Twentieth South African Symposium on Numerical Mathematics was held from 4 to 6 July 1994 at the Breakers Resort, Umhlanga Rocks. As in the past, the Symposium was organized jointly by SANUM (South African Society for Numerical Mathematics and the Department of Computer Science, University of Natal, Durban. The Foundation for Research Development (FRD) very generously sponsored the invited speakers.

The Symposium, for reasons of a broader nature, attracted slightly fewer delegates than has been the norm over the past few years. Several overseas speakers made valuable contributions to the Symposium—the keynote speaker being Professor Annie Cuyt of the University of Antwerp, Belgium, who accepted an invitation at rather short notice. Dr André Weideman, back in South Africa after an absence of a few years, ably filled the local invited speaker slot. Dr E Malkowsky, University of Antwerp also attended and read papers. A total of 31 participants attended.

Papers appearing in these proceedings are as submitted by authors.

All contributors to the symposium, chairpersons of sessions and participants are thanked for their participation. On behalf of the SANUM community and all Symposium attendees a sincere word of thanks to Ms Ethel Carte of the Computer Science Department, University of Natal, Durban for having arranged the Symposium and to Professor C Cresswell, Vice-Principal of the University of Natal, Durban for his continued support for SANUM.

The joint winners of the award for the best paper delivered by a young researcher were R Stewart of the University of Natal and K Arunakirinathar of the University of Cape Town—congratulations!

Colin Wright
Secretary, SANUM

Participants - Deelnemers

Arunakirinathar, K	<i>University of Cape Town</i>
Baart, M L	<i>Potchefstroom University for CHE</i>
Cuyt, A	<i>University of Antwerp, Belgium</i>
du Toit, E	<i>Houwteq</i>
Gordon, C	<i>University of the Witwatersrand</i>
Jonson, D	<i>University of Natal, Durban</i>
Jekot, T	<i>University of Zululand</i>
Knopfmacher, A	<i>University of the Witwatersrand</i>
Kozakiewicz, J M	<i>University of Zululand</i>
Laurie, D P	<i>Potchefstroom University for CHE</i>
Leach, P G L	<i>University of Natal, Durban</i>
Lubinsky, D S	<i>University of the Witwatersrand</i>
Malkowsky, E	<i>Universität Gießen, Germany</i>
McLure, C	<i>Technikon Natal, Durban</i>
Mdlalosa, T	<i>University of Transkei</i>
Mhlakaza, M D	<i>University of Transkei</i>
Mohlala, M L	<i>University of Zululand</i>
Nedeljkovic, V	<i>University of the Witwatersrand</i>
Pendock, N E	<i>University of the Witwatersrand</i>
Reddy, B D	<i>University of Cape Town</i>
Rohwer, C	<i>University of Stellenbosch</i>
Sipilainen, E M	<i>University of the Witwatersrand</i>
Smith, L N	<i>University of Natal, Durban</i>
Solomon, A	<i>Atlas</i>
Spoelstra, J	<i>Potchefstroom University for CHE</i>
Stewart, R W	<i>University of Natal, Durban</i>
Tabakov, P Y	<i>University of Natal, Durban</i>
van Rooyen, M	<i>University of the Witwatersrand</i>
Verdonk, B	<i>University of Antwerp, Belgium</i>
Weideman, A	<i>University of Stellenbosch</i>
Wright, C J	<i>University of the Witwatersrand</i>

Contents

	page
1. Preface.....	i
2. Participants.....	ii
3. Authors & Titles	
<i>S Adali, VE Verijenko, D Jonson and PY Tabakov:</i> Special Purpose Design Optimisation Routine Interfaced with a Finite Element Package	1
<i>K Arunakirinathar:</i> Enhanced Finite Element Methods	2
<i>MA Coetzee and ML Baart:</i> Conditions for QC Patch Construction	3
<i>A Cuyt:</i> Exploring Covariance, Consistency and Convergence in Padé Apparoxximation theory	4
<i>A Cuyt and B Verdonk:</i> Computing Multivariate Padé Approximants and Validating the Numerical Output	27
<i>C Gordon:</i> Predicting Forest Tree Growth Using a Neural Network	28
<i>T Jekot and JM Kozakiewicz:</i> Application of Shooting Method in Nonlinear Thermal Buckling of a Beam	46
<i>A Knopfmacher:</i> Distinct Degree Factorizations for Polynomials over a Finite Field	47
<i>DP Laurie:</i> Periodizing Transformations with Application to Lattice Rules	48
<i>DS Lubinsky:</i> On Convergence of Diagonal Padé Approximants and Continued Fractions	49
<i>E Malkowsky:</i> Some Numerical Methods and their Implementations for the Representation of Certain Curves and Surfaces	50
<i>E Malkowsky:</i> An Open Software in OOP for Computer Graphics and some Applications in Differential Geomery	51

	page
<i>ML Mohlala:</i>	
Solving Boundary Value Problems using the Maximum Entropy Method	81
<i>V Nedeljkovic and N Pendock:</i>	
Bayesian Estimate of Mineral Distributions in Crushed Ore	82
<i>N Pendock and V Nedeljkovic:</i>	
Entropic Discretization of Geological Data	83
<i>B D Reddy:</i>	
The Equivalent Parallelogram Associated with a Quadrilateral	84
<i>C Rohwer:</i>	
One Sided Spline Approximation to Data with Impulsive Noise	85
<i>E Sipilainen:</i>	
About Numerical Pathwise Analysis of Stochastic Differential Equations	86
<i>J Spoelstra:</i>	
Optimizing the Illumination of Sports Grounds	87
<i>M van Royen:</i>	
Production Scheduling of Perishable Products	88
<i>M Walker, S Adali, VE Verijenko and C McLure:</i>	
Maximisation of Eigenvalues for the Optimal Buckling Design of Symmetrically Laminated Composite Plates using the Finite Element Method	89
<i>JAC Weiderman:</i>	
Theory and Applications of an Orthogonal Rational Basis Set	91
<i>JAC Weiderman:</i>	
Computation of the Complex Error Function and its Integrals	107
<i>CJ Wright:</i>	
On the Stability of One-step Numerical Schemes for a Model Dynamic Boundary Value Problem	108