



The South African Institute of Computer Science
and
Information Technology

The 1997 National
Research and
Development
Conference

Riverside Sun
Vanderbijlpark
13 & 14 November

Hosted by



Potchefstroomse Universiteit
vir Christelike Hoër Onderwys

The Department of Computer Science and Information Systems
Potchefstroom University for Christian Higher Education
Vaal Triangle Campus

S
A
I
C
S
I
T
97

PROCEEDINGS

Edited by L.M. Venter & R.R. Lombard



The South African Institute of Computer Science
and
Information Technology

Proceedings
of the
The 1997 National
Research and
Development
Conference
Towards 2000

Riverside Sun
Vanderbijlpark
13 & 14 November

Edited by
L.M. Venter
R.R. Lombard

©1997 Copyrights reside with the original authors who may be contacted directly

ISBN 1-86822-300-0

Printed and Binded by Xerox Printers, Potchefstroom

The views expressed in this book are those of the individual authors

Foreword

This book contains a collection of papers presented at a Research and Development conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT). The conference was held on 13 & 14 November 1997 at the Riverside Sun, Vanderbijlpark. Most of the organization for the conference was done by the Department of Computer Science and Information Technology of the Vaal Triangle Campus, Potchefstroom University for Christian Higher Education.

The programming committee accepted a wide selection of papers for the conference. The papers range from detailed technical research work to reports of work in progress. The papers originate mainly from Academia, but also describe work done in and for Industry. It is hoped that the papers give a true reflection of the current research scene in Computer Science and Information Technology in South Africa. Since one of the aims of the conference is Research development, the papers were not subjected to a refereeing process.

A number of people spent numerous hours helping with the organization of this conference. In this regard, we wish to thank the members of the Organizing committee, and the Programming committee who had very little time to screen the abstracts and compile the program. A special thanks goes to the secretary of the department, Mrs Helei Jooste, whose very able work was interrupted by the birth of her first child.

Organizing Committee

Conference General Chairs

Prof. J.M. Hattingh (PU for CHE)

Organizing Chair

Prof. Lucas Venter (PU for CHE)

Organizing Committee

Mrs. S. Gilliland

Mr. J.P. Jooste

Mr. R.R. Lombard

Mrs. M. Huisman

Secretariat

Mrs. H. Jooste

Program Chair

Prof A de Waal (PU for CHE)

Program Committee

Prof D. Kourie (UP)

Prof. C. Bornman (UNISA)

Prof. L.M. Venter (PU for CHE)

Table of Contents

Foreword	i
Organizing Committee	ii
List of Contributors	vii
<i>Software Objects Change : Problems and Solution</i> S.A. Ajila	1
<i>Liming-like Curve Constructions</i> M.L.Baart and R. McLeod	26
<i>A Model for Evaluating Information Security</i> L. Barnard and R. von Solms	27
<i>Integrating Spatial Data Management and Object Store Technology</i> S. Berman, S. Buffler and E. Voges	31
<i>Metamodelling in Automated Software Engineering</i> S. Berman and R. Figueira	32
<i>Using Multimedia Technology for Social Upliftment in Deprived Communities of Southern Africa</i> L. Bester and E. de Preez	33
<i>Extending the Client-Server Model for Web-based Execution of Applications</i> L. Botha , J.M. Bishop and N.B. Serbedzija	36
<i>Access Control Needs in an Electronic Workflow Environment</i> R.A. Botha	45
<i>The Use of the Internet in an Academic Environment to Commercially Supply and Support Software Products</i> B. Braude and A.J. Walker	51
<i>Explanation Facilities in Expert Systems Using Hypertext Technology</i> T. Breetzke and T. Thomas	63
<i>Theoretical Computer Science: What is it all about, and is it of any relevance to us?</i> C. Brink	75
<i>Representing Quadrics on a Computer</i> M.A. Coetzee and M.L. Baart	76

<i>The Generation of Pre-Interpretations for Detecting Unsolvable Planning Problems</i> D.A. de Waal, M. Denecker, M. Bruynooghe and M. Thielscher	77
<i>The Emerging Role of the Chief Information Officer in South Africa</i> B. Dekenah	87
<i>A Java-Implemented Remote Respiratory Disease Diagnosis System on a High Bandwidth Network</i> A. Foster	88
<i>Early Results of a Comparative Evaluation of ISO 9001 and ISO/IEC 15504 Assessment Methods Applied to a Software Project</i> C. Gee and A.J. Walker	89
<i>A Neural Network Model of a Fluidised Bed</i> M. Hajek	99
<i>The Effects of Virtual Banking on the South African Banking Industry</i> M.L. Hart and M. Dunley-Owen	100
<i>Linear Response Surface Analysis and Some Applications</i> J.M. Hattingh	118
<i>Model Checking Software with Symbolic Trajectory Evaluation</i> A. Hazelhurst	120
<i>A Risk Model to Allocate Resources to Different Computerized Systems</i> H.A. Kruger and J.M. Hattingh	137
<i>Returns on the Stock Exchange</i> J.W. Kruger	144
<i>Cardinality Constrained 0-1 Knapsack Problems</i> M.F. Kruger, J.M. Hattingh and T. Steyn	150
<i>An Investigation in Software Process Improvement in the Software Development of a large Electricity Utility</i> M. Lang and A.J. Walker	151
<i>Design and Implementation of a C++ Package for Two-Dimensional Numerical Integration</i> D.P. Laurie, L. Pluym and Ronald Cools	162
<i>Algebraic Factorization of Integers Using BDE's</i> H. Messerschmidt and J. Robertson	169

<i>Global Optimization of Routes after the Process of Recovery</i> M. Mphahlele and J. Roos	176
<i>Using a Lattice to Enhance Adaptation Guided Retrieval in Example Based Machine Translation</i> G.D. Oosthuizen and S.L. Serutla	177
<i>Information Systems Development and Multi Criteria Decision Making / Systems Thinking</i> D. Petkov, O. Petkova	192
<i>The Development of a Tutoring System to Assist Students to Develop Answering Techniques</i> N Pillay	193
<i>Combining Rule-Based Artificial Intelligence with Geographic Information Systems to Plan the Physical Layer of Wireless Networks in Greenfield Areas</i> K. Prag, P. Premjeeth and K. Sandrasegaran	194
<i>A Distributed Approach to the Scheduling Problem</i> V. Ram and P. Warren	202
<i>More readings than I thought : Quantifier Interaction in Analysing the Temporal Structure of Repeated Eventualities</i> S. Rock	203
<i>Ray Guarding Configuration of Adjacent Rectangles</i> I. Sanders, D. Lubinsky and M. Sears	221
<i>Developing Soft Skills in Computer Students</i> C Schröder, T. Thomas	239
<i>Information Security Awareness, a Must for Every Organization</i> M. Thomson and R. von Solms	250
<i>Pla Va: A Lightweight Persistent Java Virtual Machine</i> S Tjasink and S. Berman	253
<i>Beliefs on Resource-Bounded Agent</i> E. Viljoen	267
<i>Object-Orientated Business Modelling and Re-engineering</i> M. Watzenboeck	268

<i>On Indexing in Case Based Reasoning Applied to Pre-Transportation Decision Making for Hazardous Waste Handling</i> K.L. Wortmann, D. Petkov and E. Senior	269
Author Index	270

List of Contributors

S.A. Ajila
Department of Mathematics and Computer
Science
National University of Lesotho
Roma, 180
Lesotho

L. Baart
Department of Mathematics
Vaal Triangle Campus of the PU for CHE
PO Box 1174
Vanderbijlpark, 1900

L. Barnard
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

S. Berman
University of Cape Town
Rondebosch, 7701

L. Bester
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth 6000

J.M. Bishop
Computer Science Department
University of Pretoria
Pretoria, 0002

L. Botha
Computer Science Department
University of Pretoria
Pretoria, 0002

R.A. Botha
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

B. Braude
Software Engineering Applications Laboratory,
Electrical Engineering
University of the Witwatersrand
Private Bag 3
Wits, 2050

T. Breetzke
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

C. Brink
University of Cape Town
Rondebosch, 7700

M. Bruynooghe
Departement Computerwetenschappen
Katholieke Universiteit Leuven
Celestijnenlaan 200A
B-3001 Heverlee
Belgium

S. Buffler
University of Capetown
Rondebosch, 7701

M.A. Coetzee
Department of Mathematics
PU for CHE
Private Bag X6001
Potchefstroom, 2520

R. Cools
Katholieke Universiteit Leuven
Celestijnenlaan 200A
B-3001 Heverlee
Belgium

E. de Preez
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

D.A. De Waal
Department of Computer Science and
Information Systems
PU for CHE
Private Bag X6001
Potchefstroom, 2531

B. Dekenah
The Board of Executors

M. Denecker
Departement Computerwetenschappen
Katholieke Universiteit Leuven
Celestijnenlaan 200A
B-3001 Heverlee
Belgium

M. Dunley-Owen
Department of Information Systems
University of Cape Town
Rondebosch, 7700

R. Figueira
University of Cape Town
Rondebosch, 7701

A. Foster
Department of Computer Science
University of Cape Town
Rondebosch, 7701

C. Gee
Software Engineering Applications Laboratory,
Electrical Engineering
University of the Witwatersrand
Private Bag 3
Wits 2050

M. Hajek
Department of Computer Science
University of Durban Westville
Private Bag X54001
Durban, 4000

M.L. Hart
Department of Information Systems
University of Cape Town
Rondebosch, 7700

J.M. Hattingh
Department of Computer Science and
Information Systems
PU for CHE
Private Bag X6001
Potchefstroom, 2520

S. Hazelhurst
Department of Computer Science
University of the Witwatersrand
Private Bag 3
Wits 2050

H.A. Kruger
Department of Computer Science and
Information Systems
PU for CHE
Private Bag X6001
Potchefstroom, 2520

J.W. Kruger
University of the Witwatersrand
Private Bag 3
Wits, 2050

M.F. Kruger
PU for CHE
Private Bag X6001
Potchefstroom, 2520

M.T. Lang
Eskom Information Technology Department

D. Laurie
Department of Mathematics
Vaal Triangle Campus of the PU for CHE
PO Box 1174
Vanderbijlpark, 1900

D. Lubinsky
Department of Computer Science
University of the Witwatersrand
Private Bag 3
Wits, 2050

R. McLeod
Saltire Software Inc.
Tigard
Oregon
U.S.A

H.J. Messerschidt
Department of Computer Science and
Informatics
University of the Orange Free State
PO Box 339
Bloemfontein, 9300

M. Mphahlele
Department of Computer Science
University of the North
Private Bag X1106
Sovenga, 0727

G.D. Oosthuizen
Department of Computer Science
University of Pretoria
Pretoria, 0002

J. Owen
University of Cape Town
Rondebosch, 7701

D. Petkov
Department of Computer Science
University of Natal
Private Bag X01
Scotsville, 3209

O. Petkova
Technikon Natal
PO Box 101112
Scotsville, 3209

N. Pillay
Department of Financial Studies
Technikon Natal, Pietermaritzburg
PO Box 101112
Scotsville, 3209

L. Pluym
Katholieke Universiteit Leuven
Celestijnenlaan 200A
B-3001 Heverlee
Belgium

K. Prag
Department of electrical Engineering
University of Durban-Westville
Private Bag X54001
Durban, 4000

P. Premjeeth
Department of electrical Engineering
University of Durban-Westville
Private Bag X54001
Durban, 4000

V. Ram
Department of Computer Science
University of Natal
Private Bag X01
Scotsville, 3209

J. Robertson
Department of Computer Science and
Informatics
University of the Orange Free State
PO Box 339
Bloemfontein, 9300

S. Rock
Department of Artificial Intelligence
Edinburgh University
United Kingdom

J. Roos
Department of Computer Science
University of Pretoria
Pretoria, 0002

I. Sanders
Department of Computer Science
University of the Witwatersrand
Private Bag 3
Wits, 2050

K. Sandrasegaran
Department of electrical Engineering
University of Durban-Westville
Private Bag X54001
Durban, 4000

C. Schoder
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

M. Sears
Department of Mathematics
University of the Witwatersrand
Private Bag 3
Wits, 2050

E. Senior
International Center for Waste Technology
University of Natal, Pietermaritzburg
Private Bag X01
Scotsville, 3209

N.B. Serbedzija
GMD FIRST
Rudower Chausee 5
D-12489 Berlin
Germany

S.L. Serutla
Department of Computer Science
The University of Pretoria
Pretoria, 0002

T. Steyn
PU for CHE
Private Bag X6001
Potchefstroom, 2520

M. Thielscher
Fachgebiet Intellektik, Fachgebiet Informatik
Technische Hochschule Darmstadt
Alexanderstrasse 10
D-64283 Darmstadt
Germany

T. Thomas
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

M. Thomson
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

S. Tjasink
University of Cape Town
Rondebosch, 7700

E. Viljoen
Department of Computer Science and
Information Systems
University of South Africa
PO Box 392
Pretoria, 0001

E. Voges
University of Cape Town
Rondebosch, 7701

R. Von Solms
Faculty of Computer Studies
Port Elizabeth Technikon
Private Bag X6011
Port Elizabeth, 6000

A.J. Walker
Software Engineering Applications Laboratory,
Electrical Engineering
University of the Witwatersrand
Private Bag 3
Wits, 2050

P. Warren
Department of Computer Science
University of Natal
Private Bag X01
Scotsville, 3209

M. Watzenboeck
University of Botswana
Private Bag 0022
Gaberone
Botswana

K.L. Wortmann
Department of Computer Science
University of Natal, Pietermaritzburg
Private Bag X01
Scotsville, 3209

A neural network model of a fluidised bed

M. Hajek

*Department of Computer Science
University of Durban-Westville
P. Bag X54001, Durban 4000*

mhajek@pixie.udw.ac.za

A neural network was used to model experimental fluidisation data – bubble size and velocity – from a laboratory size fluidised bed column. Experiments were performed for several particle sizes and temperatures.

A classical feedforward neural network trained with a backpropagation algorithm was used. Data pre-processing turned out to be vitally important. Both particle sizes and temperatures were represented as fuzzy sets. This representation took care of a smooth transition from one value to another on the input side of the network thus making training and generalisation of the network easier.

After training, the neural network was capable not only to predict the velocities of bubbles or slugs but also to identify the transition from a bubbling fluidised bed to a slugging bed.