



VOLUME 2 NUMBER 1 (2005)

ISBN 978-8141-03-X

PROCEEDINGS

OF THE

NATIONAL MATHEMATICAL CENTRE,
ABUJA, NIGERIA

COMPUTATIONAL MATHEMATICS AND APPLICATIONS

Published by the National Mathematical Centre, Sheda-Kwali, along Kaduna – Lokoja Highway, Abuja,
P.M.B. 118, Garki P.O., Abuja, Nigeria

Editorial Committee of the Lectures Notes Series

| | | |
|--------|------------------------------|-----------|
| (i) | Professor Sam O. Ale | Chairman |
| (ii) | Professor Peter Onumanyi | Member |
| (iii) | Professor L. O. Adetula | Member |
| (iv) | Dr. James O. Daniel | Member |
| (v) | Asso.prof.Benjamin O.Oyelami | Member |
| (vi) | Dr. G. I. Obodo | Member |
| (vii) | Dr.Denis Onyekwelu | Member |
| (viii) | Alh. M. Biu | Secretary |

Typesetters

- Asso. Professor Benjamin O. Oyelami
- Essien A. Effiong
- Festus Emeofo

The National Mathematical Centre Publication Committee publishes proceedings of the National Mathematical Centre, Abuja.

All correspondence or request regarding subscription should be sent to:

The Director & Chief Executive
National Mathematical Centre
Lokoja – Kaduna Road
Sheda – Kwali
P.M.B. 118, Garki GPO
Abuja
director@nmc.edu.ng
samalenmc@yahoo.com

All editorial and general communication should be addressed to:

The Chairman
Publication Committee
National Mathematical Centre
P.M.B. 118 Garki GPO
Abuja
publications@nmc.edu.ng
samalenmc@yahoo.com

The proceedings of Conference on Computational Mathematics and Applications

Edited by

K.R.ADEBOYE

*Department of Mathematic/computer science
Federal University of Technology, Minna, Nigeria*

P. ONUMANYI

*National Mathematical Centre
Abuja, Nigeria*

And

Benjamin O.OYELAMI

*Mathematics Science Programme,
National Mathematical Centre, Abuja, Nigeria.*

Library of Congress Cataloguing in publication Data Main entry under title: The proceedings of computational Mathematics and Applications

(National Mathematical Centre Abuja Lecture Notes Series Number 2.

Papers presented at the National Mathematical Centre, Abuja, August 31-September 1,2001

1. Mathematics- computational Mathematics -Congresses
 2. Engineering -control Problems –Congresses
 3. Computer Science- algorithms-Congresses
1. K.R.Adeboye, P. Onumanyi and Oyelami B.O.

ISBN 981-8141-03-X

COPYRIGHT © 2005 by National Mathematical Centre, Abuja

ALL RIGHT RESERVES

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, micro-filming, and recording, or by any information storage and retrieval system, without permission in writing from the publisher,

National Mathematical Centre,
Along Kwali – Lokoja Road,
Kwali, P.M.B. 118 Garki Post Office
Abuja, Federal Capital Territory, Nigeria
Printed in Nigeria.

FOREWORD

On behalf of the National Mathematical Centre, I thank Professor Sunday Iyahan, the Conference organizer and chief editor of the Proceedings and other editors, Professor K.R. Adeboye, professor Peter Onumanyi and Dr. B.O. Oyelami. I wish to express Centre's gratitude to the following persons who are either invited speaker or chairman of one of the plenary session in the conference:

Professor J.O.C Ezeilo the founding father of the Centre; Professors Ibidapo Obey, L.A.Bruraimo-Igbo, J.U.Onwatu , M .A. Daniyan, A.S.Sambo and O.Taiwo .I wish also to express my appreciation to the staff of the Centre who worked relentlessly to make this publication a reality.

We are encouraged by the high quality by the Assessors of manuscripts arising from the conference.

The topic of the conference "*Computation and Applied Mathematics* " is important and relevant to the nation's quest for scientific and technological breakthroughs .The conference was the forum where recent discovery on computation and applied mathematics were showcased .The papers presented covered broad areas of numerical analysis, control theory, optimisation, modelling and simulation.

The Proceedings cover major parts of the recent research into the development and analysis of new methods for the computation and applied mathematics throughout science and engineering. With this contribution it is a giant stride toward revolutionising the theory of computing and automata. This makes possible comprehensive understanding of many complex real life processes, through the power of modelling, simulation and computational techniques.

With the publication of this Proceeding, the other scientific activities scheduled for the year 2006 will follow.

Professor Sam Ale, mni, OFR

Director & Chief Executive

National Mathematical Centre

Sheda-Kwali, Abuja

Nigeria

National Mathematical Centre, Abuja
Conference in Computational Mathematics and Applications,
August 31- September 1, 2001

A Report

1. Preliminary Preparations

In preparing for the Conference,

- (i) The Centre organized the following relevant Courses
 - (a) ROC-CMAI: A Research Oriented Course in Computational Mathematics and Applications I(Optimisation) July 1-20, 2001
 - (b) ROC-CMAII: A Research Oriented Course in Computational Mathematics and Application II (Numerical Analysis) July 22 – August 10, 2001.
 - (c) ROC-CMAIII: A Research Oriented Course in Computational Mathematics and Applications III (Control Theory) August 12 – 30, 2001. (Please see Attachment I).
- (ii) The Centre took paid advertisement of the Conference in two National Newspapers (The Guardian and New Nigeria), and distributed related information materials to Departments of Mathematics and Faculties of Engineering in all Nigerian Universities, Polytechnics and Colleges of Education
(Please see Attachments II, IIA. IIB).

2. The First Day: August 31, 2001

The Conference started with the Participants receiving Registration Forms and Conference bags each containing amongst others, a Programme of Activities (attachment III) a Book of Abstracts (attachment IV), a pad and a biro. There was then a formal Opening Ceremony Chair manned by Professor M. A. Daniyan, Federal University of Technology, Minna. The Opening Ceremony also included a Keynote Address for the Conference by Professor A. S. Sambo, Vice Chancellor, Abubakar Tafawa Balewa University Bauchi.

The following four 1-hour lectures each followed by discussions in Plenary Sessions followed the Opening Ceremony.

First Plenary Session

Chairman: Professor J. O. C. Ezeilo, FAS

Guest Lecturer: Professor O. Ibidap-Obe Acting Vice-Chancellor, University of Lagos.

Title of Address: Some Contributions to Computational Mathematics; Heuristic Approach to intelligent Systems.

Second Plenary Session

Chairman: Professor S. O. Iyahen, FAS, National Mathematical Centre, Abuja

Guest Lecturer: Professor P. Onumanyi, University of Jos, Jos

Title of Address: A Continuous Numerov Method of Improved Performance in the Block Solution of Second Order Ordinary Differential Equation.

Third Plenary Session

Research Communications

Chairman: Professor L. A. Buraimoh-Igbo, Obafemi Awolowo University, Ile-Ife

Guest Lecturer: Professor J. U. Onwuatu, Federal University of Technology Owerri

Title of Address: Model Reduction and Simplification of Large Scale Systems

The Second Day, September 1, 2001

In the second day of the Conference, the following twenty-four short Research Communications were presented:

1. K. R. Adeboye, Department of Mathematics, Federal University of Technology, Minna
 H^1 Garlekin-collection and quasi-iterative method for boundary value problems
2. B. O. Oyelami, J. A. Ogidi, P. Onumanyi and M. Yacouba, ATBU, Bauchi
Modelling the spread of AID/HIV: An application to Bauchi and Gombe States of Nigeria.
3. M.N. O. Ikhile and F. O. Otunta, Department of Mathematics, University of Benin, Benin City.
Numerical Interval Methods for simultaneous Inclusion of all zero of a polynomial
4. D. O. Awoyemi, Department of Mathematics, Federal University of Technology, Akure.
An algorithmic collocation approach for direct solution of special and general fourth-order initial value problems of ordinary differential equations
5. Chika Moore and B. V. C. Nnoli, Department of Mathematics, University of Nigeria, Nsukka.
Iterative construction of fixed points of asymptotically pseudocontractive maps
6. K. R. Adeboye, Federal University of Technology, Minna
A. O. Muritala and A. M. Rabi, Obafemi Awolowo University, Ile-Ife
On numerical solution of radial flow in an oil reservoir
7. M. N. O. Ikhile, Department of Mathematics, University of Benin, Benin City.
Improved modifications of Machly's method by use of new corrections for simultaneous inclusion of polynomial zeros
8. S. J. Kayode, Federal University of Technology, Akure,
An optimal order collocation method for direct solution of initial value

- Problem of general second order ordinary differential equations.**
9. U. S. U. Aashikpelokhai, Department of Mathematics, Edo State University, Ekpoma.
- On the stability functions of an odd-order family of rational integrators**
10. B. O. Oyelami, Sam O. Ale and P. Onumanyi, ATBU, Bauchi.
- Impulsive HIV/Aids model using the B-transform**
11. Bashir M. Yakasai, Department of Mathematical Sciences, Bayero University, Kano.
- Replacement model using subjective data**
12. P. Onumanyi and Y. A. Yahaya, Department of Mathematics, University of Jos, Jos.
- Two-step multi-step collocation methods with continuous coefficients for the block solution of special second order odes**
13. Francis O. Otunta, University of Benin, Benin City.
- A gradient method for discrete optimal control problems**
14. F. M. Aderibigbe, University of Ado-Ekiti, Ado-Ekiti and
T. A. Adewale, Ondo State University, Akungba-Akoko.
- On a trust region algorithm with initial radius defined by a non-normal metric**
15. M. R. Odekunle, Federal University of Technology, Yola.
- Solution of evolutionary problems: an outlook using lanezos-chebyshev reduction**
16. Ogundare Babatunde and Afuwape Anthony A., Department of Mathematics Obafemi Awolowo University, Ile-Ife.
- Further results on boundedness of certain third order nonlinear differential equation**
17. J. C. Onwuatu, Federal University of Technology, Owerri.
- Characterizing ordinary differential systems with delay control**
18. O. Taiwo, Department of Chemical Engineering, OAU, Ile-Ife & A. M. Musa, Federal Polytechnic, Bida
- Robust adaptive controller for generation recycles reaction**
19. F. M. Okoro, Edo State University, Ekpoma and M. A. Ibiejugba, Department of Mathematics, University of Ilorin, Ilorin.
- Preconditioned conjugate gradient method for the solution of large systems of linear equations**
20. J. O. Omelehin, Department of Mathematics, University of Ilorin, Ilorin.
- On the existence and uniqueness of solution for reaction diffusion control problem**
21. O. M. Bamigbola, Department of Mathematics, University of Ilorin, Ilorin.
- A variational finite element method for solving parabolic control problems**
22. Sunday A. Reju, Federal University of Technology, Minna
- Some computational analysis of the optimal control of energized waves**
23. Augusto, F. B. Ladoke Akintola University of Technology, Ogbomoso and
O. M. Bamigbola, Department of Mathematics, University of Ilorin, Ilorin.
- Extension of coggins algorithm – A directional approach**
24. Dr. Ademiluyi, Federal University of Technology, Akure.
- A new class of explicit rational RK method for integration of differential equation with large eigenvalue**

4. Closing Ceremony

After these sessions on Research Communications there was a joint closing Ceremony for both the Conference in Computational Mathematics and Applications, and the Research Oriented Course in Computational Mathematics and Application III (Control Theory), at which the Participants in the Course were given their Certificates. The participants at the Course and Conference expressed satisfaction at the conference. Along with the Course Lecturers and Resource Scientists present, they urged that avenues be explored for putting into use, the Applications of Mathematics in the solution of problems of national interest. The Guest Lecturers, Resource Scientists and some Management/Academic Staff of the Centre soon after met to discuss this

At the end of the Conference, an Editorial Board:

| | |
|--|----------|
| Professor K. R. Adeboye, Federal University of Technology, Minna | Chairman |
| Professor L. A. Buraimoh-Igbo, Obafemi Awolowo University, Ile-Ife | Member |
| Professor Otunta, University of Benin, Benin City | Member |

Was constituted to arrange for the assessment for publication, of the publication of manuscripts of the Short Communications presented at the Conference.

Contributors

| | |
|----------------|--|
| Sam O.Ale | Director-General, National Mathematical Centre, Abuja, Nigeria |
| A.S.Sambo* | Vice-Chancellor, Abubakar Tafawa Balewa University, Bauchi, Nigeria |
| O.Ibidapo-Obe | Vice-Chancellor, University of Lagos, Lagos, Nigeria |
| O.Taiwo | Chemical Engineering Department, Obafemi Awolowo University, Ile-Ife, Nigeria |
| M.A.Ibiejugba | University of Ilorin, Ilorin, Nigeria |
| P.Onumanyi** | Department of Mathematics, University of Jos, Jos, Nigerian |
| K.R.Adeboye | Department of Mathematics/Computer Federal University of Technology Minna, Minna, Nigeria |
| B.O.Oyelami*** | Mathematical Sciences Programme Abubakar Tafawa Balewa University, Bauchi Bauchi, Nigeria. |
| H.W.S.Sirisena | Department of Mathematics, University of Jos, Jos, Nigerian |

* Director-General, Energy Commission of Nigeria, Abuja, Nigeria

** National Mathematical Centre, Abuja, Nigeria

*** National Mathematical Centre, Abuja, Nigeria

| | |
|------------------|--|
| J.Fatokun | Department of Mathematics, University of Jos, Jos, Nigerian |
| J.A.Ogidi | Biological Sciences Programme Abubakar Tafawa Balewa University, Bauchi Bauchi, Nigeria. |
| M.Yacouba | Mathematical Sciences Programme Abubakar Tafawa Balewa University, Bauchi Bauchi, Nigeria. |
| F.M.Okoro | Department of Computer Science Ambrose Alli University, Ekpoma, Ekpoma, Nigeria |
| Y.Yusuph | Department of Mathematics, University of Jos, Jos, Nigerian |
| M.N.O.Ikhile | Department of Mathematics, University of Benin, Benin City, Nigeria |
| Francis O.Otunta | Department of Mathematics, University of Benin, Benin City, Nigeria |
| D.O.Awoyemi | Department of Mathematical Sciences Federal University of Technology Akure, Akure, Nigeria |
| S.J.Kayode | Department of Mathematical Sciences Federal University of Technology Akure, Akure, Nigeria |

Contents

| | |
|--|------------|
| Cover page | i |
| Editorial committee of lecture note series | ii |
| Editors' names | iii |
| Copyright statement | iv |
| Foreword | v |
| Report | vi |
| Contributors | x |
| Contents | xii |
| <i>Computational Mathematics and Applications for National Development and growth</i> - A.S.Sambo | pp.1-7 |
| <i>Some contributions to Computational Mathematics: Heuristic intelligent systems</i> - O.Ibidapo-Obe | pp.8-22 |
| <i>Model Simplification for large systems</i> - O.Taiwo | pp 23-49 |
| <i>Impulsive HIV/Aids model using the B-transform</i> - B. O. Oyelami, Sam O. Ale and P.Onumanyi | pp.50-64 |
| <i>Continuous linear multistep Methods for improved performance in the solutions of first order systems of ordinary differential equations</i> - P. Onumanyi, U.W.Sirisena and J.Fatokun | pp.65-74 |
| <i>H¹ Garlekin-collection and quasi-iterative method for boundary value problems-</i> K.R.Adeboye | pp.74-81 |
| <i>Modelling the spread of AID/HIV: An application to Bauchi and Gombe States of Nigeria</i> - B. O. Oyelami, J. A. Ogidi, P. Onumanyi and M. Yacouba | pp.82-95 |
| <i>Preconditioned conjugate gradient method for the solution of large systems of linear equations</i> - F. M. Okoro and M. A. Ibiejugba | pp.96-105 |
| <i>A Maximal order collocation method for direct solution of initial value Problem of general second order ordinary differential equations</i> D.O.Awoyemi and S. J. Kayode | pp.106-114 |
| <i>Two-step multi-step collocation methods with continuous coefficients for the block solution of special second order odes-</i> P. Onumanyi and Y. A. Yahaya | pp.115-127 |
| <i>On a trust algorithm with initial radius chosen by a normed metric</i> F.M.Aderibigbe and T.A.Adewale | pp.128-133 |

A gradient method for discrete optimal control problems - Francis O. Otunta
pp.134-141

A P-Stable Linear Multistep Method for Direct Solution of General Third Order
Ordinary Differential Equations D.O.Awoyemi pp.142-151

New multistep FDMs through multistep collocation for $y'' = f(x, y)$ -
Y.Yusuph and P.Onumanyi pp.152-164

Numerical Interval Methods for simultaneous Inclusion of all zero of a polynomial
- M.N. O. Ikhile and F. O. Otunta pp.165-181