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13. ABSTRACT *(Maximum 200 words)*

Mathematical modeling, computer simulation, and numerical and computational mathematics have had a revolutionary influence on how scientific research is done. Every day new applications appear which demonstrate the dramatic increase in the role of computer simulation to model a variety of natural phenomena in order to both better understand them and to uncover new scientific principles and data. To explore these diverse topics, the need for interdisciplinary interaction and collaboration has become evident. These topics were the basis of an interdisciplinary symposium held at the University of Texas in April 1995.

The symposium brought together leading researchers to assess the increasing opportunities in scientific research on computational mathematics and computer simulation, including mathematical modeling using numerical methods,high performance computing for large-scale applications, specialized applications in biology, environmental studies, numerical science, penetration mechanics, and wavelets and image processing together with the role of computer simulations in engineering analyses, manufacturing, and design.

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INTERDISCIPLINARY SYMPOSIUM ON

COMPUTATIONAL AND APPLIED MATHEMATICS

FINAL REPORT

J. Tinsley Oden

September, 1997

DAAH04-95-1-0160

The University of Texas at Austin

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INTERDISCIPLINARY SYMPOSIUM ON COMPUTATIONAL AND APPLIED MATHEMATICS

Mathematical modeling, computer simulation and numerical and computational mathematics have had a revolutionary influence on how scientific research is done. However, every day new applications appear which demonstrate the dramatic increase in the role of computer simulation and mathematical modeling for engineering analysis, manufacturing and design, and the unprecedented use of computer simulation to model a variety of natural phenomena in order to both better understand them and to uncover new scientific principles and data. To explore these diverse topics, the need for interdisciplinary interaction and collaboration has become evident. This special issue contains invited papers embracing the main areas pertinent to mathematical analysis, modeling, computer simulation, methodology, and algorithms. These topics were the basis of an interdisciplinary symposium held at the University of Texas in April 1995 to celebrate the inauguration of the new Computational and Applied Mathematics Ph.D. Program and the establishment of a new research center devoted to this area, TICAM: The Texas Institute for Computational and Applied Mathematics.

The symposium brought together leading researchers to assess the increasing opportunities in scientific research on computational mathematics and computer simulation, including mathematical modeling using numerical methods, high performance computing for large scale applications, specialized applications in biology, environmental studies, material science, penetration mechanics, and wavelets and image processing together with the role of computer simulations in engineering analyses, manufacturing, and design. This symposium was deisgned to help lay down specific directions for interdisciplinary graduate research that incorporate computational mathematics, and to provide a forum for a diverse group of scholars and researchers in computational and applied mathematics.

Many of the topics presented at the symposium (e.g. high performance computing, finite elements, object-oriented programming) are represented at national meetings as topic areas and there have been specialty conferences on, for example, wavelets; but the purpose at this symposium was to focus on the interdisciplinary aspects of the subject and to explore the interactions between these areas.

Invited papers presented at the Symposium were published in a special issue of *Journal of Computational and Applied Mathematics* 74 (1996) 1. The following is a list of papers published in this volume. An extra 100 copies of this volume have been ordered, but not received to date.

A.N. Agarwal and P.M. Pinsky
Stablilized element residual method (SERM): A posteriori error estimaton for the advection-diffusion equation.

T. Arbogast, S. Bryant, C. Dawson, F. Saaf, C. Wang and M. Wheeler
Computational methods for multiphase flow and reactive transport problems arising in subsurface contaminant remediation.

O. Axelsson
The stabilized V-cycle method

I Babuska, B. Andersson, B. Guo, J.M. Melenk and H.S. Oh
Finite element method for solving problems with singular solutions

Z. Bai, M. Fahey and G. Golub
Some large-scale matrix computation problems

R. Barrett, M. Berry, J. Dongarra, V. Eijkhour and C. Romine
Algorithmic bombardment for the iterative solution of linear systems: A poly-iterative approach

T. Belytshcko, Y. Kongauz, M. Fleming, D. Organ and W.K. Liu
Smoothing and accelerated computations in the element free Galerkin method

J.L. Bona, V.A. Dougalis, O.A. Karakashian and W.R. McKinney

The effect of dissipation on solutions of the generalized Korteweg-de Vries equation

J.H. Bramble and J.E. Pasciak
Least-squares methods for Stokes equations based on a discrete minus one inner product

B. Engquist and O. Runborg
Multi-phase computations in geometrical optics

R.E. Ewing
Multidisciplinary interactions in energy and environmental modeling

T.J.R. Hughes and J.R. Stewart
A space-time formulation for multiscale phenomena

T. Karkkainen, P. Neittaanmaki and A Niemisto
Numerical methods for nonlinear inverse problems

J.T. Oden and Y. Feng
Local and pollution error estimation for finite element approximations of elliptic boundary value problems

A.L. Pardhanani and G.F. Carey
Efficient simulation of complex patterns in reaction-diffusion systems

S. Shaw, M.K. Warby and J.R. Whiteman
Discrete schemes for treating hereditary problems of viscoelasticity and applications

D.M. Young and D.R. Kincaid
A new class of parallel alternating-type iterative methods

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Randy Bank, University of California, San Diego
Gene Golub, Stanford University
T.J.R. Hughes, Stanford University