

# CONTENTS

## PREFACE

## PART I

	<u>Page No.</u>
<b>NUMERICAL GRID GENERATION TECHNIQUES</b>	1
SECTION 1 GENERAL TECHNIQUES	3
Numerical Generation of Grids for Pathological Shapes Walter M. Buehl	5
Computer Aided Grid Design R. Camaréro, B. Ozell, H. Yang, H. Zhang and C. Dupuis	15
Mathematical Aspects of Grid Generation I Jose E. Castillo	35
PENELOPE, Numerical Generation of 2-D Curvilinear Meshes J-M. Hervouet	45
Coordinate Generation in Symmetrical Interior, Exterior or Annular 2-D Domains, Using a Generalised Schwarz-Christoffel Transformation M. Hoekstra	59
One Parameter Mesh Generation for Spheroidal Domains Vitoriano Ruas	71
Geometry/Grid Generation in N + 1 Easy Steps B.K. Soni, M.W. McClure and C.W. Mastin	83
Surface Mesh Generation Using Elliptic Equations Z.U.A. Warsi and W.N. Tiarn	95
SECTION 2 ADAPTIVE AND ORTHOGONAL TECHNIQUES	111
Orthogonal Grids with Adaptive Control Renzo Arina	113
Constructing Adaptive Grids with Poisson Grid Generators Dale A. Anderson	125

Page No.

The Creation of Local Clusters in Arbitrarily Given Grids Peter R. Eiseman	137
The Numerical Generation Curvilinear Orthogonal Grids With Fixed Points on the Boundaries D.E. Papantonis, N.A. Athanassiadis, K.N. Tziotis	153
Evaluating Algebraic Adaptive Grid Strategies Alan L. Schwartz and William C. Connell	163
The Generation of Contour Oriented Orthogonal and Periodic Coordinate Grids by Means of Spline Functions E. Steck	175
A Numerical Method for the Generation of 2-D Orthogonal Curvilinear Grids G. Tzabiras, M. Vafiadou and G. Nassos	183
SECTION 3 COMPOSITE METHODS	195
Numerical Grid Generation for Three-Dimensional Geometries Using Segmented Computational Regions Roderick M. Coleman and Michael L. Brabanski	197
Composite Computational Grid Generation Using Optimization Stephen R. Kennon and George S. Dulikravich	217
Interface Procedures for Overlapping Grids C. Wayne Mastin	227
Application of a Block-Structured Grid Generation Scheme for Modeling Three-Dimensional Viscous Flows W.S. Pien, A. Ecer and C. Bowes	247
Generation of Patched Multiple-Region Grids Using Elliptic Equations D.M. Schuster	259
Composite Grid Generation for General 3D Regions Joe F. Thompson	271
SECTION 4 GRID GENERATION FOR AIRCRAFT DESIGN	291
Problem and Solution Formulations for the Generation of 3D Block-Structured Grids J.W. Boerstoel	293

Page No.

Generation of Body-Fitted Grids Around Airfoils Using Multigrid Method R.K. Jain	305
An Approach to the Interactive Generation of Block- Structured Volume Grids Using Computer Graphics Devices Werner Seibert	319
A Block Structured Mesh Generation Technique for Aerodynamic Geometries J. Shaw, C.R. Forsey, N.P. Weatherill and K.E. Rose	329
Elliptic Grid Generation System for Three-Dimensional Configurations Using Poisson's Equation W. Schwarz	341
Elliptic Generation of Composite Three-Dimensional Grids About Realistic Aircraft Reese L. Sorenson	353
SECTION 5 GRID GENERATION FOR INTERNAL FLOW PROBLEMS	
Elliptic Generation of Three Dimensional Grids for Internal Flow Calculations A. Hilgenstock, M. Kursawe, H. Pfost and E.V. Lavante	375
3-D Mesh Generation for Calculating Flow Through Radial-Axial Turbines C. Neury	387
Algebraic Grid Generation for Annular Nozzle Flowfield Prediction B.N. Wang and J.D. Hoffman	399
SECTION 6 TRIANGULAR GRID GENERATION	
Adaptive Triangular Meshes for Compressible Flow Solutions D. Graham Holmes and Scott H. Lamson	413
Application of a FEM Moving Node Adaptive Method to Accurate Shock Capturing B. Palmerio and A. Dervieux	425
An Optimized Triangular Mesh System From Random Points Glen Y. Watabayashi and J.A. Galt	437
An Element by Element Preconditioner For Refined Finite Element Grids S.Ø. Wille	449

Page No.

SECTION 7 USE OF MULTIGRID IN NUMERICAL GRID GENERATION	461
A Zonal-Multi-Grid Method for the Simulation of Flows in a System of Channels Laszlo Fuchs	463
Boundary-Fitted Coordinate Generation Using a Non- Linear Multigrid Algorithm Guy Lonsdale	473
Multigrid Methods: An Overview with Emphasis on Grid Generation Processes K. Stüben and J. Linden	483

**PART II APPLICATION OF NUMERICAL GRID 511  
GENERATION TECHNIQUES TO FLUID FLOW  
PROBLEMS**

SECTION 1 THE SOLUTION OF NAVIER-STOKES EQUATIONS	513
"TGFLOW" A Software Package for the Analysis of Laminar Fluid Flow John P. Coulter, Scott D. Gilmore and Selcuk I. Güceri	515
Numerical Grid Generation Applied to Spectral Turbulent Simulations T.R. Fodemski, P.R. Voke and M.W. Collins	527
A New Solution for a Class of Incompressible Flows Using Numerical Grid Generation Techniques G. Grossman and R.M. Barron	539
A Perspective of Computational Fluid Dynamics Paul Kutler	547
Numerical Computation of Separated and Reattached Flows N. Toy and K. Ainkaran	567
SECTION 2 COMPUTATIONAL HYDRAULICS	579
Numerical Grid Generation in Coastal Hydrodynamics A.S.-Arcilla and J.L. Monsó	581

Page No.

Mesoscale Numerical Modelling Dieter Eppel	593
Flow in a Wavy Channel Using Body-Fitted Coordinates V.K. Garg and P.K. Maji	617
Discussion of a Depth-Dependent Adaptive Grid Generator for Use in Computational Hydraulics B.H. Johnson and J.F. Thompson	629
Experience with Numerical Grid Generation Techniques and Their Application in Flow Problems at the Delft Hydraulics Laboratory M.J. Officier and A.K. Wiersma	641
SECTION 3 THERMAL AND FLUID FLOW PROBLEMS	653
"TGSOLD" A Software to Simulate Solidification in Irregularly Shaped Domains Eric P. Beyeler and Selcuk I. Güceri	655
Analysis of Transient Free Convection Using a Primitive Variable Boundary Fitted Algorithm G.V. Hadjisophocleous, A.C.M. Sousa and J.E.S. Venart	667
Local Effects of High Nonorthogonal Grids in the Solution of Heat Transfer Problems in Cusped Corners C.R. Maliska and A.F.C. Silva	679
SECTION 4 APPLICATION OF GRID GENERATION TO TECHNICAL PROBLEMS	691
The Generation of Continuous Multi-Block Grids Around Car Configurations Above A Flat Ground Plane Using Transfinite Interpolation T. Berglind	693
Analysis of Structures Produced From Visco-Elastic Materials By The Aid of Adina-Program I. Cohen, M. Mikulinsky and A. Shtark	705
Grid Generation For Gas Lubrication, Using the APL Language F. Hendriks	717
Adaptive Grids in Space and Time for Process and Device Simulators W. Jüngling, G. Hobler, S. Selberherr and H. Pötzl	729

Page No.

Residual and Transient Thermal Stresses in Laminated Orthotropic Composites Nancy R. Sottos and Selcuk I. Guceri	741
Calculation of Optimal Coordinates for Two-Dimensional Viscous Flow R.K. Rout	755
Three Dimemsional Mesh Generation for a Coordinate System for Navier Stokes Equations Y.Marx, J.Piquet, M.Visonneau	772
Strategies in Mesh Generation Based on Industrial Requirements W.Schmidt.	785