

CONTENTS OF VOLUME I

PREFACE	v
---------------	---

I. General Topics

1. HISTORICAL REMARK ON FLUIDDYNAMICS AND COMPUTERS AT ISAS, UNIVERSITY OF TOKYO Koichi Oshima	3
2. PROGRESS IN CFD FOR TURBOMACHINE CASCADE FLOW PROBLEMS EMPHASIZING INVESTIGATIONS IN JAPAN Hisaaki Daiguji	12
3. CONTEMPORARY AUSTRALIAN CFD SCENE K. Srinivas and C. A. J. Fletcher	42

II. Numerical Methods

IIa. Grid Generation and Adaptation

4. SOLUTION OF THE EULER EQUATIONS ON SOLUTION-ADAPTIVE CARTESIAN GRIDS Kenneth G. Powell	65
5. ANISOTROPIC CARTESIAN GRID METHOD FOR VISCOUS FLOW COMPUTATION Zi-Niu Wu	93
6. NUMERICAL SIMULATION OF INCOMPRESSIBLE FLOWS AND ANALYSIS OF SOLUTIONS Charles-Henri Bruneau	114
7. SOLUTION-ADAPTIVE METHODS FOR ELLIPTIC GRID GENERATION Kenichi Matsuno	127
8. ADVANCING-FRONT/LOCAL-RECONNECTION (AFLR) UNSTRUCTURED GRID GENERATION David L. Marcum	140
9. ANISOTROPIC MESH ADAPTION BY METRIC CONTROL FOR SYSTEMS OF PDE INVOLVING MULTISCALE PHENOMENA Frederic Hecht and Bijan Mohammadi	158

IIb. Finite Approximation Methods

Far Field Boundary Conditions

10. AN APPLICATION OF THE DIFFERENCE POTENTIALS METHOD TO
SOLVING EXTERNAL PROBLEMS IN CFD
Victor S. Ryaben'kii and Semyon V. Tsynkov 169

Finite Volumes: Artificial Viscosity Schemes

11. THE METHOD OF SPACE-TIME CONSERVATION ELEMENT AND SOLUTION
ELEMENT — A NEW PARADIGM FOR NUMERICAL SOLUTION OF
CONSERVATION LAWS
Sin-Chung Chang, Shen-Tao Yu, Ananda Himansu,
Xiao-Yen Wang, Chuen Yen Chow, and Ching-Yuen Loh 206
12. DISCONTINUOUS FINITE ELEMENTS AND FINITE VOLUME VERSIONS
OF THE LAX-FRIEDRICH AND NESSYAHU-TADMOR SCHEMES FOR
COMPRESSIBLE FLOWS ON UNSTRUCTURED GRIDS
Paul Arminjon, Marie-Claude Viallon, Aziz Madrane, and
Lahcen Kaddouri 241
13. ARTIFICIAL DISSIPATION AS A FEEDBACK CONTROL WITH
APPLICATION TO THE CELL VERTEX METHOD
K. W. Morton and S. M. Stringer 262

Finite Volumes: Upwind Schemes

14. A GENERAL CLASS OF DIFFERENCE APPROXIMATION FOR SCALAR CONSERVATION
LAWS REALIZING BOTH HIGH RESOLUTION AND THE CONVERGENCE TO
ENTROPY SOLUTION (An Analysis from the Viewpoint of Numerical
Viscosity)
Hideaki Aiso 280
15. NON-EXISTENCE OF THIRD ORDER MUSCL SCHEMES UNIFIED
CONSTRUCTION OF ENO SCHEMES AND A NEW DISCONTINUITY
SHARPENING TECHNIQUE — STIFF SOURCE TERM APPROACH
Huamo Wu, Lier Wang, and Geng Sun 300
16. PROBING NUMERICAL FLUXES: MASS FLUX, POSITIVITY, AND
ENTROPY-SATISFYING PROPERTY
Meng-Sing Liou 318

Finite Elements

17.	A FRACTIONAL STEP METHOD FOR THE SOLUTION OF THE COMPRESSIBLE NAVIER-STOKES EQUATIONS R. Codina, M. Vazquez, and O.C. Zienkiewicz	331
18.	COMPRESSIBLE TURBULENT FLOW COMPUTATIONS ON UNSTRUCTURED TRIANGULAR GRIDS M. T. Manzari, K. Morgan, and O. Hassan	348
19.	NEW HYBRID-STREAMLINE-UPWIND FINITE-ELEMENT METHOD IN A DUAL SPACE (Natural Convection at High Rayleigh Numbers) Takahiko Tanahashi and Takafumi Makihara	359

Spectral Methods

20.	KEY TO PROBLEMS IN SPECTRAL METHODS Jian-Ping Wang	369
21.	EFFECTIVENESS OF A SPECTRAL FINITE DIFFERENCE SCHEME Yoshihiro Mochimaru	379
22.	SPECTRAL METHODS FOR THE VORTICITY-STREAMFUNCTION EQUATIONS Roger Peyret	395

Vortex Methods

23.	THREE RESTRICTIONS ON THE VORTEX METHODS Yoshifumi Ogami	418
24.	METHOD OF DISCRETE VORTICES IN AERODYNAMIC PROBLEMS REDUCIBLE TO SINGULAR INTEGRAL EQUATIONS S. M. Belotserkovsky, I. K. Lifanov, and L. N. Poltavsky	438

IIC. Preconditioning and Convergence Acceleration Techniques

25.	REVIEW OF PRECONDITIONING FOR THE COMPRESSIBLE FLUID DYNAMIC EQUATIONS E. Turkel	449
26.	ENHANCED ACCELERATION AND RECONDITIONING TECHNIQUES Yousef Saad	478
27.	MULTILEVEL ELLIPTIC SOLVERS ON UNSTRUCTURED GRIDS Tony F. Chan, Susi Go, and Ludmil Zikatanov	488

28. MULTIGRID METHODS FOR STEADY AND TIME-DEPENDENT FLOW Chaoqun Liu	512
---	-----

IId. Design and Optimization

29. AIRFOIL SHAPE OPTIMIZATION USING THE IMPLICIT FUNCTION THEOREM Yasuyoshi Horibata	536
30. AERODYNAMIC OPTIMIZATION ON UNSTRUCTURED MESHES WITH VISCOUS EFFECTS Jonathan Elliott and Jaime Peraire	542
31. AERODYNAMIC DESIGN OPTIMIZATION USING ADVANCED CFD CODES, AUTOMATIC DIFFERENTIATION AND PARALLEL COMPUTING Amidu Oloso, Arthur C. Taylor, III, and James C. Newman, III	560