Integral methods in science and engineering

Volume two: approximation methods
Contents

Preface

Invited papers

L. Gaul and M. Wagner
A new hybrid symmetric boundary element method in elastodynamics 3

J. Saranen and G. Vainikko
Fast solvers of integral equations on closed curves 12

Contributed papers

J. Aalto
GLS-smoothing with field equations, boundary conditions and material interface conditions 25

J. Aalto and M. Åman
A patch recovery technique for Kirchhoff plates 30

M. Ahues and S. Piskarev
Spectral approximation of weakly singular integral operators. Part one: convergence theory 35

S.M. Bauer
On the stability of spherical shells with imperfections 40

M. Belyi and I. Shirinskaya
Algorithms for the calculation of fundamental solutions of finite element and finite difference equations 45

B. Bertram
Numerical solution of Fredholm integral equations using simple wavelet expansions 50

I.V. Boikov
Optimal algorithms of solution for weakly singular integral equations 54

A. Boikova
Methods for the approximate calculation of the Hadamard integral and solution of integral equations with Hadamard integrals 59

S.N. Chandler-Wilde and B. Zhang
On the solvability and numerical treatment of a class of second kind integral equations on unbounded domains 64

Y.V. Chebrakov and V.V. Shmagin
Some non-traditional approaches to solving a few data analysis problems 69

R. Čiegis
On the accuracy of a posteriori estimates for finite element schemes 74

S.B. Filippov
Application of asymptotic methods for the evaluation of optimal parameters for ring-stiffened cylindrical shells 79
A. Gundar
On some data-flow machine-orientated solution of twin summatory equations with Legendre's associated functions in the kernel ...................................................... 84

J. Hämäläinen and J. Saranen
A collocation method for the single layer heat equation of the first kind .................. 88

M. Hamina
On the numerical solution of a non-linear heat conduction problem .......................... 93

P.J. Harris
A numerical method for determining the Kelvin impulse of a bubble ..................... 99

P. Janele and A. Mioduchowski
Solution of some non-linear elastodynamic problems ........................................... 103

O. Kaleva
On the estimation of spectral power density from irregularly observed data .............. 108

M.L. Kholmyansky
Boundary element method implementation for linear boundary conditions of a general type ................................................................. 114

D.J. Kinney and M.M. Hafez
Implicit coupling of an integral turbulent boundary layer method with a three-dimensional unstructured full potential formulation ...................................................... 119

V.P. Kostov and E.V. Degtiariova-Kostova
Computation of suboptimal paths in a planar motion with bounded derivative of the curvature ................................................................................................. 124

A. Largillier
Spectral approximation of weakly singular integral operators. Part two: a Newton method for the jet printer industry ................................................................. 129

S. Leonhard
An efficient time-domain method for the design and analysis of guided wave problems ................................................................. 134

M.P. Levin
Numerical investigation of integral boundary conditions for the Navier-Stokes equations in vorticity-stream function variables ...................................................... 139

R. Maglione and G. Robotti
Numerical procedure for solving a non-linear N-equation system for determining the three rheological parameters for mud drilling from experimental data 144

H. Mäkiö
A finite volume element method for electromagnetic field computations of RF-resonators ................................................................................................. 150

V.I. Maksimov
Dynamical ill-posed problems for semilinear parabolic equations .......................... 155

A. Matveyeva
On the construction of an approximate solution for a hypersingular integral equation of the second kind ................................................................. 160

A. Mayo
Deferred correction finite difference methods for the evaluation of integrals in potential theory and scattering ................................................................. 165
G. Novati and R. Springhetti
A Galerkin boundary contour method for two-dimensional potential problems 171

F.R. Payne and K.R. Payne
New facets of DFI, a DE solver for all seasons ........................................... 176

A. Pedas
The collocation method for weakly singular integral equations ....................... 181

A. Ringenbach
A new domain decomposition technique with boundary element methods .............. 186

T. Scapolla
Hierarchic high order finite elements for plate and shell problems .................. 191

V. Shutyaev
Iteration methods for evolution data assimilation problems ............................ 196

V. Sizikov
Use of an integral equation for solving special systems of linear-non-linear equa-

tions .................................................................................................................. 200

D. Trif and T. Petrila
An analytic-numerical algorithm for the incompressible Navier-Stokes equa-
tions in complex domains .............................................................................. 206

T. Vasil’eva
Application of Newton’s regularisation method to the solution of an aerody-
namics inverse problem ................................................................................ 210

S.K. Wilson and B.R. Duffy
On lubrication with comparable viscous and inertia forces ................................ 215

N. Yaacob and B.B. Sanugi
A new fifth order four-stage explicit Runge-Kutta method based on the cen-
troidal mean ..................................................................................................... 220

L. Yan, A. Haji-Sheikh and F.R. Payne
Heat transfer under spray cooling in stagnation point flow ............................... 225