

Boundary Elements XXIII

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Book Description

Highly accurate and efficient, the Boundary Element Method (BEM) is now acknowledged as the best computational tool for the solution of certain classes of problems, such as elastodynamics, soil-structure interaction, and fracture mechanics.

Presenting the results of state-of-the-art research from around the world, this book features contributions from the 23rd International Conference on Boundary Element Methods. Almost 50 papers, many by young researchers, are included and these provide indisputable proof of the vitality of current work and of the continuous interest and active involvement of scientists and engineers in the BEM and its engineering applications.

In addition to advanced formulations, computational techniques, and the dual reciprocity method a wide range of applications in fracture mechanics and fatigue, plates and shells, geomechanics, dynamics and vibrations, electrostatics and electromagnetics, fluid flow, optimization, and wave propagation are covered.

Contents

Section 1

Fracture mechanics and fatigue

Interaction between elliptic hole and crack in thin plate under uniform bending heat flux; Boundary integral equations for plane elastic problems posed on orientations of principal stresses and displacements; Instabilised crack growths; Singular integral equations in 3-D elastic problems for thread-like defects.

Section 2

Plates and shells

Boundary element analysis of rib-stiffened elastic plates; Plate analysis using classical or Reissner-Mindlin theories; Integral equation method for conical shell under axisymmetric loads; Green's function for thin plate with elliptic hole under bending heat source.

Section 3

Geomechanics

Coupled modeling of an impact in tunnel face burst; A direct time domain BEM-FEM scheme for soil-structure interaction problems; Semi-analytic subsidence prediction.

Section 4

Dynamics and vibrations

Transient dynamic response of 3-D elastoplastic structures by the D/BEM; Nonlinear dynamic analysis of heterogeneous orthotropic membranes by the analog method; Application of boundary element method in frequency response functions of concrete gravity dams; Structural dynamics using Gaussian mass matrix.

Section 5

Electrostatics and electromagnetics

Indirect linear equation solvers for magnetostatics boundary element formulations; Plane wave coupling to finite length cables buried in a lossy ground; Hybridization of a boundary element method with the finite element method in electromagnetics.

Section 6

Fluid Flow

A field-panel approach for transonic flow calculations about 3D configurations; A boundary element method for time domain analysis of nonlinear fluid sloshing; Time-dependent fundamental solution in Green element calculations of nonlinear unconfined flow; Measuring the properties of multiphase fluid using the BEM; Prediction of radiated noise from a fan over an absorbing surface.

Section 7

Applications in optimization

Genetic algorithm for shape optimization of acoustic scattering bodies; Optimization of an insulating support in three-dimensional gas insulated systems.

Section 8

Dual reciprocity method and basic functions

Towards a mesh-free computation of transport phenomena; Dual reciprocity BEM for free vibration analysis of anisotropic solids; Application of radial basis functions on dual reciprocity BEM for dynamic analysis of pierced shear walls; DRBEM simulation of radionuclide transport near nuclear waste repository; MD-DRM mass conservative interpolation for the solution of non-linear viscous flow problems; **BEM-RBF approach for viscoelastic flow analysis.**

Section 9

Wave propagation problems

A BEM approach to SH-wave motion in a random continuum; Scalar wave propagation in 2-D: a BEM formulation based on the operational quadrature method; 3D wave propagation in the presence of an infinite cylindrical solid submerged in a fluid medium; Boundary element analysis of large amplitude of water motion of incident waves against permeable submerged breakwaters; 3D cross-hole wave scattering via the BEM.

Section 10

Advanced formulations

A meshless local boundary integral equation method in thermoelasticity; Estimation of boundary derivatives by Trefftz method and its application to sloshing phenomenon; Domain decomposition approaches to the boundary element method; An extension of the boundary element method in orthotropic materials for multiply connected regions; Pickup and stripping nuclear reactions by three-dimensional boundary element method.

Section 11

Computational techniques

A simple error indicator and adaptive algorithm for 2D elastic BEM; Gauss quadrature method using wavelet basis as a weighting function for boundary element analysis; Boundary flux reconstruction for narrow band TLC applications; Determination of

optimal threshold for matrix compression in wavelet BEM; Definition of two-dimensional condensation via BEM.