

1. Record Nr.	UNINA9910821005403321
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Titolo	Introduction to finite element analysis : formulation, verification and validation // Barna Szabo, Ivo Babuska
Pubbl/distr/stampa	Chichester, West Sussex, : Wiley, 2011
ISBN	9786613405548 9781283405546 1283405547 9781119993483 1119993482 9781119993827 1119993822 9781119993834 1119993830
Descrizione fisica	1 online resource (384 p.)
Collana	Wiley series in computational mechanics
Classificazione	TEC006000
Altri autori (Persone)	Babuska Ivo
Disciplina	620.001/51825
Soggetti	Finite element method Numerical analysis
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Introduction to FiniteElement Analysis; Contents; About the Authors; Series Preface; Preface; 1 Introduction; 1.1 Numerical simulation; 1.1.1 Conceptualization; 1.1.2 Validation; 1.1.3 Discretization; 1.1.4 Verification; 1.1.5 Decision-making; 1.2 Why is numerical accuracy important?; 1.2.1 Application of design rules; 1.2.2 Formulation of design rules; 1.3 Chapter summary; 2 An outline of the finite element method; 2.1 Mathematical models in one dimension; 2.1.1 The elastic bar; 2.1.2 Conceptualization; 2.1.3 Validation; 2.1.4 The scalar elliptic boundary value problem in one dimension 2.2 Approximate solution2.2.1 Basis functions; 2.3 Generalized formulation in one dimension; 2.3.1 Essential boundary conditions; 2.3.2 Neumann boundary conditions; 2.3.3 Robin boundary conditions; 2.4 Finite element approximations; 2.4.1 Error measures and norms; 2.4.2 The error of approximation in the energy norm; 2.5 FEM in one

dimension; 2.5.1 The standard element; 2.5.1 The standard element; 2.5.2 The standard polynomial space; 2.5.3 Finite element spaces; 2.5.4 Computation of the coefficient matrices; 2.5.5 Computation of the right hand side vector; 2.5.6 Assembly; 2.5.7 Treatment of the essential boundary conditions; 2.5.8 Solution; 2.5.9 Post-solution operations; 2.6 Properties of the generalized formulation; 2.6.1 Uniqueness; 2.6.2 Potential energy; 2.6.3 Error in the energy norm; 2.6.4 Continuity; 2.6.5 Convergence in the energy norm; 2.7 Error estimation based on extrapolation; 2.7.1 The root-mean-square measure of stress; 2.8 Extraction methods; 2.9 Laboratory exercises; 2.10 Chapter summary; 3 Formulation of mathematical models; 3.1 Notation; 3.2 Heat conduction; 3.2.1 The differential equation; 3.2.2 Boundary and initial conditions; 3.2.3 Symmetry, antisymmetry and periodicity; 3.2.4 Dimensional reduction; 3.3 The scalar elliptic boundary value problem; 3.4 Linear elasticity; 3.4.1 The Navier equations; 3.4.2 Boundary and initial conditions; 3.4.3 Symmetry, antisymmetry and periodicity; 3.4.4 Dimensional reduction; 3.5 Incompressible elastic materials; 3.6 Stokes' flow; 3.7 The hierarchic view of mathematical models; 3.8 Chapter summary; 4 Generalized formulations; 4.1 The scalar elliptic problem; 4.1.1 Continuity; 4.1.2 Existence; 4.1.3 Approximation by the finite element method; 4.2 The principle of virtual work; 4.3 Elastostatic problems; 4.3.1 Uniqueness; 4.3.2 The principle of minimum potential energy; 4.4 Elastodynamic models; 4.4.1 Undamped free vibration; 4.5 Incompressible materials; 4.5.1 The saddle point problem; 4.5.2 Poisson's ratio locking; 4.5.3 Solvability; 4.6 Chapter summary; 5 Finite element spaces; 5.1 Standard elements in two dimensions; 5.2 Standard polynomial spaces; 5.2.1 Trunk spaces; 5.2.2 Product spaces; 5.3 Shape functions; 5.3.1 Lagrange shape functions; 5.3.2 Hierarchic shape functions; 5.4 Mapping functions in two dimensions; 5.4.1 Isoparametric mapping; 5.4.2 Mapping by the blending function method

Sommario/riassunto

When using numerical simulation to make a decision, how can its reliability be determined? What are the common pitfalls and mistakes when assessing the trustworthiness of computed information, and how can they be avoided? Whenever numerical simulation is employed in connection with engineering decision-making, there is an implied expectation of reliability: one cannot base decisions on computed information without believing that information is reliable enough to support those decisions. Using mathematical models to show the reliability of computer-generated information is an essential
