Trefftz and Collocation Methods

This book covers a class of numerical methods that are generally referred to as 'Collocation methods'. Different from the Finite Element and the Finite Difference methods, the discretization and approximation of the collocation method is based on a set of unstructured points in space. This 'meshless' feature is attractive because it eliminates the bookkeeping requirements of the 'element' based methods. This text discusses several types of collocation methods including the radial basis function method, the Trefftz method, and the coupled collocation and finite element method. Governing equations investigated include Laplace, Poisson, Helmholtz and biharmonic equations. Regular boundary value problems, boundary value problems with singularity, and Eigenvalue problems are also examined. Rigorous mathematical proofs are contained in these chapters, and many numerical experiments are also provided to support the algorithms and to verify the theory. A tutorial on the applications of these methods is also provided.

Contents:

Part I: Collocation Trefftz method
Basic algorithms and theory; Motz's problem and its variants; Coupling techniques; Biharmonic equations with singularities

Part II: Collocation methods
Collocation methods; Combinations of collocation and finite element methods; Radial basis function collocation methods

Part III: Advanced topics
Combinations with high order FEMs; Eigenvalue problems; The Helmholtz equation; Explicit harmonic solutions of Laplace's equations

Appendix
Historic review of boundary methods

WITPRESS

Email:witpress@witpress.com
www.witpress.com

ISBN 978-1-84564-153-5

9 781845 641535 >

Z-C. Li, T-T. Lu, H-Y. Hu & A. H-D. Cheng

Trefftz and Collocation Methods

WITPRESS

Z-C. Li, T-T. Lu,
H-Y. Hu & A. H-D. Cheng

WITPRESS