Finite Element Programming: 1. Literature

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Finite Element Programming

- Hinton, E. and Owen, D. R. J. Academic Press, London, 1977, 305 pp. ISBN 0-12-349350-1
  - This book describes in detail three finite element codes (BEAM, PLANE and PLATE). The basic aim is to help the reader in the gap between theory and practical programming. In the development of programs, the emphasis has been placed on simplicity, ease of understanding and practicality. Only one type of element is implemented, the parabolic isoparametric element. Equation solving is performed by using the frontal solution technique. The book is directed to readers that are interested to develop own finite element codes

An Introduction to Finite Element Computations

- Hinton, E. and Owen, D. R. J., Pineridge Press, Swansea, 1979, 385 pp., ISBN 0-906674-06-9
  - A basic introduction to the finite element method is presented. 10 computer codes written in FORTRAN, and illustrative examples are included for all applications. This book is written for private study or can be used as a professional reference.
  - Partial contents: introduction to finite elements; matrix theory for bar systems; computer implementation of matrix theory for bar systems, program FRAME; 1D finite elements; advanced 1D finite element concepts, program BEAM; finite elements in 2D, program QUASAR; 2D quasi-harmonic applications; advanced 2D and 3D elements; solid mechanics applications; semi-analytical finite element methods, program STRIP; computational aids and refinements; further study of the finite element method.

An Introduction to the Finite Element Method

- Reddy, J. N., McGraw-Hill Book Co., New York, 1984, 1993, 495 pp., ISBN 0-07-051346-5
  - An introduction to the finite element method is given as a variational-based technique of solving differential equations. This book is directed to senior undergraduate and beginning graduate students in engineering and applied mechanics. It also contains three computer codes (FEM1D, PLATE and FEM2D).
  - Partial contents: introduction; integral formulations and variational methods; finite element analysis of 1-D problems; bending of beams; finite element error analysis; eigenvalue and time-dependent problems; numerical integration and computer implementation; finite element analysis of two-dimensional problems; single variable problems; interpolation functions; numerical integration and modelling considerations; plane elasticity; computer implementation; prelude to advanced topics; FORTRAN listings of subroutines.

Numerical Methods in Finite Element Analysis

- Bathe, K. J. and Wilson, E. L., Prentice-Hall, Englewood Cliffs, 1976, 524 pp., ISBN 0-13-627190-1
  - This book contains three main parts: matrices and linear algebra, the finite element method, and solution of finite element equilibrium equations. Its aim is to provide a tool for teaching upper-level undergraduate and graduate courses in engineering.
  - Partial contents: elementary concept of matrices; matrices and vector spaces; formulation of finite element method; formulation and calculation of isoparametric finite element matrices; variational formulation of the finite element method; implementation of the finite element method; solution of equilibrium equations in static analysis; solution of equilibrium equations in dynamic analysis; analysis of direct integration methods; preliminaries to the solution of eigenproblems; solution methods for eigenproblems; solution of large eigenproblems.

Programming the Finite Element Method

- Smith, I. M. and Griffith, D. V., J. Wiley & Sons, Chichester, 1982, 1988, 1998, 2004, 534 pp., ISBN 0-471-96542-1, 0470849703
  - Programming steps of the finite element method are given as well as listings of various programs (in ALGOL and FORTRAN IV). The last edition of this book has been considerably altered and updated. Less emphasis is on geomechanics, more is given to programming. Listings of special purpose routines are included. These are written as general as possible. Problem-specific main programs are then written using these subroutines. The book is directed to a practical postgraduate course on finite elements or to readers seeking up to apply the finite element method in new application areas.

Concepts and Applications of Finite Element Analysis

- Cook, R. D., J. Wiley & Sons, New York, 1974, 1981, 1989, 2001, 537 pp., ISBN 0471-84788-7, 0-471-03050-3, 0-471-35605-0
  - This book discusses the concepts and applications of finite element analysis with an applied mechanics viewpoint. It is directed to senior engineering students as well as practicing engineers. A number of FORTRAN routines, such as banded-stiffness matrix formulation, static condensation, etc. are included.
  - Partial contents: background and introductory material; the stiffness method and the plane truss; potential energy and the Rayleigh-Ritz method; use of assumed displacement fields; the isoparametric formulation; some modifications of elements;

Finite Element Programs in Structural Engineering and Continuum Mechanics

- Ross, C. T. F., Albion Publishing, Chichester, 1996, ISBN 1-898563-28-4
  - Bridging the gap between theoretical textbooks and the expensive software packages, this handbook covers finite element programming in a wide range of problems in mechanical, civil, aeronautical and electrical engineering. Topics included range from the static analysis of 2D and 3D structures to stress analysis of thick slabs on elastic foundation, and from 2D and 3D vibration analysis problems to 2D field problems including heat transfer and acoustic vibrations. The 24 printouts of FE computer programs, written in QUICK BASIC, are introduced by a preliminary chapter giving useful hints and formulae intended for structural design.

Finite Element Procedures in Engineering Analysis

- Bathe, K. J., Prentice-Hall, Englewood Cliffs, 1982, 735 pp., ISBN 0-13-317305-4
  - The book presents the various aspects of finite element analysis and provides a basis for the understanding of the complete solution problems applied to solid and structural mechanics, heat transfer, fluid flow and other fields of engineering. The primary aim of this book is to provide a tool for teaching finite element procedures to upper-level undergraduate and graduate students in engineering.
  - Partial contents: introduction to the matrix method; some basic concepts in engineering; basic formulation of the finite element method; different types of finite elements; nonlinear analysis in solid and structural mechanics; analysis of heat transfer problems, seepage, torsion and incompressible inviscid fluid flow; various methods of analysis to solve large problems; direct integration method; vector iteration method; solutions of large eigenproblems.

Finite Element Procedures

- Bathe, K. J. , Prentice-Hall, Englewood Cliffs, 1995, 1037 pp. ISBN 0-13-301458-4
  - This book explores the full range of finite element methods used in engineering practice for actual applications in computer-aided-design. It provides an introduction to finite element methods and the commonality in the various techniques as well as explores state-of-the-art methods with a focus on what are deemed to become classical techniques procedures that will be standard and authoritative for finite element analysis for years to come. Elementary concepts and advanced techniques in statics, dynamics, solids, fluids and nonlinear analysis are included. The book also contains worked-out examples and various complete program listings.

Engineering Stress Analysis- A Finite Element Approach With FORTRAN 77 Software

- Fenner, D. N., J. Wiley & Sons, Chichester, 1987, 250 pp.ISBN 07458-0246-X, 0-470-20895-3
  - This book gives an introduction to the finite element method and its practical implementation with FORTRAN 77 language. Two programs are presented: FIESTA1 and FIESTA2, 1D and 2D stress analysis codes, respectively. The book is directed to students in the field of mechanical, civil and aeronautical engineering.
  - Partial contents: analysis of stress and strain; material behavior; formulation of stress analysis; finite element concepts; various topics- the principle of virtual work, minimum of potential energy, energy bounds in the displacement method; practical aspects of the program FIESTA2 for 2D stress analysis; analysis of plane frames; plane elasticity applications; theoretical element formulation aspects; axisymmetric problems; theory and implementation of the torsion elastic shafts.

Object Oriented Methods and Finite Element Analysis

- Mackie, R. I., Saxe-Coburg Publ., Edinburgh, 2000, 250 pp., ISBN 1-874-672-08-3
  - This book presents the advantages of object oriented programming for finite element software development. It explains the overall design philosophy as well as provides the reader with detailed programming information. The OO approach to finite element programming requires a radically different approach to traditional finite element programming. The differences are highlighted and the advantages of the OO approach are demonstrated. Sufficient detailed programming information is included to help the program developer to implement his/her own OO code or adapt the ideas presented in the book. The book is intended for researchers and postgraduate students working in the field of finite element technology. It is accompanied by a voucher for a complementary software disc containing the source code described in the book.