

Liu, Gui-Rong

Mesh free methods. Moving beyond the finite element method. (English) Zbl 1031.74001
Boca Raton, FL: CRC Press. xviii, 692 p. (2003).

The mesh free (MFree) method is a very new area of research. There exist many problems that offer ample opportunities for research to develop the next generation of numerical methods. The title method is also in a rapidly developing and growing stage. Different techniques are developed every day. This book addresses some of the current important issues, both positive and negative, related to MFree methods, which should prove beneficial to researchers, engineers, and students who are interested in venturing into this area of research. This book provides systematic steps that lead the reader to understand mesh free methods; how they work; how to use and develop a mesh free method, as well as the book presents the problems associated with element free methods.

This book covers the following types of problems: mechanics of solids (2D solids); mechanics of structures (beams, plates, and shells); fluid mechanics (fluid flow, convection flow, and hydrodynamics). The bulk of the material in the book is the result of intensive research work by the author and his research team in the past 6 years. Works of other researchers are also introduced.

The significance of this book is as follows:

1. This is the first book published that comprehensively covers MFree methods.
2. The book covers, in a systematic manner, basic theories, principles, techniques, and procedures in solving mechanics problems using MFree methods. It will be very useful for researchers entering this new area of research, and for professionals and engineers developing computer codes for the next generation of computational mechanics.
3. Readers will benefit from the research outcome of G.-R. Liu's research team and their work on an award-winning project on MFree methods founded by the Singapore government. Many materials in this book are the results of ongoing projects, and have not been previously published.
4. A software package named *MFree2D* with its own pre- and postprocessors, which has been developed by the author's team, is also introduced.
5. A large number of examples with illustrations are provided for validating, benchmarking, and demonstrating MFree methods. These examples can be useful reference materials for other researchers.

The book is written for senior university students, graduate students, researchers, and professionals in engineering and science. Mechanical engineers and practitioners and structural engineers and practitioners will also find the book useful. Knowledge of FEM is not required but would help a great deal in understanding many concepts and procedures of MFree methods. Basic knowledge of mechanics is also helpful in reading this book smoothly. A very brief introduction to mechanics is provided to prepare readers who are not familiar with the basics of mechanics.

Reviewer: [Leonid B.Chubarov \(Novosibirsk\)](#)

MSC:

- [74-02](#) Research exposition (monographs, survey articles) pertaining to mechanics of deformable solids
- [65N30](#) Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
- [76Mxx](#) Basic methods in fluid mechanics
- [74Sxx](#) Numerical and other methods in solid mechanics
- [76-02](#) Research exposition (monographs, survey articles) pertaining to fluid mechanics

Cited in 1 Review Cited in 141 Documents

Keywords:

[Computational mechanics](#); [mesh free method](#); [mechanics of solids](#); [mechanics of structures](#); [fluid mechanics](#)

Software:

Mfree2D