Meshfree and Particle Methods
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DESCRIPTION

Provides thorough coverage of essential concepts and state-of-the-art developments in the field

_Meshfree and Particle Methods_ is the first book of its kind to combine comprehensive, up-to-date information on the fundamental theories and applications of meshfree methods with systematic guidance on practical coding implementation. Broad in scope and content, this unique volume provides readers with the knowledge necessary to perform research and solve challenging problems in nearly all fields of science and engineering using meshfree computational techniques.

The authors provide detailed descriptions of essential issues in meshfree methods, as well as specific techniques to address them, while discussing a wide range of subjects and use cases. Topics include approximations in meshfree methods, nonlinear meshfree methods, essential boundary condition enforcement, quadrature in meshfree methods, strong form collocation methods, and more. Throughout the book, topics are integrated with descriptions of computer implementation and an open-source code (with a dedicated chapter for users) to illustrate the connection between the formulations discussed in the text and their real-world implementation and application. This authoritative resource:

- Explains the fundamentals of meshfree methods, their constructions, and their unique capabilities as compared to traditional methods
- Features an overview of the open-source meshfree code RKPM2D, including code and numerical examples
- Describes all the variational concepts required to solve scientific and engineering problems using meshfree methods such as Nitsche’s method and the Lagrange multiplier method
• Includes comprehensive reviews of essential boundary condition enforcement, quadrature in meshfree methods, and nonlinear aspects of meshfree analysis

• Discusses other Galerkin meshfree methods, strong form meshfree methods, and their comparisons

Meshfree and Particle Methods: Fundamentals and Applications is the perfect introduction to meshfree methods for upper-level students in advanced numerical analysis courses, and is an invaluable reference for professionals in mechanical, aerospace, civil, and structural engineering, and related fields, who want to understand and apply these concepts directly, or effectively use commercial and other production meshfree and particle codes in their work.

🔥 ABOUT THE AUTHOR

Ted Belytschko, the former Walter P Murphy and McCormick Institute Professor of Northwestern University, is one of the world’s most renowned researchers in computational mechanics and meshfree methods. He is the originator of the Element-Free Galerkin (EFG) Methods, and his paper Element-Free Galerkin Methods published in 1994 remains the most widely cited paper on the subject.

J. S. Chen is Distinguished Professor and William Prager Chair Professor in the Department of Structural Engineering & Department of Mechanical and Aerospace Engineering at The University of California, San Diego. His research interests are in computational solid mechanics and multiscale materials modeling, with focus on meshfree methods and advanced finite element methods.

Michael Hillman a Principal Scientist at Karagozian and Case Inc., and the former L. Robert and Mary L. Kimball Professor and Associate Professor of Civil Engineering at The Pennsylvania State University. His research interests are in computational solid mechanics, fundamental advancement of meshfree methods, and enhanced and novel meshfree methods.

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