

Erdogan Madenci · Erkan Oterkus

Peridynamic Theory and Its Applications

 Springer

Peridynamic Theory And Its Applications

Walter Herbert Gerstle



Peridynamic Theory And Its Applications:

Peridynamic Theory and Its Applications Erdogan Madenci, Erkan Oterkus, 2013-10-21 This book presents the peridynamic theory which provides the capability for improved modeling of progressive failure in materials and structures and paves the way for addressing multi physics and multi scale problems The book provides students and researchers with a theoretical and practical knowledge of the peridynamic theory and the skills required to analyze engineering problems The text may be used in courses such as Multi physics and Multi scale Analysis Nonlocal Computational Mechanics and Computational Damage Prediction Sample algorithms for the solution of benchmark problems are available so that the reader can modify these algorithms and develop their own solution algorithms for specific problems Students and researchers will find this book an essential and invaluable reference on the topic

Peridynamics and Its Applications Using Ansys

Erdogan Madenci, Sundaram Vinod Kumar Anicod, Yanan Zhang, 2024-07-24 This book introduces a unified implementation of bond and state based peridynamic theory PD within a commercial finite element framework Ansys utilizing its native elements It details the implementation of the PD theory and its integration with traditional finite elements The primary objective is to equip students researchers and practicing engineers with both theoretical and practical knowledge of the PD theory along with the skills necessary for analyzing engineering problems using Ansys The book demonstrates that unlike the conventional finite element method FEM the PD theory is highly suitable for progressive failure analysis the multi scale analysis of materials involving fracture and failure and multi physics analysis including electromigration corrosion and electrodeposition Additionally it provides a step by step illustration of the specific procedures in the pre processing solution and post processing phases of the analysis through the Graphical User Interface GUI for various applications The book is designed to be introductory and self contained minimizing the need for additional reference material

Advances in Peridynamics Erdogan Madenci, Pranesh Roy, Deepak Behera, 2022-05-20 This book presents recent improvements in peridynamic modeling of structures It provides sufficient theory and numerical implementation helpful to both new and existing researchers in the field The main focus of the book is on the non ordinary state based NOSB peridynamics PD and its applications for performing finite deformation It presents the framework for modeling high stretch polymers viscoelastic materials thermoelasticity plasticity and creep It provides a systematic derivation for dimensionally reduced structures such as axisymmetric structures and beams Also it presents a novel approach to impose boundary conditions without suffering from displacement kinks near the boundary Furthermore it presents refinements to bond based PD model by including rotation kinematics for modeling isotropic and composite materials Moreover it presents a PD FEM coupling framework in ANSYS based on principle for virtual work Lastly it presents an application of neural networks in the peridynamic PINN framework Sample codes are provided for readers to develop hands on experience on peridynamic modeling Describes new developments in peridynamics and their applications in the presence of material and geometric nonlinearity Describes an

approach to seamlessly couple PD with FE Introduces the use of the neural network in the PD framework to solve engineering problems Provides theory and numerical examples for researchers and students to self study and apply in their research Codes are provided as supplementary material Provides theoretical development and numerical examples suitable for graduate courses

Marine Structures Erkan Oterkus, 2020-01-31 Structural mechanics is an important field of engineering The main goal of structural mechanics is to ensure that structures are safe and durable so that catastrophic situations can be prevented which can otherwise cause loss of life environmental pollution and financial losses Depending on the uses of the structure and the conditions that the structure is subjected to special treatment may be required for the analysis Specifically marine structures are subjected to harsh environmental conditions due to the marine environment which can cause several different damage mechanisms including fatigue and corrosion This book on Marine structures considers a wide range of areas related to marine structures and provides a compilation of numerical and experimental studies related to Marine structures research

Fracture and Fatigue Assessments of Structural Components Alberto Campagnolo, 2020-12-04 In dealing with fracture and fatigue assessments of structural components different approaches have been proposed in the literature They are usually divided into three subgroups according to stress based strain based and energy based criteria Typical applications include both linear elastic and elastoplastic materials and plain and notched or cracked components under both static and fatigue loadings The aim of this Special Issue is to provide an update to the state of the art on these approaches The topics addressed in this Special Issue are applications from nano to full scale complex and real structures and recent advanced criteria for fracture and fatigue predictions under complex loading conditions such as multiaxial constant and variable amplitude fatigue loadings

Topics in Modal Analysis & Testing, Volume 9 Michael Mains, Brandon J. Dilworth, 2025-08-07 Topics in Modal Analysis Testing Volume 9 Proceedings of the 36th IMAC A Conference and Exposition on Structural Dynamics 2018 the ninth volume of nine from the Conference brings together contributions to this important area of research and engineering The collection presents early findings and case studies on fundamental and applied aspects of Modal Analysis including papers on Operational Modal Modal Analysis Applications Experimental Techniques Modal Analysis Measurements Parameter Estimation Modal Vectors Modeling Basics of Modal Analysis Additive Manufacturing Modal Testing of Printed Parts

Innovations in the Analysis and Design of Marine Structures Yordan Garbatov, C. Guedes Soares, 2025-05-09 Innovations in the Analysis and Design of Marine Structures is a collection of papers presented at MARSTRUCT 2025 the 10th International Conference on Marine Structures MARSTRUCT 2025 Lisbon Portugal 20-22 May 2025 The contributions cover a wide range of topics including Loads and load effects Strength assessment Experimental analysis of structures Materials and fabrication of structures Structural design and optimization Structural reliability and safety Innovations in the Analysis and Design of Marine Structures is essential reading for academics engineers and professionals involved in the design of marine and offshore structures The Proceedings in

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Computational and Experimental Simulations in Engineering Shaofan Li, 2023-11-30 This book gathers the latest advances innovations and applications in the field of computational engineering as presented by leading international researchers and engineers at the 29th International Conference on Computational bioengineering geotechnical engineering offshore multi scale structural integrity materials design and computer modeling methods in engineering The contributions which were selected by means of a rigorous international peer review process highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaborations

Handbook of Peridynamic Modeling Florin Bobaru, John T. Foster, Philippe H Geubelle, Stewart A. Silling, 2016-11-03 This handbook covers the peridynamic modeling of failure and damage Peridynamics is a reformulation of continuum mechanics based on integration of interactions rather than spatial differentiation of displacements The book extends the classical theory of continuum mechanics to allow unguided modeling of crack propagation fracture in brittle quasi brittle and ductile materials autonomous transition from continuous damage fragmentation to fracture modeling of long range forces within a continuous body and multiscale coupling in a consistent mathematical framework

Introduction To Practical Peridynamics: Computational Solid Mechanics Without Stress And Strain Walter Herbert Gerstle, 2015-07-23 Parting with the classical continuum concepts of stress and strain in the computational simulation of solids this book proposes a peridynamic model that applies the model directly to particle lattices The model is directly solvable on a computer Introduction to Practical Peridynamics is both a graduate level textbook and a treatise The text provides the necessary foundations to understand and apply the state based peridynamic lattice model as well as a guide for the practical use of the model for solving realistic structural engineering problems particularly in reinforced concrete structures in elasticity plasticity damage fracture and large deformations Contents in this book include introductory chapters presenting the historical background of the subject classical elasticity computational solid modeling continuum mechanics fracture mechanics particle dynamics simulations on parallel computers as well as example simulations

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