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Abstract: The purpose of this chapter is to describe how one can implement the state-based peridynamic lattice model (SPLM) either on a single processor (a laptop or desktop computer) or on many processors running in parallel using the MPI (Message Passing Interface) protocol. The molecular dynamics research community has led the way in developing methods for simulating particle dynamics on massively parallel computers....

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A ductile fracture of an Al-Mg-Si alloy. A fracture is a mathematical singularity to which the classical equations of continuum mechanics cannot be applied directly - Peridynamics offers a numerical method. Peridynamics is a formulation of continuum mechanics

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Bookmark File PDF Introduction To Practical Peridynamics Computational 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 (with model applications). Request Inspection Copy

This dictionary offers clear and reliable explanations of over 100 keywords covering the entire field of non-classical continuum mechanics and generalized

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This textbook demonstrates the application of the finite element philosophy to the solution of real-world problems and is aimed at graduate level students, but is

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also suitable for advanced undergraduate students. An essential part of an engineer ' s training is the development of the skills necessary to analyse and predict the behaviour of engineering systems under a wide range of potentially complex loading conditions. Only a small proportion of real-life problems can be solved analytically, and consequently, there arises the need to be able to use numerical methods capable of simulating real phenomena accurately. The finite element (FE) method is one such widely used numerical method. Finite Element Applications begins with demystifying the ' black box ' of finite element solvers and progresses to addressing the different pillars that make up a robust finite element solution

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The book presents a set of novel, efficient and systematic concurrent multiscale optimization methods by considering the distribution of the material in macro-scale and the unit-cell configuration design in micro-scale simultaneously. Different from the traditional optimization method that is performed in a single scale, the proposed methods could generate a great deal of

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improvements in structural performance through the multiscale structure-material concurrent optimum design. The proposed theory and methods are related to statics, dynamics, thermoelastics and the coupling of different physical fields. Therefore, it provides a comprehensive designing scheme when multiple factors are taken into account. For example, the designing scheme can have a great significance on enhancing the structural performances under coupled multi-physical fields, such as load bearing capacity, vibration resistance ability, and safety under thermal stress and so on. Several numerical examples are highlighted in this unique volume based on practical engineering applications. The examples collectively demonstrate

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drastically improved designs featuring excellent unit-cell configuration and highly regular macroscale material distribution in a variety of industrial applications.

This comprehensive volume presents a unified framework of continuum theories. It indicates that (i) microcontinuum theories (micromorphic and micropolar theories) are natural extension of classical continuum mechanics, and (ii) classical continuum mechanics is a special case of microcontinuum theories when the deformable material point is idealized as a single mathematical point. The kinematics and basic laws are rigorously derived. Based on axiomatic approach,

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This book presents cutting-edge concepts, paradigms, and research highlights in the field of computational materials science and engineering, and provides a fresh, up-to-date perspective on solving present and future materials challenges. The chapters are written by not only pioneers in the fields of computational materials chemistry and materials science, but also experts in multi-scale modeling and simulation as applied to materials engineering. Pedagogical

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introductions to the different topics and continuity between the chapters are provided to ensure the appeal to a broad audience and to address the applicability of integrated computational materials science and engineering for solving real-world problems.

Studies of complexity, singularity, and anomaly using nonlocal continuum models are steadily gaining popularity. This monograph provides an introduction to basic analytical, computational, and modeling issues and to some of the latest developments in these areas. Nonlocal Modeling, Analysis, and Computation includes motivational examples of nonlocal models, basic building blocks of nonlocal vector calculus, elements of

Bookmark File PDF Introduction To Practical Peridynamics Computational theory for well-posedness and nonlocal spaces, connections to and coupling with local models, convergence and compatibility of numerical approximations, and various applications, such as nonlocal dynamics of anomalous diffusion and nonlocal peridynamic models of elasticity and fracture mechanics. A particular focus is on nonlocal systems with a finite range of interaction to illustrate their connection to local partial differential equations and fractional PDEs. These models are designed to represent nonlocal interactions explicitly and to remain valid for complex systems involving possible singular solutions and they have the potential to be alternatives for as well as bridges to existing models. The author

Bookmark File PDF Introduction To Practical Peridynamics Computational Solid Mechanics Without Stress And Strain Frontiers Research In Computation And Mechanics Of Materials And Biology discusses ongoing studies of nonlocal models to encourage the discovery of new mathematical theory for nonlocal continuum models and offer new perspectives on traditional models, analytical techniques, and algorithms.

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

Bookmark File PDF Introduction To Practical Peridynamics Computational Solid Mechanics Without Stress And Strain Frontier Research In Computation And Mechanics Of Materials And Biology continuous damage/fragmentation to fracture; modeling of long-range forces within a continuous body; and multiscale coupling in a consistent mathematical framework.

This book provides readers with an incisive look at cutting-edge peridynamic modeling methods, numerical techniques, their applications, and potential future directions for the field. It starts with an introductory chapter authored by Stewart Silling, who originally developed peridynamics. It then looks at new concepts in the field, with chapters covering dual-horizon peridynamics, peridynamics for axisymmetric analysis, beam and plate models in peridynamics, coupled

Bookmark File PDF Introduction To Practical Peridynamics Computational peridynamics and XFEM, peridynamics for dynamic fracture modeling, and more. From there, it segues into coverage of cutting-edge applications of peridynamics, exploring its biological applications, modeling at the nanoscale, peridynamics for composites delamination and damage in ceramics, and more, concluding with a chapter on the application of artificial intelligence and machine learning in peridynamics. Covers modeling methods, numerical techniques, applications, and future directions for the field Discusses techniques such as dual-horizon peridynamics, damage modeling using the phase-field approach, and contact analysis of rigid and deformable bodies with refined non-ordinary state-based peridynamics Looks at a range of different

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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

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