The Configuration Space Method For Kinematic Desig

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Mathematical Methods in Quantum Mechanics Springer Nature
THIS BOOK HAS SIX TUTORIALS AND REVIEWS WRITTEN BY INVITED EXPERTS. FIVE CHAPTERS TEACH TOPICS IN QUANTUM MECHANICS AND MOLECULAR SIMULATIONS. THE SIXTH CHAPTER EXPLAINS HOW PROGRAMS FOR CHEMICAL STRUCTURE DRAWING WORK. AN EDITORIAL DISCUSSES SOME OF THE MOST WELL-KNOWN PERSONAGES IN COMPUTATIONAL CHEMISTRY. FROM REVIEWS OF THE SERIES "Anyone who is doing or intends to do computational research on molecular structure and design should seriously consider purchasing this book for his or her personal library."-JOURNAL OF COMPUTATIONAL CHEMISTRY. "These reviews are becoming regarded as the standard reference among both specialists and novices in the expanding field of computational chemistry." -JOURNAL OF MOLECULAR GRAPHICS AND MODELLING. "[This book is] written for newcomers learning about molecular modeling techniques as well as for seasoned professionals who need to acquire expertise in areas outside their own."-JOURNAL OF CHEMICAL INFORMATION AND COMPUTER SCIENCE.
Computer Modelling of Fluids Polymers and Solids Springer Science & Business Media
Suitable for advanced undergraduate and graduate students, this new textbook contains an introduction to the mathematical concepts used in physics and engineering. The entire book is unique in that it draws upon applications from physics, rather than mathematical examples, to ensure students are fully equipped with the tools they need. This approach prepares the reader for advanced topics, such as quantum mechanics and general relativity, while offering examples, problems, and insights into classical physics. The book is also distinctive in the coverage it devotes to modelling, and to oft-neglected topics such as Green's functions.
Reviews in Computational Chemistry Springer
Computer Modelling techniques have developed very rapidly during the last decade, and interact with many contemporary scientific disciplines. One of the areas of greatest activity has concerned the modelling of condensed phases, including liquids solids and amorphous systems, where simulations have been used to provide insight into basic physical processes and in more recent years to make reliable predictions of the properties of the systems simulated. Indeed the predictive role of simulations is increasingly recognised both in academic and industrial contexts. Current active areas of application include topics as diverse as the viscosity of liquids, the conformation of proteins, the behaviour of hydrogen in metals, the diffusion of molecules in porous catalysts and the properties of micelles. This book, which is based on a NATO ASI held at the University of Bath, UK, from September 5th-17th, 1988, aims to give a general survey of this field, with detailed discussions both of methodologies and of applications. The earlier chapters of the book are devoted mainly to techniques and the later ones to recent simulation studies of fluids, polymers (including biological molecules) and solids. Special attention is paid to the role of interatomic potentials which are the fundamental physical input to simulations. In addition, developments in computer hardware are considered in depth, owing to the crucial role which such developments are playing in the expansion of the horizons of computer modelling studies.
The Configuration Space Method for Kinematic Design of Mechanisms Oxford University Press, USA
This book is the first work dedicated to the Bees Algorithm. Following a gentle introduction to the main ideas underpinning the algorithm, the book presents recent results and developments relating to the algorithm and its application to optimisation problems in production and manufacturing. With the advent of the Fourth Industrial Revolution, production and manufacturing processes and systems have become more complex. To obtain the best performance from them requires efficient and effective optimisation techniques that do not depend on the availability of process or system models. Such models are usually either not obtainable or mathematically intractable due to the high degrees of nonlinearities and uncertainties in the processes and systems to be represented. The Bees Algorithm is a powerful swarm-based intelligent optimisation metaheuristic inspired by the foraging behaviour of honeybees. The algorithm is conceptually elegant and extremely easy to apply. All it needs to solve an optimisation problem is a means to evaluate the quality of potential solutions. This book demonstrates the simplicity, effectiveness and versatility of the algorithm and encourages its further adoption by engineers and researchers across the world to realise smart and sustainable manufacturing and production in the age of Industry 4.0 and beyond.
Proceedings of the National Seminar on Applied Systems Engineering and Soft Computing John Wiley & Sons
A novel algorithmic approach to mechanism design based on a geometric representation of kinematic function called configuration space partitions. This book presents the configuration space method for computer-aided design of mechanisms with changing part contacts. Configuration space is a complete and compact geometric representation of part motions and part interactions that supports the core mechanism design tasks of analysis, synthesis, and tolerancing. It is the first general algorithmic treatment of the kinematics of higher pairs with changing contacts. It will help designers detect and correct design flaws and unexpected kinematic behaviors, as demonstrated in the book's four case studies taken from industry. After presenting the configuration space framework and algorithms for mechanism kinematics, the authors describe algorithms for kinematic analysis, tolerancing, and synthesis based on configuration spaces. The case studies follow, illustrating the application of the configuration space method to the analysis and design of automotive, micro-mechanical, and optical mechanisms. Appendixes offer a catalog of higher-pair mechanisms and a description of HIPAIR, an open source C++ mechanical design system that implements some of the configuration space methods described in the book, including configuration space visualization and kinematic simulation. HIPAIR comes with an interactive graphical user interface and many sample mechanism input files. The Configuration Space Method for Kinematic Design of Mechanisms will be a valuable resource for students, researchers, and engineers in mechanical engineering, computer science, and robotics.
Mathematical Methods for Physics and Engineering Springer Nature
Since Lord Rayleigh introduced the idea of viscous damping in his classic work "The Theory of Sound" in 1877, it has become standard practice to use this approach in dynamics, covering a wide range of applications from aerospace to civil engineering. However, in the majority of practical cases this approach is adopted more for mathematical convenience than for modeling the physics of vibration damping. Over the past decade, extensive research has been undertaken on more general "non-viscous" damping models and vibration of non-viscously damped systems. This book, along with a related book Structural Dynamic Analysis with Generalized Damping Models: Identification, is the first comprehensive study to cover vibration problems with general non-viscous damping. The author draws on his considerable research experience to produce a text covering: dynamics of viscously damped systems; non-viscously damped single- and multi-degree of freedom systems; linear systems with non-local and non-viscous damping; reduced computational methods for damped systems; and finally a method for dealing with general asymmetric systems. The book is written from a vibration theory standpoint, with numerous worked examples which are relevant across a wide range of mechanical, aerospace and structural engineering applications. Contents 1. Introduction to Damping Models and Analysis Methods. 2. Dynamics of Undamped and Viscously Damped Systems. 3. Non-Viscously Damped Single-Degree-of-Freedom Systems. 4. Non-viscously Damped Multiple-Degree-of-Freedom Systems. 5. Linear Systems with General Non-Viscous Damping. 6. Reduced Computational Methods for Damped Systems
Robot Motion Planning Cambridge University Press

Autonomous robot vehicles are vehicles capable of intelligent motion and action without requiring either a guide or teleoperator control. The recent surge of interest in this subject will grow even grow further as their potential applications increase. Autonomous vehicles are currently being studied for use as reconnaissance/exploratory vehicles for planetary exploration, undersea, land and air environments, remote repair and maintenance, material handling systems for offices and factories, and even intelligent wheelchairs for the disabled. This reference is the first to deal directly with the unique and fundamental problems and recent progress associated with autonomous vehicles. The editors have assembled and combined significant material from a multitude of sources, and, in effect, now conviniently provide a coherent organization to a previously scattered and ill-defined field.

Applied Many-Body Methods in Spectroscopy and Electronic Structure Elsevier

Quantum mechanics and the theory of operators on Hilbert space have been deeply linked since their beginnings in the early twentieth century. States of a quantum system correspond to certain elements of the configuration space and observables correspond to certain operators on the space. This book is a brief, but self-contained, introduction to the mathematical methods of quantum mechanics, with a view towards applications to Schrodinger operators. Part 1 of the book is a concise introduction to the spectral theory of unbounded operators. Only those topics that will be needed for later applications are covered. The spectral theorem is a central topic in this approach and is introduced at an early stage. Part 2 starts with the free Schrodinger equation and computes the free resolvent and time evolution. Position, momentum, and angular momentum are discussed via algebraic methods. Various mathematical methods are developed, which are then used to compute the spectrum of the hydrogen atom. Further topics include the nondegeneracy of the ground state, spectra of atoms, and scattering theory. This book serves as a self-contained introduction to spectral theory of unbounded operators in Hilbert space with full proofs and minimal prerequisites: Only a solid knowledge of advanced calculus and a one-semester introduction to complex analysis are required. In particular, no functional analysis and no Lebesgue integration theory are assumed. It develops the mathematical tools necessary to prove some key results in nonrelativistic quantum mechanics. Mathematical Methods in Quantum Mechanics is intended for beginning graduate students in both mathematics and physics and provides a solid foundation for reading more advanced books and current research literature. It is well suited for self-study and includes numerous exercises (many with hints).

Robotics John Wiley & Sons

Here is a comprehensive presentation of methodology for the design and synthesis of an intelligent complex robotic system, connecting formal tools from discrete system theory, artificial intelligence, neural network, and fuzzy logic. The necessary methods for solving real time action planning, coordination and control problems are described. A notable chapter presents a new approach to intelligent robotic agent control acting in a realworld environment based on a lifelong learning approach combining cognitive and reactive capabilities. Another key feature is the homogeneous description of all solutions and methods based on system theory formalism.

Geometric and Topological Methods for Quantum Field Theory Springer Science & Business Media

With applications in mind, this self-contained monograph provides a coherent and thorough treatment of the configuration spaces of Euclidean spaces and spheres, making the subject accessible to researchers and graduates with a minimal background in classical homotopy theory and algebraic topology.

Metalearning John Wiley & Sons

This book contains a collection of articles summarizing the state of knowledge in a large portion of modern homotopy theory. A call for articles was made on the occasion of an emphasis semester organized by the Centre de Recerca Matemtica in Bellaterra (Barcelona) in 1998. The main topics treated in the book include abstract features of stable and unstable homotopy, homotopical localizations, p-compact groups, H-spaces, classifying spaces for proper actions, cohomology of discrete groups, K-theory and other generalized cohomology theories, configuration spaces, and Lusternik-Schnirelmann category. The book is addressed to all mathematicians interested in homotopy theory and in geometric aspects of group theory. New research directions in topology are highlighted. Moreover, this informative and educational book serves as a welcome reference for many new results and recent methods.

Modern Robotics American Mathematical Soc.

This volume deals with core problems in robotics, like motion planning, sensor-based planning, manipulation, and assembly planning. It also discusses the application of robotics algorithms in other domains, such as molecular modeling, computer graphics, and image analysis. Topics Include: - Planning - Sensor Based Motion Planning - Control and Moti

Planning Algorithms Springer Science & Business Media

There has been a steady advance of the atomic and molecular many-body methodology over the last few years, with a concomitant development of versatile computer codes. Understanding and interpretation of electronic structural features and the associated spectroscopic properties via many-body techniques are becoming competitive with those obtained with the traditional formalisms. Since the many-body techniques are not yet a part of the repertoire of the "black-box tools" of electronic structure and spectroscopy, it seems worthwhile to take stock now of the recent progress in certain selected areas. The present volume is more in the nature of proceedings of a "Paper Symposium," rather than of one which actually took place. We did organize in Calcutta, between December 10 and 12, 1990, a small meeting on Applied Many-Body Methods to Spectroscopy and Electronic Structure, jointly organized by the Indian Association for the Cultivation of Science and the S.N. Bose National Centre for Basic Sciences. Several leading practitioners were invited, among which some could not come for various reasons.

Topology and Robotics Springer Science & Business Media

The classical story - of the hypergeometric functions, the configuration space of 4 points on the projective line, elliptic curves, elliptic modular functions and the theta functions - now evolves, in this book, to the story of hypergeometric funktions in 4 variables, the configuration space of 6 points in the projective plane, K3 surfaces, theta functions in 4 variables. This modern theory has been established by the author and his collaborators in the 1990's; further development to different aspects is expected. It leads the reader to a fascinating 4-dimensional world. The author tells the story casually and visually in a plain language, starting form elementary level such as equivalence relations, the exponential function, ... Undergraduate students should be able to enjoy the text.

The Complexity of Robot Motion Planning Springer

This is the first book presenting a broad overview of parallelism in constraint-based reasoning formalisms. In recent years, an increasing number of contributions have been made on scaling constraint reasoning thanks to parallel architectures. The goal in this book is to overview these achievements in a concise way, assuming the reader is familiar with the classical, sequential background. It presents work demonstrating the use of multiple resources from single machine multi-core and GPU-based computations to very large scale distributed execution platforms up to 80,000 processing units. The contributions in the book cover the most important and recent contributions in parallel propositional satisfiability (SAT), maximum satisfiability (MaxSAT), quantified Boolean formulas (QBF), satisfiability modulo theory (SMT), theorem proving (TP), answer set programming (ASP), mixed integer linear programming (MILP), constraint programming (CP), stochastic local search (SLS), optimal path finding with A*, model checking for linear-time temporal logic (MC/LTL), binary decision diagrams (BDD), and model-based diagnosis (MBD). The book is suitable for researchers, graduate students, advanced undergraduates, and practitioners who wish to learn about the state of the art in parallel constraint reasoning.

Hypergeometric Functions, My Love Elsevier

One of the ultimate goals in robotics is the creation of autonomous robots. Such robots will accept high-level descriptions of tasks and will execute them without further human intervention. The input descriptions will specify what the user wants dome rather than how to do it. This book discusses a central problem in the development of autonomous robots. Motion planning, the central theme of this book, can be loosely defined as follows: how can a robot decide what motions to perform in order to achieve as a goal the arrangement of physical objects? This capability is eminently necessary since, by definition, a robot accomplishes tasks by moving in the real world. The minimum one would expect from an autonomous robot is the ability to plan its own motions.

Intelligent Production and Manufacturing Optimisation—The Bees Algorithm Approach Wolters Kluwer

Algorithms that control the computational processes relating sensors and actuators are indispensable for robot navigation and the perception of the world in which they move. Therefore, a deep understanding of how algorithms work to achieve this control is essential for the development of efficient and usable robots in a broad field of applications.

Geometry and Topology of Configuration Spaces Springer Science & Business Media

This book constructs the mathematical apparatus of classical mechanics from the beginning, examining basic problems in dynamics like the theory of oscillations and the Hamiltonian formalism. The author emphasizes geometrical considerations and includes phase spaces and flows, vector fields, and Lie groups. Discussion includes qualitative methods of the theory of dynamical systems and of asymptotic methods like averaging and adiabatic invariance.

Cohomological Methods in Homotopy Theory American Mathematical Soc.

A modern and unified treatment of the mechanics, planning, and control of robots, suitable for a first course in robotics.

Lectures on The Many-Body Problems CRC Press

This open access book as one of the fastest-growing areas of research in machine learning, metalearning studies principled methods to obtain efficient models and solutions by adapting machine learning and data mining processes. This adaptation usually exploits information from past experience on other tasks and the adaptive processes can involve machine learning approaches. As a related area to metalearning and a hot topic currently, automated machine learning (AutoML) is concerned with automating the machine learning processes. Metalearning and AutoML can help AI learn to control the application of different learning methods and acquire new solutions faster without unnecessary interventions from the user. This book offers a comprehensive and thorough introduction to almost all aspects of metalearning and AutoML, covering the basic concepts and architecture, evaluation, datasets, hyperparameter optimization, ensembles and workflows, and also how this knowledge can be used to select, combine, compose, adapt and configure both algorithms and models to yield faster and better solutions to data mining and data science problems. It can thus help developers to develop systems that can improve themselves through experience. This book is a substantial update of the first edition published in 2009. It includes 18 chapters, more than twice as much as the previous version. This enabled the authors to cover the most relevant topics in more depth and incorporate the overview of recent research in the respective area. The book will be of interest to researchers and graduate students in the areas of machine learning, data mining, data science and artificial intelligence.