

Planning Algorithms Motion Planning

Right here, we have countless books **Planning Algorithms Motion Planning** and collections to check out. We additionally offer variant types and with type of the books to browse. The normal book, fiction, history, novel, scientific research, as capably as various new sorts of books are readily open here.

As this Planning Algorithms Motion Planning , it ends happening living thing one of the favored ebook Planning Algorithms Motion Planning collections that we have. This is why you remain in the best website to look the unbelievable book to have.

Repetitive Motion Planning and Control of Redundant Robot Manipulators - Yunong Zhang 2014-07-08
Repetitive Motion Planning and Control of Redundant Robot Manipulators presents four typical motion planning schemes based on optimization techniques, including the fundamental RMP scheme and its extensions. These schemes are unified as quadratic programs (QPs), which are solved by neural networks or numerical algorithms. The RMP schemes are demonstrated effectively by the simulation results based on various robotic models; the experiments applying the fundamental RMP scheme to a physical robot manipulator are also presented. As the schemes and the corresponding solvers presented in the book have solved the non-repetitive motion problems existing in redundant robot manipulators, it is of particular use in applying theoretical research based on the quadratic program for redundant robot manipulators in industrial situations. This book will be a valuable reference work for engineers, researchers, advanced undergraduate and graduate students in robotics fields. Yunong Zhang is a professor at The School of Information Science and Technology, Sun Yat-sen University, Guangzhou, China; Zhijun Zhang is a research fellow working at the same institute.

Motion and Operation Planning of Robotic Systems - Giuseppe Carbone 2015-03-12

This book addresses the broad multi-disciplinary topic of robotics, and presents the basic techniques for motion and operation planning in robotics systems. Gathering contributions from experts in diverse and wide ranging fields, it offers an overview of the most recent and cutting-edge practical applications of these methodologies. It covers both theoretical and practical approaches, and elucidates the transition from theory to implementation. An extensive analysis is provided, including humanoids, manipulators, aerial robots and ground mobile robots. 'Motion and Operation Planning of Robotic Systems' addresses the following topics: *The theoretical background of robotics. *Application of motion planning techniques to manipulators, such as serial and parallel manipulators. *Mobile robots planning, including robotic applications related to aerial robots, large scale robots and traditional wheeled robots. *Motion planning for humanoid robots. An invaluable reference text for graduate students and researchers in robotics, this book is also intended for researchers studying robotics control design, user interfaces, modelling, simulation, sensors, humanoid robotics.

Mechanics of Robotic Manipulation - Matthew T. Mason 2001-06-08

The science and engineering of robotic manipulation. "Manipulation" refers to a variety of physical changes made to the world around us. Mechanics of Robotic Manipulation addresses one form of robotic manipulation, moving objects, and the various processes involved—grasping, carrying, pushing, dropping, throwing, and so on. Unlike most books on the subject, it focuses on manipulation rather than manipulators. This attention to processes rather than devices allows a more fundamental approach, leading to results that apply to a broad range of devices, not just robotic arms. The book draws both on classical mechanics and on classical planning, which introduces the element of imperfect information. The book does not propose a specific solution to the problem of manipulation, but rather outlines a path of inquiry.

Combinatorial And Toric Homotopy: Introductory Lectures - Darby Alastair 2017-10-20

This volume consists of introductory lectures on the topics in the new and rapidly developing area of toric homotopy theory, and its applications to the current research in configuration spaces and braids, as well as to more applicable mathematics such as fr-codes and robot motion planning. The book starts intertwining homotopy theoretical and combinatorial ideas within the remit of toric topology and illustrates an attempt

to classify in a combinatorial way polytopes known as fullerenes, which are important objects in quantum physics, quantum chemistry and nanotechnology. Toric homotopy theory is then introduced as a further development of toric topology, which describes properties of Davis–Januszkiewicz spaces, moment-angle complexes and their generalizations to polyhedral products. The book also displays the current research on configuration spaces, braids, the theory of limits over the category of presentations and the theory of fr-codes. As an application to robotics, the book surveys topological problems relevant to the motion planning problem of robotics and includes new results and constructions, which enrich the emerging area of topological robotics. The book is at research entry level addressing the core components in homotopy theory and their important applications in the sciences and thus suitable for advanced undergraduate and graduate students. Contents: Toric Homotopy Theory (Stephen Theriault)Fullerenes, Polytopes and Toric Topology (Victor M Buchstaber and Nikolay Yu Erokhovets)Around Braids (Vladimir Vershinin)Higher Limits, Homology Theories and fr-Codes (Sergei O Ivanov and Roman Mikhailov)Configuration Spaces and Robot Motion Planning Algorithms (Michael Farber)Cellular Stratified Spaces (Dai Tamaki) Readership: Advanced undergraduate and graduate students as well as researchers interested in homotopy theory and its applications in the sciences. Keywords: Toric Topology;Toric Homotopy;Configuration Space;Stratified Spaces;Braid Group;Fullerene;Polytope;Virtual Braid Group;Thompson Group;Robotics;Motion PlanningReview: Key Features: The first book in the area of toric homotopy theory consisting of introductory lectures on the topics and their applications to fr-codes and robot motion planning
Algorithmic Foundations of Robotics VIII - Gregory S. Chirikjian 2010-02-04

This book contains selected contributions to WAFR, the highly-competitive meeting on the algorithmic foundations of robotics. They address the unique combination of questions that the design and analysis of robot algorithms inspires.

The Complexity of Robot Motion Planning - John Canny 1988

The Complexity of Robot Motion Planning makes original contributions both to robotics and to the analysis of algorithms. In this groundbreaking monograph John Canny resolves long-standing problems concerning the complexity of motion planning and, for the central problem of finding a collision free path for a jointed robot in the presence of obstacles, obtains exponential speedups over existing algorithms by applying high-powered new mathematical techniques. Canny's new algorithm for this "generalized movers' problem," the most-studied and basic robot motion planning problem, has a single exponential running time, and is polynomial for any given robot. The algorithm has an optimal running time exponent and is based on the notion of roadmaps - one-dimensional subsets of the robot's configuration space. In deriving the single exponential bound, Canny introduces and reveals the power of two tools that have not been previously used in geometrical algorithms: the generalized (multivariable) resultant for a system of polynomials and Whitney's notion of stratified sets. He has also developed a novel representation of object orientation based on unnormalized quaternions which reduces the complexity of the algorithms and enhances their practical applicability. After dealing with the movers' problem, the book next attacks and derives several lower bounds on extensions of the problem: finding the shortest path among polyhedral obstacles, planning with velocity limits, and compliant motion planning with uncertainty. It introduces a clever technique, "path encoding," that allows a proof of NP-hardness for the first two problems and then shows that the general form of compliant motion planning, a problem that is

the focus of a great deal of recent work in robotics, is non-deterministic exponential time hard. Canny proves this result using a highly original construction. John Canny received his doctorate from MIT and is an assistant professor in the Computer Science Division at the University of California, Berkeley. The Complexity of Robot Motion Planning is the winner of the 1987 ACM Doctoral Dissertation Award.

Geometric Reasoning for Perception and Action - Christian Laugier 1993-08-30

Geometry is a powerful tool to solve a great number of problems in robotics and computer vision. Impressive results have been obtained in these fields in the last decade. It is a new challenge to solve problems of the actual world which require the ability to reason about uncertainty and complex motion constraints by combining geometric, kinematic, and dynamic characteristics. A necessary step is to develop appropriate geometric reasoning techniques with reasonable computational complexity. This volume is based on a workshop held in Grenoble, France, in September 1991. It contains selected contributions on several important areas in the field of robotics and computer vision. The four chapters cover the following areas: - motion planning with kinematic and dynamic constraints, - motion planning and control in the presence of uncertainty, - geometric problems related to visual perception, - numerical problems linked to the implementation of practical algorithms for visual perception.

Robot Motion Planning and Control - Jean-Paul Laumond 1998

Content Description #Includes bibliographical references.

Motion Planning in Medicine: Optimization and Simulation Algorithms for Image-Guided Procedures - Ron Alterovitz 2008-09-20

Written by Ron Alterovitz and Ken Goldberg, this monograph combines ideas from robotics, physically-based modeling, and operations research to develop new motion planning and optimization algorithms for image-guided medical procedures.

Hybrid Control and Motion Planning of Dynamical Legged Locomotion - Nasser Sadati 2012-09-11

This book addresses the need in the field for a comprehensive review of motion planning algorithms and hybrid control methodologies for complex legged robots. Introducing a multidisciplinary systems engineering approach for tackling many challenges posed by legged locomotion, the book provides engineering detail including hybrid models for planar and 3D legged robots, as well as hybrid control schemes for asymptotically stabilizing periodic orbits in these closed-loop systems. Complete with downloadable MATLAB code of the control algorithms and schemes used in the book, this book is an invaluable guide to the latest developments and future trends in dynamical legged locomotion.

Autonomous Robots - Farbod Fahimi 2008-10-25

It is at least two decades since the conventional robotic manipulators have become a common manufacturing tool for different industries, from automotive to pharmaceutical. The proven benefits of utilizing robotic manipulators for manufacturing in different industries motivated scientists and researchers to try to extend the applications of robots to many other areas by inventing several new types of robots other than conventional manipulators. The new types of robots can be categorized in two groups; redundant (and hyper-redundant) manipulators, and mobile (ground, marine, and aerial) robots. These groups of robots, known as advanced robots, have more freedom for their mobility, which allows them to do tasks that the conventional manipulators cannot do. Engineers have taken advantage of the extra mobility of the advanced robots to make them work in constrained environments, ranging from limited joint motions for redundant (or hyper-redundant) manipulators to obstacles in the way of mobile (ground, marine, and aerial) robots. Since these constraints usually depend on the work environment, they are variable. Engineers have had to invent methods to allow the robots to deal with a variety of constraints automatically. A robot that is equipped with those methods is called an Autonomous Robot. *Autonomous Robots: Kinematics, Path Planning, and Control* covers the kinematics and dynamic modeling/analysis of Autonomous Robots, as well as the methods suitable for their control. The text is suitable for mechanical and electrical engineers who want to familiarize themselves with methods of modeling/analysis/control that have been proven efficient through research.

RoboCup 2014: Robot World Cup XVIII - Reinaldo A. C. Bianchi 2015-05-11

This book includes the thoroughly refereed proceedings of the 18th Annual RoboCup International Symposium, held in Joao Pessoa, Brazil, in July 2014. The 36 revised papers were carefully reviewed and

selected from 66 submissions and include 11 champion-team papers, three special-track papers on open-source hardware and software, nine papers on the advancement of the RoboCup leagues track, and three best papers. The contributions present current research and educational activities in the field of robotics and artificial intelligence with a special focus on the interaction between robots and humans.

Planning Algorithms - Steven M. LaValle 2006-05-29

Planning algorithms are impacting technical disciplines and industries around the world, including robotics, computer-aided design, manufacturing, computer graphics, aerospace applications, drug design, and protein folding. Written for computer scientists and engineers with interests in artificial intelligence, robotics, or control theory, this is the only book on this topic that tightly integrates a vast body of literature from several fields into a coherent source for teaching and reference in a wide variety of applications. Difficult mathematical material is explained through hundreds of examples and illustrations.

Path Planning of Cooperative Mobile Robots Using Discrete Event Models - Cristian Mahulea 2020-01-09

Offers an integrated presentation for path planning and motion control of cooperative mobile robots using discrete-event system principles. Generating feasible paths or routes between a given starting position and a goal or target position—while avoiding obstacles—is a common issue for all mobile robots. This book formulates the problem of path planning of cooperative mobile robots by using the paradigm of discrete-event systems. It presents everything readers need to know about discrete event system models—mainly Finite State Automata (FSA) and Petri Nets (PN)—and methods for centralized path planning and control of teams of identical mobile robots. *Path Planning of Cooperative Mobile Robots Using Discrete Event Models* begins with a brief definition of the Path Planning and Motion Control problems and their state of the art. It then presents different types of discrete models such as FSA and PNs. The RMTTool MATLAB toolbox is described thereafter, for readers who will need it to provide numerical experiments in the last section. The book also discusses cell decomposition approaches and shows how the divided environment can be translated into an FSA by assigning to each cell a discrete state, while the adjacent relation together with the robot's dynamics implies the discrete transitions. Highlighting the benefits of Boolean Logic, Linear Temporal Logic, cell decomposition, Finite State Automata modeling, and Petri Nets, this book also: Synthesizes automatic strategies based on Discrete Event Systems (DES) for path planning and motion control and offers software implementations for the involved algorithms. Provides a tutorial for motion planning introductory courses or related simulation-based projects using a MATLAB package called RMTTool (Robot Motion Toolbox). Includes simulations for problems solved by methodologies presented in the book. *Path Planning of Cooperative Mobile Robots Using Discrete Event Models* is an ideal book for undergraduate and graduate students and college and university professors in the areas of robotics, artificial intelligence, systems modeling, and autonomous control.

Robot Motion Planning - Jean-Claude Latombe 2012-12-06

One of the ultimate goals in Robotics is to create 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 done rather than how to do it. The robots will be any kind of versatile mechanical device equipped with actuators and sensors under the control of a computing system. Making progress toward autonomous robots is of major practical interest in a wide variety of application domains including manufacturing, construction, waste management, space exploration, undersea work, assistance for the disabled, and medical surgery. It is also of great technical interest, especially for Computer Science, because it raises challenging and rich computational issues from which new concepts of broad usefulness are likely to emerge. Developing the technologies necessary for autonomous robots is a formidable undertaking with deep interweaved ramifications in automated reasoning, perception and control. It raises many important problems. One of them - motion planning - is the central theme of this book. It can be loosely stated as follows: How can a robot decide what motions to perform in order to achieve goal arrangements 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.

Principles of Robot Motion - Howie Choset 2005-05-20

A text that makes the mathematical underpinnings of robot motion accessible and relates low-level details of implementation to high-level algorithmic concepts. Robot motion planning has become a major focus of robotics. Research findings can be applied not only to robotics but to planning routes on circuit boards, directing digital actors in computer graphics, robot-assisted surgery and medicine, and in novel areas such as drug design and protein folding. This text reflects the great advances that have taken place in the last ten years, including sensor-based planning, probabilistic planning, localization and mapping, and motion planning for dynamic and nonholonomic systems. Its presentation makes the mathematical underpinnings of robot motion accessible to students of computer science and engineering, relating low-level implementation details to high-level algorithmic concepts.

Modern Robotics - Kevin M. Lynch 2017-05-25

This introduction to robotics offers a distinct and unified perspective of the mechanics, planning and control of robots. Ideal for self-learning, or for courses, as it assumes only freshman-level physics, ordinary differential equations, linear algebra and a little bit of computing background. Modern Robotics presents the state-of-the-art, screw-theoretic techniques capturing the most salient physical features of a robot in an intuitive geometrical way. With numerous exercises at the end of each chapter, accompanying software written to reinforce the concepts in the book and video lectures aimed at changing the classroom experience, this is the go-to textbook for learning about this fascinating subject.

Planning Algorithms - Steven M. LaValle 2006-05-29

Planning algorithms are impacting technical disciplines and industries around the world, including robotics, computer-aided design, manufacturing, computer graphics, aerospace applications, drug design, and protein folding. This coherent and comprehensive book unifies material from several sources, including robotics, control theory, artificial intelligence, and algorithms. The treatment is centered on robot motion planning, but integrates material on planning in discrete spaces. A major part of the book is devoted to planning under uncertainty, including decision theory, Markov decision processes, and information spaces, which are the 'configuration spaces' of all sensor-based planning problems. The last part of the book delves into planning under differential constraints that arise when automating the motions of virtually any mechanical system. This text and reference is intended for students, engineers, and researchers in robotics, artificial intelligence, and control theory as well as computer graphics, algorithms, and computational biology.

Vision-Based Mobile Robot Control and Path Planning Algorithms in Obstacle Environments Using Type-2 Fuzzy Logic - Mahmut Dirik 2021-03-01

The book includes topics, such as: path planning, avoiding obstacles, following the path, go-to-goal control, localization, and visual-based motion control. The theoretical concepts are illustrated with a developed control architecture with soft computing and artificial intelligence methods. The proposed vision-based motion control strategy involves three stages. The first stage consists of the overhead camera calibration and the configuration of the working environment. The second stage consists of a path planning strategy using several traditional path planning algorithms and proposed planning algorithm. The third stage consists of the path tracking process using previously developed Gauss and Decision Tree control approaches and the proposed Type-1 and Type-2 controllers. Two kinematic structures are utilized to acquire the input values of controllers. These are Triangle Shape-Based Controller Design, which was previously developed and Distance-Based Triangle Structure that is used for the first time in conducted experiments. Four different control algorithms, Type-1 fuzzy logic, Type-2 Fuzzy Logic, Decision Tree Control, and Gaussian Control have been used in overall system design. The developed system includes several modules that simplify characterizing the motion control of the robot and ensure that it maintains a safe distance without colliding with any obstacles on the way to the target. The topics of the book are extremely relevant in many areas of research, as well as in education in courses in computer science, electrical and mechanical engineering and in mathematics at the graduate and undergraduate levels.

Mobile Robots in Rough Terrain - Karl Iagnemma 2004-07-08

This monograph discusses issues related to estimation, control, and motion planning for mobile robots operating in rough terrain, with particular attention to planetary exploration rovers. Rough terrain robotics is becoming increasingly important in space exploration, and industrial applications. However, most current

motion planning and control algorithms are not well suited to rough terrain mobility, since they do not consider the physical characteristics of the rover and its environment. Specific addressed topics are: wheel terrain interaction modeling, including terrain parameter estimation and wheel terrain contact angle estimation; rough terrain motion planning; articulated suspension control; and traction control. Simulation and experimental results are presented that show that the described algorithms lead to improved mobility for robotic systems in rough terrain.

Adaptive State × Time Lattices: A Contribution to Mobile Robot Motion Planning in Unstructured Dynamic Environments - Petereit, Janko 2017-01-20

Algorithmic Foundations of Robotics XII - Ken Goldberg 2021-05-21

This book presents the outcomes of the 12th International Workshop on the Algorithmic Foundations of Robotics (WAFR 2016). WAFR is a prestigious, single-track, biennial international meeting devoted to recent advances in algorithmic problems in robotics. Robot algorithms are an important building block of robotic systems and are used to process inputs from users and sensors, perceive and build models of the environment, plan low-level motions and high-level tasks, control robotic actuators, and coordinate actions across multiple systems. However, developing and analyzing these algorithms raises complex challenges, both theoretical and practical. Advances in the algorithmic foundations of robotics have applications to manufacturing, medicine, distributed robotics, human-robot interaction, intelligent prosthetics, computer animation, computational biology, and many other areas. The 2016 edition of WAFR went back to its roots and was held in San Francisco, California - the city where the very first WAFR was held in 1994. Organized by Pieter Abbeel, Kostas Bekris, Ken Goldberg, and Lauren Miller, WAFR 2016 featured keynote talks by John Canny on "A Guided Tour of Computer Vision, Robotics, Algebra, and HCI," Erik Demaine on "Replicators, Transformers, and Robot Swarms: Science Fiction through Geometric Algorithms," Dan Halperin on "From Piano Movers to Piano Printers: Computing and Using Minkowski Sums," and by Lydia Kavraki on "20 Years of Sampling Robot Motion." Furthermore, it included an Open Problems Session organized by Ron Alterovitz, Florian Pokorny, and Jur van den Berg. There were 58 paper presentations during the three-day event. The organizers would like to thank the authors for their work and contributions, the reviewers for ensuring the high quality of the meeting, the WAFR Steering Committee led by Nancy Amato as well as WAFR's fiscal sponsor, the International Federation of Robotics Research (IFRR), led by Oussama Khatib and Henrik Christensen. WAFR 2016 was an enjoyable and memorable event.

Motion Planning for Humanoid Robots - Kensuke Harada 2010-08-12

Research on humanoid robots has been mostly with the aim of developing robots that can replace humans in the performance of certain tasks. Motion planning for these robots can be quite difficult, due to their complex kinematics, dynamics and environment. It is consequently one of the key research topics in humanoid robotics research and the last few years have witnessed considerable progress in the field. Motion Planning for Humanoid Robots surveys the remarkable recent advancement in both the theoretical and the practical aspects of humanoid motion planning. Various motion planning frameworks are presented in Motion Planning for Humanoid Robots, including one for skill coordination and learning, and one for manipulating and grasping tasks. The problem of planning sequences of contacts that support acyclic motion in a highly constrained environment is addressed and a motion planner that enables a humanoid robot to push an object to a desired location on a cluttered table is described. The main areas of interest include: • whole body motion planning, • task planning, • biped gait planning, and • sensor feedback for motion planning. Torque-level control of multi-contact behavior, autonomous manipulation of moving obstacles, and movement control and planning architecture are also covered. Motion Planning for Humanoid Robots will help readers to understand the current research on humanoid motion planning. It is written for industrial engineers, advanced undergraduate and postgraduate students.

Advanced Path Planning for Mobile Entities - Rastislav Róka 2018-09-26

The book Advanced Path Planning for Mobile Entities provides a platform for practicing researchers, academics, PhD students, and other scientists to design, analyze, evaluate, process, and implement diverse issues of path planning, including algorithms for multipath and mobile planning and path planning for mobile robots. The nine chapters of the book demonstrate capabilities of advanced path

planning for mobile entities to solve scientific and engineering problems with varied degree of complexity.
Algorithmic Motion Planning in Robotics - Micha Sharir 1991

Advanced Agent Technology - Francien Dechesne 2012-01-10

This book constitutes the thoroughly refereed post-workshop proceedings of 5 workshops, held at the 10th International Conference on Autonomous Agents and Multiagent Systems, AAMAS 2011, in Taipei, Taiwan, May 2-6, 2011. The 37 revised full papers presented together with 1 invited paper were carefully reviewed and selected from numerous submissions. The papers are organized in sections on the workshops Agent-Based Modeling for Policy Engineering (AMPLE), Agent-Oriented Software Engineering (AOSE), Autonomous Robots and Multirobot Systems (ARMS), Data Oriented Constructive Mining and Multi-Agent Simulation, Massively Multi-Agent Systems: Models, Methods and Tools (DOCM3AS), and Infrastructures and Tools for Multiagent Systems (ITMAS).

Autonomous Mobile Robots and Multi-Robot Systems - Eugene Kagan 2019-12-16

Offers a theoretical and practical guide to the communication and navigation of autonomous mobile robots and multi-robot systems This book covers the methods and algorithms for the navigation, motion planning, and control of mobile robots acting individually and in groups. It addresses methods of positioning in global and local coordinates systems, off-line and on-line path-planning, sensing and sensors fusion, algorithms of obstacle avoidance, swarming techniques and cooperative behavior. The book includes ready-to-use algorithms, numerical examples and simulations, which can be directly implemented in both simple and advanced mobile robots, and is accompanied by a website hosting codes, videos, and PowerPoint slides Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming consists of four main parts. The first looks at the models and algorithms of navigation and motion planning in global coordinates systems with complete information about the robot's location and velocity. The second part considers the motion of the robots in the potential field, which is defined by the environmental states of the robot's expectations and knowledge. The robot's motion in the unknown environments and the corresponding tasks of environment mapping using sensed information is covered in the third part. The fourth part deals with the multi-robot systems and swarm dynamics in two and three dimensions. Provides a self-contained, theoretical guide to understanding mobile robot control and navigation Features implementable algorithms, numerical examples, and simulations Includes coverage of models of motion in global and local coordinates systems with and without direct communication between the robots Supplemented by a companion website offering codes, videos, and PowerPoint slides Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming is an excellent tool for researchers, lecturers, senior undergraduate and graduate students, and engineers dealing with mobile robots and related issues.

Robotics Research - Paolo Dario 2005-02-17

ISRR, the "International Symposium on Robotics Research", is one of robotics' pioneering symposia, which has established some of the field's most fundamental and lasting contributions over the past two decades. This book presents the results of the eleventh edition of "Robotics Research" ISRR03, offering a broad range of topics in robotics. The contributions provide a wide coverage of the current state of robotics research: the advances and challenges in its theoretical foundation and technology basis, and the developments in its traditional and new emerging areas of applications. The diversity, novelty, and span of the work unfolding in these areas reveal the field's increased maturity and expanded scope, and define the state of the art of robotics and its future direction.

Path Planning for Vehicles Operating in Uncertain 2D Environments - Viacheslav Pshikhopov 2017-01-28

Path Planning for Vehicles Operating in Uncertain 2D-environments presents a survey that includes several path planning methods developed using fuzzy logic, grapho-analytical search, neural networks, and neural-like structures, procedures of genetic search, and unstable motion modes. Presents a survey of accounting limitations imposed by vehicle dynamics Proposes modified and new original methods, including neural networking, grapho-analytical, and nature-inspired Gives tools for a novice researcher to select a method that would suit their needs or help to synthesize new hybrid methods

Springer Handbook of Robotics - Bruno Siciliano 2016-07-27

The second edition of this handbook provides a state-of-the-art overview on the various aspects in the rapidly developing field of robotics. Reaching for the human frontier, robotics is vigorously engaged in the growing challenges of new emerging domains. Interacting, exploring, and working with humans, the new generation of robots will increasingly touch people and their lives. The credible prospect of practical robots among humans is the result of the scientific endeavour of a half a century of robotic developments that established robotics as a modern scientific discipline. The ongoing vibrant expansion and strong growth of the field during the last decade has fueled this second edition of the Springer Handbook of Robotics. The first edition of the handbook soon became a landmark in robotics publishing and won the American Association of Publishers PROSE Award for Excellence in Physical Sciences & Mathematics as well as the organization's Award for Engineering & Technology. The second edition of the handbook, edited by two internationally renowned scientists with the support of an outstanding team of seven part editors and more than 200 authors, continues to be an authoritative reference for robotics researchers, newcomers to the field, and scholars from related disciplines. The contents have been restructured to achieve four main objectives: the enlargement of foundational topics for robotics, the enlightenment of design of various types of robotic systems, the extension of the treatment on robots moving in the environment, and the enrichment of advanced robotics applications. Further to an extensive update, fifteen new chapters have been introduced on emerging topics, and a new generation of authors have joined the handbook's team. A novel addition to the second edition is a comprehensive collection of multimedia references to more than 700 videos, which bring valuable insight into the contents. The videos can be viewed directly augmented into the text with a smartphone or tablet using a unique and specially designed app. Springer Handbook of Robotics Multimedia Extension Portal: <http://handbookofrobotics.org/>

Autonomy and Unmanned Vehicles - Somaiyeh MahmoudZadeh 2019-08-30

This book addresses higher-lower level decision autonomy for autonomous vehicles, and discusses the addition of a novel architecture to cover both levels. The proposed framework's performance and stability are subsequently investigated by employing different meta-heuristic algorithms. The performance of the proposed architecture is shown to be largely independent of the algorithms employed; the use of diverse algorithms (subjected to the real-time performance of the algorithm) does not negatively affect the system's real-time performance. By analyzing the simulation results, the book demonstrates that the proposed model provides perfect mission timing and task management, while also guaranteeing secure deployment.

Although mainly intended as a research work, the book's review chapters and the new approaches developed here are also suitable for use in courses for advanced undergraduate or graduate students.

Robot Intelligence Technology and Applications 3 - Jong-Hwan Kim 2015-04-15

This book covers all aspects of robot intelligence from perception at sensor level and reasoning at cognitive level to behavior planning at execution level for each low level segment of the machine. It also presents the technologies for cognitive reasoning, social interaction with humans, behavior generation, ability to cooperate with other robots, ambience awareness, and an artificial genome that can be passed on to other robots. These technologies are to materialize cognitive intelligence, social intelligence, behavioral intelligence, collective intelligence, ambient intelligence and genetic intelligence. The book aims at serving researchers and practitioners with a timely dissemination of the recent progress on robot intelligence technology and its applications, based on a collection of papers presented at the 3rd International Conference on Robot Intelligence Technology and Applications (RiTA), held in Beijing, China, November 6 - 8, 2014. For better readability, this edition has the total 74 papers grouped into 3 chapters: Chapter I: Ambient, Behavioral, Cognitive, Collective, and Social Robot Intelligence, Chapter II: Computational Intelligence and Intelligent Design for Advanced Robotics, Chapter III: Applications of Robot Intelligence Technology, where individual chapters, edited respectively by Peter Sincak, Hyun Myung, Jun Jo along with Weimin Yang and Jong-Hwan Kim, begin with a brief introduction written by the respective chapter editors.

Planning Algorithms - Steven Michael LaValle 2006

Written for computer scientists and engineers with interests in artificial intelligence, robotics, or control theory, this is the only book on this topic that integrates literature from several fields into a coherent source for teaching and reference in applications including robotics, computational biology, computer graphics, manufacturing, aerospace applications, and medicine.

Autonomous Mobile Robots - Frank L. Lewis 2018-10-03

It has long been the goal of engineers to develop tools that enhance our ability to do work, increase our quality of life, or perform tasks that are either beyond our ability, too hazardous, or too tedious to be left to human efforts. Autonomous mobile robots are the culmination of decades of research and development, and their potential is seemingly unlimited. Roadmap to the Future Serving as the first comprehensive reference on this interdisciplinary technology, Autonomous Mobile Robots: Sensing, Control, Decision Making, and Applications authoritatively addresses the theoretical, technical, and practical aspects of the field. The book examines in detail the key components that form an autonomous mobile robot, from sensors and sensor fusion to modeling and control, map building and path planning, and decision making and autonomy, and to the final integration of these components for diversified applications. Trusted Guidance A duo of accomplished experts leads a team of renowned international researchers and professionals who provide detailed technical reviews and the latest solutions to a variety of important problems. They share hard-won insight into the practical implementation and integration issues involved in developing autonomous and open robotic systems, along with in-depth examples, current and future applications, and extensive illustrations. For anyone involved in researching, designing, or deploying autonomous robotic systems, Autonomous Mobile Robots is the perfect resource.

Algorithmic Foundations of Robotics X - Emilio Frazzoli 2013-02-14

Algorithms are a fundamental component of robotic systems. Robot algorithms process inputs from sensors that provide noisy and partial data, build geometric and physical models of the world, plan high-and low-level actions at different time horizons, and execute these actions on actuators with limited precision. The design and analysis of robot algorithms raise a unique combination of questions from many elds, including control theory, computational geometry and topology, geometrical and physical modeling, reasoning under uncertainty, probabilistic algorithms, game theory, and theoretical computer science. The Workshop on Algorithmic Foundations of Robotics (WAFR) is a single-track meeting of leading researchers in the eld of robot algorithms. Since its inception in 1994, WAFR has been held every other year, and has provided one of the premiere venues for the publication of some of the eld's most important and lasting contributions. This books contains the proceedings of the tenth WAFR, held on June 13{15 2012 at the Massachusetts Institute of Technology. The 37 papers included in this book cover a broad range of topics, from fundamental theoretical issues in robot motion planning, control, and perception, to novel applications.

Sensing, Intelligence, Motion - Vladimir J. Lumelsky 2005-11-28

A leap forward in the field of robotics Until now, most of the advances in robotics have taken place in structured environments. Scientists and engineers have designed highly sophisticated robots, but most are still only able to cooperate and move in predetermined, planned environments designed specifically for the robots and typically at very high cost. This new book takes robotics to the next level by setting forth the theory and techniques needed to achieve robotic motion in unstructured environments. The ability to move and operate in an arbitrary, unplanned environment will lead to automating a wide range of new robotic tasks, such as patient care, toxic site cleanup, and planetary exploration. The approach that opens the door for robots to handle unstructured tasks is known as Sensing-Intelligence-Motion (SIM), which draws from research in topology, computational complexity, control theory, and sensing hardware. Using SIM as an underlying foundation, the author's carefully structured presentation is designed to: * Formulate the challenges of sensor-based motion planning and then build a theoretical foundation for sensor-based motion planning strategies * Investigate promising algorithmic strategies for mobile robots and robot arm manipulators, in both cases addressing motion planning for the whole robot body * Compare robot performance to human performance in sensor-based motion planning to gain better insight into the challenges of SIM and help build synergistic human-robot teams for tele-operation tasks. It is both exciting and encouraging to discover that robot performance decisively exceeds human performance in certain tasks requiring spatial reasoning, even when compared to trained operators * Review sensing hardware that is necessary to realize the SIM paradigm Some 200 illustrations, graphic sketches, and photos are included to clarify key issues, develop and validate motion planning approaches, and demonstrate full systems in operation. As the first book fully devoted to robot motion planning in unstructured environments, Sensing, Intelligence, Motion is a must-read for engineers, scientists, and researchers involved in robotics. It

will help them migrate robots from highly specialized applications in factories to widespread use in society where autonomous robot motion is needed.

Robotics - Bruno Siciliano 2010-08-20

Based on the successful Modelling and Control of Robot Manipulators by Sciavicco and Siciliano (Springer, 2000), Robotics provides the basic know-how on the foundations of robotics: modelling, planning and control. It has been expanded to include coverage of mobile robots, visual control and motion planning. A variety of problems is raised throughout, and the proper tools to find engineering-oriented solutions are introduced and explained. The text includes coverage of fundamental topics like kinematics, and trajectory planning and related technological aspects including actuators and sensors. To impart practical skill, examples and case studies are carefully worked out and interwoven through the text, with frequent resort to simulation. In addition, end-of-chapter exercises are proposed, and the book is accompanied by an electronic solutions manual containing the MATLAB® code for computer problems; this is available free of charge to those adopting this volume as a textbook for courses.

Principles of Robot Motion - Howie Choset 2005-05-20

A text that makes the mathematical underpinnings of robot motion accessible and relates low-level details of implementation to high-level algorithmic concepts. Robot motion planning has become a major focus of robotics. Research findings can be applied not only to robotics but to planning routes on circuit boards, directing digital actors in computer graphics, robot-assisted surgery and medicine, and in novel areas such as drug design and protein folding. This text reflects the great advances that have taken place in the last ten years, including sensor-based planning, probabilistic planning, localization and mapping, and motion planning for dynamic and nonholonomic systems. Its presentation makes the mathematical underpinnings of robot motion accessible to students of computer science and engineering, relating low-level implementation details to high-level algorithmic concepts.

Autonomous Mobile Robots and Multi-Robot Systems - Eugene Kagan 2019-09-02

Offers a theoretical and practical guide to the communication and navigation of autonomous mobile robots and multi-robot systems This book covers the methods and algorithms for the navigation, motion planning, and control of mobile robots acting individually and in groups. It addresses methods of positioning in global and local coordinates systems, off-line and on-line path-planning, sensing and sensors fusion, algorithms of obstacle avoidance, swarming techniques and cooperative behavior. The book includes ready-to-use algorithms, numerical examples and simulations, which can be directly implemented in both simple and advanced mobile robots, and is accompanied by a website hosting codes, videos, and PowerPoint slides Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming consists of four main parts. The first looks at the models and algorithms of navigation and motion planning in global coordinates systems with complete information about the robot's location and velocity. The second part considers the motion of the robots in the potential field, which is defined by the environmental states of the robot's expectations and knowledge. The robot's motion in the unknown environments and the corresponding tasks of environment mapping using sensed information is covered in the third part. The fourth part deals with the multi-robot systems and swarm dynamics in two and three dimensions. Provides a self-contained, theoretical guide to understanding mobile robot control and navigation Features implementable algorithms, numerical examples, and simulations Includes coverage of models of motion in global and local coordinates systems with and without direct communication between the robots Supplemented by a companion website offering codes, videos, and PowerPoint slides Autonomous Mobile Robots and Multi-Robot Systems: Motion-Planning, Communication and Swarming is an excellent tool for researchers, lecturers, senior undergraduate and graduate students, and engineers dealing with mobile robots and related issues.

Robot Motion Planning and Control - Jean-Paul Laumond 2014-03-12

How can a robot decide what motions to perform in order to achieve tasks in the physical world? Robot motion planning encompasses several different disciplines, most notably robotics, computer science, control theory and mathematics. This volume presents an interdisciplinary account of recent developments in the field. Topics covered include: combining geometric algorithms and control techniques to account for the nonholonomic constraints of most mobile robots; the mathematical machinery necessary for

understanding nonholonomic systems; applying optimal techniques to compute optimal paths; feedback

control for nonholonomic mobile robots; probabilistic algorithms and new motion planning approaches; and a survey of recent techniques for dealing with collision detection.