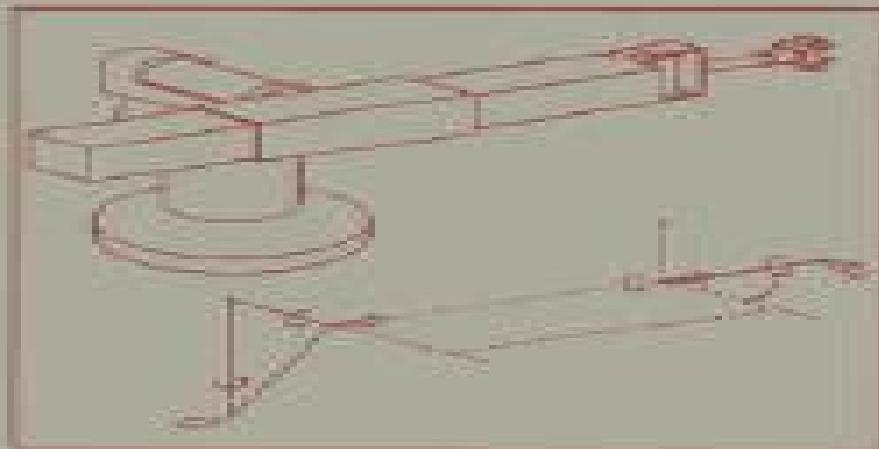


Lecture Notes in Computer Science

1014

Angel Pasqual del Pobil
Miguel Angel Serna

Spatial Representation and Motion Planning



Springer

Spatial Representation And Motion Planning

Angel P. del Pobil, Miquel A. Serna



Spatial Representation And Motion Planning:

Spatial Representation and Motion Planning, 1995 *Spatial Representation and Motion Planning* Angel P. del Pobil, Miguel A. Serna, 1995-11-08 This book is devoted to the development of adequate spatial representations for robot motion planning Drawing upon advanced heuristic techniques from AI and computational geometry the authors introduce a general model for spatial representation of physical objects This model is then applied to two key problems in intelligent robotics collision detection and motion planning In addition the application to actual robot arms is kept always in mind instead of dealing with simplified models This monograph is built upon Angel del Pobil's PhD thesis which was selected as the winner of the 1992 Award of the Spanish Royal Academy of Doctors **Spatial representation and motion planning** Angel Pasqual del Pobil, Miguel Angel Serna, 1995 *Motion Planning* Xj Jing, 2008-06-01 In this book new results or developments from different research backgrounds and application fields are put together to provide a wide and useful viewpoint on these headed research problems mentioned above focused on the motion planning problem of mobile robots These results cover a large range of the problems that are frequently encountered in the motion planning of mobile robots both in theoretical methods and practical applications including obstacle avoidance methods navigation and localization techniques environmental modelling or map building methods and vision signal processing etc Different methods such as potential fields reactive behaviours neural fuzzy based methods motion control methods and so on are studied Through this book and its references the reader will definitely be able to get a thorough overview on the current research results for this specific topic in robotics The book is intended for the readers who are interested and active in the field of robotics and especially for those who want to study and develop their own methods in motion path planning or control for an intelligent robotic system **Spatial Reasoning and Planning** Jiming Liu, Laeeque K. Daneshmend, 2012-12-06 Spatial reasoning and planning is a core constituent in robotics graphics computer aided design and geographic information systems After a review of previous work in the related areas Liu and Daneshmend present here a unified framework for qualitative spatial representation and reasoning which enables the generation of solutions to spatial problems where the geometric knowledge is imprecise The approach utilizes qualitative spatial representation and reasoning integrated with a quantitative search procedure based on simulated annealing Many graphical illustrations and detailed algorithm descriptions help the readers to comprehend the solution paths and to develop their own applications The book is written as a self contained text for researchers and graduate students in computer science and related engineering disciplines The methodologies algorithmic details and case studies presented can be used as course material as well as a convenient reference **Motion Planning for Humanoid Robots** Kensuke Harada, Eiichi Yoshida, Kazuhito Yokoi, 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 Motion Planning in Dynamic Environments Kikuo Fujimura,2012-12-06 Computer Science Workbench is a monograph series which will provide you with an in depth working knowledge of current developments in computer technology Every volume in this series will deal with a topic of importance in computer science and elaborate on how you yourself can build systems related to the main theme You will be able to develop a variety of systems including computer software tools computer graphics computer animation database management systems and computer aided design and manufacturing systems Computer Science Workbench represents an important new contribution in the field of practical computer technology TOSIYASU L KUNII To my parents Kenjiro and Nori Fujimura Preface Motion planning is an area in robotics that has received much attention recently Much of the past research focuses on static environments various methods have been developed and their characteristics have been well investigated Although it is essential for autonomous intelligent robots to be able to navigate within dynamic worlds the problem of motion planning in dynamic domains is relatively little understood compared with static problems *Intelligent Robots - Sensing, Modeling And Planning* Bob Bolles,Horst Bunke,Hartmut Noltemeier,1997-12-04 Rapid advances in sensors computers and algorithms continue to fuel dramatic improvements in intelligent robots In addition robot vehicles are starting to appear in a number of applications For example they have been installed in public settings to perform such tasks as delivering items in hospitals and cleaning floors in supermarkets recently two small robot vehicles were launched to explore Mars This book presents the latest advances in the principal fields that contribute to robotics It contains contributions written by leading experts addressing topics such as Path and Motion Planning Navigation and Sensing Vision and Object Recognition Environment Modeling and others **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

CAD Based Programming for Sensory Robots Bahram Ravani, 2012-12-06 This book contains 26 papers presented at the NATO Advanced Research Workshop on CAD Based Programming for Sensory Robots held in IL CIOCCa Italy July 4 6 1988 CAD based robot programming is considered to be the process where CAD Computer Based models are used to develop robot programs If the program is generated at least partially by a programmer interacting for example with a computer graph i c d sp i l ay of the robot and its workce 11 env ironment the process is referred to as graphical off line programming On the other hand if the robot program is generated automatically for example by a computer then the process is referred to as automatic robot programmi ng The key element here is the use of CAD models both for interact i ve and automat i c generat i on of robot programs CAD based programmi ng therefore bri ngs together computer based model i ng and robot programmi ng and as such cuts across several discipl ines including geometric model i ng robot programming kinematic and dynamic modeling artificial intelligence sensory monitoring and so on

Quotient Space Based Problem Solving Ling Zhang, Bo Zhang, 2014-01-30 Quotient Space Based Problem Solving provides an in depth treatment of hierarchical problem solving computational complexity and the principles and applications of multi granular computing including inference information fusing planning and heuristic search Explains the theory of hierarchical problem solving its computational complexity and discusses the principle and applications of multi granular computing Describes a human like theoretical framework using quotient space theory that will be of interest to researchers in artificial intelligence Provides many applications and examples in the engineering and computer science area Includes complete coverage of planning heuristic search and coverage of strictly mathematical models

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 inter est in a wide variety of application domains including manufacturing construction waste management space exploration undersea work as sistance 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 useful ness 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.

Informatics in Control, Automation and Robotics Giuseppina Gini, Henk Nijmeijer, Wolfram Burgard, Dimitar Filev, 2023-11-29. The book focuses the latest endeavors relating researches and developments conducted in fields of control robotics and automation. Through ten revised and extended articles, the present book aims to provide the most up-to-date state of the art of the aforementioned fields, allowing researchers, Ph.D. students, and engineers not only updating their knowledge but also benefiting from the source of inspiration that represents the set of selected articles of the book. The deliberate intention of editors to cover as well theoretical facets of those fields as their practical accomplishments and implementations offers the benefit of gathering in a same volume a factual and well-balanced prospect of nowadays research in those topics. A special attention toward Intelligent Robots and Control may characterize another benefit of this book.

Adaptive State × Time Lattices: A Contribution to Mobile Robot Motion Planning in Unstructured Dynamic Environments Petereit, Janko, 2017-01-20. Mobile robot motion planning in unstructured dynamic environments is a challenging task. Thus, often suboptimal methods are employed which perform global path planning and local obstacle avoidance separately. This work introduces a holistic planning algorithm which is based on the concept of state. *ICAUTO-95* Pradip K. Chande, 1995.

CAD/CAM Robotics and Factories of the Future '90 Suren N. Dwivedi, Alok K. Verma, John E. Sneckenberger, 2012-12-06. According to the Concurrent Engineering Research Center (CERC) at West Virginia University, the concurrent engineering (CE) is a rapid simultaneous approach where research and development, design, manufacturing, and support are carried out in parallel. The mission of concurrent engineering is to reduce time to market, improve total quality, and lower cost for products or systems developed and supported by large organizations. The purpose of the concurrent design methodology is to let the designer know the consequences of his design decisions in the manufacturing and assembly stages as well as in subsequent operations. Design for manufacture and assembly, design for reliability, and testability. CAD/CAM/CAE knowledge-based systems, cost analysis, and advanced material technology are the major constituents of concurrent engineering. The need for concurrent engineering can be justified from the fact that in every production cycle, the design phase approximately takes 5 to 10% of the total cycle, but overall it influences 80% of the production cycle. This volume contains articles from a wide spectrum dealing with concepts of concurrent engineering. The importance of the knowledge-based systems in the CE environment is significant as they provide the common platform to achieve the same level of expertise to the designers and manufacturers throughout the organization for the specific task. Their role in doing it right the first time is very important in

providing aid to the designers and manufacturers to optimize the design and manufacturing setups for a cost effectiveness and reduced production time

Gross Motion Planning Y. K. Hwang, Narendra Ahuja, 1992

Nonholonomic Motion Planning Zexiang Li, J.F. Canny, 2012-12-06 Nonholonomic Motion Planning grew out of the workshop that took place at the 1991 IEEE International Conference on Robotics and Automation. It consists of contributed chapters representing new developments in this area. Contributors to the book include robotics engineers, nonlinear control experts, differential geometers, and applied mathematicians. Nonholonomic Motion Planning is arranged into three chapter groups: Controllability, one of the key mathematical tools needed to study nonholonomic motion; Motion Planning for Mobile Robots, in this section the papers are focused on problems with nonholonomic velocity constraints as well as constraints on the generalized coordinates; Falling Cats, Space Robots, and Gauge Theory, there are numerous connections to be made between symplectic geometry techniques for the study of holonomies in mechanics, gauge theory, and control. In this section these connections are discussed using the backdrop of examples drawn from space robots and falling cats reorienting themselves. Nonholonomic Motion Planning can be used either as a reference for researchers working in the areas of robotics, nonlinear control, and differential geometry, or as a textbook for a graduate level robotics or nonlinear control course.

Motion and Operation Planning of Robotic Systems Giuseppe Carbone, Fernando Gomez-Bravo, 2015-03-12 This book addresses the broad multidisciplinary 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.

Applications of Evolutionary Computing Mario Giacobini, Anthony Brabazon, Stefano Cagnoni, Aniko Ekart, Anna I. Esparcia-Alcázar, Muddassar Farooq, Andreas Fink, Penousal Machado, Jon McCormack, Michael O'Neill, Ferrante Neri, Mike Preuss, Franz Rothlauf, Ernesto Tarantino, Shengxiang Yang, 2009-04-11 The year 2009 celebrates the bicentenary of Darwin's birth and the 150th anniversary of the publication of his seminal work *On the Origin of Species*. If this makes 2009 a special year for the research community working in biology and evolution, the field of evolutionary computation (EC) also shares the same excitement. EC techniques are efficient, nature inspired planning and optimization methods based on the principles of natural evolution and genetics. Due to their efficiency and simple underlying principles, these methods can be used in the

context of problem solving optimization and machine learning A large and ever increasing number of researchers and professionals make use of EC techniques in various application domains

This volume presents a careful selection of relevant EC applications combined with a thorough examination of the techniques used in EC The papers in the volume illustrate the current state of the art in the application of EC and can help and inspire researchers and professionals to develop efficient EC methods for design and problem solving

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