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Safe Robot Navigation Among Moving and Steady Obstacles
Mobile Robots: The Evolutionary Approach
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TRAVIS TAPIA

3D Robotic Mapping John Wiley & Sons
A Mathematical Introduction to Robotic Manipulation presents a mathematical formulation of the kinematics, dynamics, and control of robot manipulators. It uses an elegant set of mathematical tools that emphasizes the geometry of robot motion and allows a large class of robotic manipulation problems to be analyzed within a unified framework. The foundation of the book is a derivation of robot kinematics using the product of the exponentials formula. The authors explore the kinematics of open-chain manipulators and multifingered robot hands, present an analysis of the dynamics and control of robot systems, discuss the specification and control of internal forces and internal motions, and address the implications of the nonholonomic nature of rolling contact are addressed, as well. The wealth of information, numerous examples, and exercises make A Mathematical Introduction to Robotic Manipulation valuable as both a reference for robotics researchers and a text for students in advanced robotics courses.
Probabilistic Robotics Cambridge University Press
There exists quite a vast literature on mobile robots, covering fundamental principles on motion control and path-planning in indoor environments using ultrasonic/laser transducers. However, there is a scarcity of books/collective documents on vision based navigation of mobile robots and multi-agent systems. The book Innovations in Robot Mobility and Control fills this gap. It attempts to develop interesting models for vision based map building in indoor and outdoor environments, precise motion control, navigation in dynamic environment, and above all multi-agent co-operation of robots. The most important aspects of this book is that the principles and models introduced in the text are all field-tested, and thus can readily be used in solving real world problems, such as factory automation, disposal of nuclear wastes, landmine clearing and computerized surgery. The chapters presented in the book have been contributed by specialist researchers from different disciplines of robotics. The book thus is unique in its contents and originality. Though contributed by

several researchers, the presentation style of the book is uniform throughout. Primarily meant for graduate students and researchers in robotics, the book is equally useful to interested audience of any discipline for its contents and simplicity in presentation style.

Simulation, Modeling, and Programming for Autonomous Robots Springer Science & Business Media

Mobile robots are the focus of a great deal of current research in robotics. Mobile robotics is a young, multidisciplinary field involving knowledge from many areas, including electrical, electronic and mechanical engineering, computer, cognitive and social sciences. Being engaged in the design of automated systems, it lies at the intersection of artificial intelligence, computational vision, and robotics. Thanks to the numerous researchers sharing their goals, visions and results within the community, mobile robotics is becoming a very rich and stimulating area. The book Recent Advances in Mobile Robotics addresses the topic by integrating contributions from many researchers around the globe. It emphasizes the computational methods of programming mobile robots, rather than the methods of constructing the hardware. Its content reflects different complementary aspects of theory and practice, which have recently taken place. We believe that it will serve as a valuable handbook to those who work in research and development of mobile robots.

Autonomous Mobile Robots and Multi-Robot Systems Springer Science & Business Media

Mobile robotics is a challenging field with great potential. It covers disciplines including electrical engineering, mechanical engineering, computer science, cognitive science, and social science. It is essential to the design of automated robots, in combination with artificial intelligence, vision, and sensor technologies. Mobile robots are widely used for surveillance, guidance, transportation and entertainment tasks, as well as medical applications. This Special Issue intends to concentrate on recent developments concerning mobile robots and the research surrounding them to enhance studies on the fundamental problems observed in the robots. Various multidisciplinary approaches and integrative contributions including navigation, learning and adaptation, networked system, biologically inspired robots and cognitive methods are welcome contributions to this Special Issue, both from a research and an application perspective.

Advanced Mobile Robotics IGI Global

The subject of this book is model abstraction of dynamical systems. The p- mary goal of the work embodied in this book is to design a controller for the mobile robotic car using abstraction. Abstraction provides a means to rep- sent the dynamics of a system using a simpler model while retaining important characteristics of the original system. A second goal of this work is to study the propagation of uncertain initial conditions in the framework of abstraction. The summation of this work is presented in this book. It includes the following: • An overview of the history and current research in mobile robotic control design. • A mathematical review that provides the tools used in this research area. • The development of the robotic car model and both controllers used in the new control design. • A review of abstraction and an extension of these ideas into new system relationship characterizations called traceability and -traceability. • A framework for designing controllers based on abstraction. • An open-loop control design with simulation results. • An investigation of system abstraction with uncertain initial conditions.

Mobile Robotics Elsevier

This book provides state-of-the-art scientific and engineering research findings and developments in the area of mobile robotics and associated support technologies. The book contains peer reviewed articles presented at the CLAWAR 2010 conference. Robots are no longer confined to industrial manufacturing environments. A great deal of interest is invested in the use of robots outside the factory environment. The CLAWAR conference series, established as a high profile international event, acts as a platform for dissemination of research and development findings and supports such a trend to address the current interest in mobile robotics to meet the needs of mankind in various sectors of the society. These include personal care, public health, and services in the domestic, public and industrial environments. The editors of the book have extensive research experience and publications in the area of robotics in general and in mobile robotics specifically, and their experience is reflected in editing the contents of the book.

Mobile Robotics for Multidisciplinary Study MDPI

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

Advanced Mobile Robotics Springer Science & Business Media

This book focuses on the performance of mobile robots through the use of multi-hierarchical symbolic representations of the environment. To perform deliberative actions, a robot must possess some symbolic representation of its workspace, but representations of real environments can become so large that they must be conveniently arranged to facilitate and, in some cases, make possible their use. Practical solutions tested on real robots, for example a robotic wheelchair, are provided.

Recent Advances in Mobile Robotics Butterworth-Heinemann

An introduction to the techniques and algorithms of the newest field in robotics. Probabilistic robotics is a new and growing area in robotics, concerned with perception and control in the face of uncertainty. Building on the field of mathematical statistics, probabilistic robotics endows robots with a new level of robustness in real-world situations. This book introduces the reader to a wealth of techniques and algorithms in the field. All algorithms are based on a single overarching mathematical foundation. Each chapter provides example implementations in pseudo code, detailed mathematical derivations, discussions from a practitioner's perspective, and extensive lists of exercises and class projects. The book's Web site, www.probabilistic-robotics.org, has additional material. The book is relevant for anyone involved in robotic software development and scientific research. It will also be of interest to applied statisticians and engineers dealing with real-world sensor data.

A Mathematical Introduction to Robotic Manipulation John Wiley & Sons

An introduction to the techniques and algorithms of the newest field in robotics. Probabilistic robotics is a new and growing area in robotics, concerned with perception and control in the face of uncertainty. Building on the field of mathematical statistics, probabilistic robotics endows robots with a new level of robustness in real-world situations. This book introduces the reader to a wealth of techniques and algorithms in the field. All algorithms are based on a single overarching mathematical foundation. Each chapter provides example implementations in pseudo code, detailed mathematical derivations, discussions from a practitioner's perspective, and extensive lists of exercises and class projects. The book's Web site, www.probabilistic-robotics.org, has additional material. The book is relevant for anyone involved in robotic software development and scientific research. It will also be of interest to applied statisticians and engineers dealing with real-world sensor data.

Designs and Prototypes of Mobile Robots MDPI

An important feature of this book is the particular combination of

topics included. These are (1) control, (2) navigation and (3) remote sensing, all with application to mobile robots. Much of the material is readily extended to any type ground vehicle. In the controls area, robot steering is the issue. Both linear and nonlinear models are treated. Various control schemes are utilized, and through these applications the reader is introduced to methods such as: (1) Linearization and use of linear control design methods for control about a reference trajectory, (2) Use of Lyapunov stability theory for nonlinear control design, (3) Derivation of optimal control strategies via Pontryagin's maximum principle, (4) Derivation of a local coordinate system which is fundamental for the steering of vehicles along a path never before traversed. This local coordinate system has application regardless of the control design methods utilized. In the navigation area, various coordinate systems are introduced, and the transformations among them are derived. (1) The Global Positioning System (GPS) is introduced and described in significant detail. (2) Also introduced and discussed are inertial navigation systems (INS). These two methods are treated in terms of their ability to provide vehicle position as well as attitude. A preceding chapter is devoted to coordinate rotations and transformations since they play an important role in the understanding of this body of theory.

Innovations in Robot Mobility and Control Springer

Mobile robotics is a challenging field with great potential. It covers disciplines including electrical engineering, mechanical engineering, computer science, cognitive science, and social science. It is essential to the design of automated robots, in combination with artificial intelligence, vision, and sensor technologies. Mobile robots are widely used for surveillance, guidance, transportation and entertainment tasks, as well as medical applications. This Special Issue intends to concentrate on recent developments concerning mobile robots and the research surrounding them to enhance studies on the fundamental problems observed in the robots. Various multidisciplinary approaches and integrative contributions including navigation, learning and adaptation, networked system, biologically inspired robots and cognitive methods are welcome contributions to this Special Issue, both from a research and an application perspective.

FastSLAM MIT Press

Numerous researches are being conducted in the field of robotics and mobile robots have always formed an essential part of such researches. Mobile robotics is a growing integrative field associated with several other fields like mechanical, electronic and electrical engineering, cognitive, social and computer sciences. It is associated with computational vision, robotics and artificial intelligence because of being involved in the design of automated systems. Mobile robotics is gradually becoming a stimulating area because of the efforts of various researchers. This book covers numerous topics by integrating contributions from many researchers around the globe. It lays stress on the computational techniques of programming mobile robots. It explores different aspects of theory and practice of robotics and consists of two sections: "Visual Perception, Mapping, Robot Localization, and Obstacle Avoidance" and "Path Planning and Motion Planning." It aims to serve as a guide to students and researchers studying mobile robots.

Recent Trends In Mobile Robots Springer Science & Business Media

A mobile robot is an automatic machine that is capable of moving around in a physical environment. Mobile robotics is a subfield of robotics and information engineering concerned with the research and development of mobile robots. This field integrates the technological advancements in machine learning with physical environment, which enables the mobile robots to navigate their surroundings. Mobile robots can be classified into autonomous mobile robots and non-autonomous mobile robots. Autonomous robots do not require any external guidance for locomotion, while non-autonomous mobile robots move with the assistance of a guidance system. Mobile robots have applications in hospitals, industries and military. This book is a compilation of chapters that discuss the most vital concepts and emerging trends in the field of mobile robotics. A number of latest researches have been included to keep the readers up-to-date with the global concepts in this area of study. The book aims to serve as a resource guide for students and experts alike and contribute to the growth of the discipline.

Multiple Abstraction Hierarchies for Mobile Robot Operation in Large Environments Cambridge University Press

Introduction -- Math fundamentals -- Numerical methods -- Dynamics -- Optimal estimation -- State estimation -- Control -- Perception -- Localization and mapping -- Motion planning

Mobile Robots Navigation Cambridge University Press

Safe Robot Navigation Among Moving and Steady Obstacles is the first book to focus on reactive navigation algorithms in unknown dynamic environments with moving and steady obstacles. The first three chapters provide introduction and background on sliding mode control theory, sensor models, and vehicle kinematics. Chapter 4 deals with the problem of optimal navigation in the presence of obstacles. Chapter 5 discusses the problem of reactively navigating. In Chapter 6, border patrolling algorithms are applied to a more general problem of reactively navigating. A method for guidance of a Dubins-like mobile robot is presented in Chapter 7. Chapter 8 introduces and studies a simple biologically-inspired strategy for navigation a Dubins-car. Chapter 9 deals with a hard scenario where the environment of operation is cluttered with obstacles that may undergo arbitrary motions, including rotations and deformations. Chapter 10 presents a novel reactive algorithm for collision free navigation of a nonholonomic robot in unknown complex dynamic environments with moving obstacles. Chapter 11 introduces and examines a novel purely reactive algorithm to navigate a planar mobile robot in densely cluttered environments with unpredictably moving and deforming obstacles. Chapter 12 considers a multiple robot scenario. For the Control and Automation Engineer, this book offers accessible and precise development of important mathematical models and results. All the presented results have mathematically rigorous proofs. On the other hand, the Engineer in Industry can benefit by the experiments with real robots such as Pioneer robots, autonomous wheelchairs and autonomous mobile hospital. First book on collision free reactive robot navigation in unknown dynamic environments Bridges the gap between mathematical model and practical algorithms Presents implementable and computationally efficient algorithms of robot navigation Includes mathematically rigorous proofs of their convergence A detailed review of existing reactive navigation algorithm for obstacle avoidance Describes fundamentals of sliding mode control

Introduction to Autonomous Mobile Robots, second edition Springer

Introduction to Mobile Robot Control provides a complete and concise study of modeling, control, and navigation methods for wheeled non-holonomic and omnidirectional mobile robots and manipulators. The book begins with a study of mobile robot drives and corresponding kinematic and dynamic models, and discusses the sensors used in mobile robotics. It then examines a variety of model-based, model-free, and vision-based controllers with unified proof of their stabilization and tracking performance, also addressing the problems of path, motion, and task planning,

along with localization and mapping topics. The book provides a host of experimental results, a conceptual overview of systemic and software mobile robot control architectures, and a tour of the use of wheeled mobile robots and manipulators in industry and society. Introduction to Mobile Robot Control is an essential reference, and is also a textbook suitable as a supplement for many university robotics courses. It is accessible to all and can be used as a reference for professionals and researchers in the mobile robotics field. Clearly and authoritatively presents mobile robot concepts Richly illustrated throughout with figures and examples Key concepts demonstrated with a host of experimental and simulation examples No prior knowledge of the subject is required; each chapter commences with an introduction and background

Scientific Methods in Mobile Robotics BoD – Books on Demand

Mobile Robotics presents the different tools and methods that enable the design of mobile robots; a discipline booming with the emergence of flying drones, underwater mine-detector robots, robot sailboats and vacuum cleaners. Illustrated with simulations, exercises and examples, this book describes the fundamentals of modeling robots, developing the concepts of actuators, sensors, control and guidance. Three-dimensional simulation tools are also explored, as well as the theoretical basis for the reliable localization of robots within their environment. This revised and updated edition contains additional exercises and a completely new chapter on the Bayes filter, an observer that enhances our understanding of the Kalman filter and facilitates certain proofs.

Modern Robotics Momentum Press

"Programming Mobile Robots with Aria and Player" provides a guide to creating object-oriented C++ programs for robots using the Player and Aria APIs within a Linux environment. The book is supported throughout with examples, diagrams, sample programs, and configuration files. MobileRobot's Pioneers are used as vehicles throughout the book, but most of the techniques and programs that are demonstrated for Player are applicable to the other makes and models that the API supports. In addition, the Aria section is also appropriate for other robots made by MobileRobots. The book discusses how to install the various pieces of software needed and also describes how to: configure robots; control robots remotely; program each individual sensor and actuator; and set up and control robots. "Programming Mobile Robots with Aria and Player" serves as a complete text for undergraduate and postgraduate robotics programming modules, and is also an invaluable reference source for students, teachers and researchers. Additional material for this book can be found at http://extras.springer.com.

Handbook of Mobile Robotics Springer

This is a textbook for advanced undergraduate and graduate students in the field of mobile robotics. Emphasising computation and algorithms, the authors address a range of strategies for enabling robots to perform tasks that involve motion and behavior. The book is divided into three major sections: locomotion, sensing, and reasoning. It concentrates on wheeled and legged mobile robots, but discusses a variety of other propulsion systems. Kinematic models are developed for many of the more common locomotive strategies. It presents algorithms for both visual and nonvisual sensor technologies, including sonar, vision, and laser scanners. In the section on reasoning, the authors offer a thorough examination of planning and the issues related to spatial representation. They emphasize the problems of navigation, pose estimation, and autonomous exploration. The book is a comprehensive treatment of the field, offering a discussion of state-of-the art methods with illustrations of key technologies.

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