Probabilistic Robotics Intelligent Robotics And Autonomous Agents

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Introduction to AI Robotics, second edition
Selected Contributions of the Ninth International Workshop on the Algorithmic Foundations of Robotics
Mathematics, Models, and Methods
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Build intelligent robots that perform human tasks using AI techniques
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5th European Conference, ECAL'99, Lausanne, Switzerland, September 13-17, 1999 Proceedings
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Probabilistic Approaches to Robotic Perception

SHANIYA CHERRY

Robotics MIT Press

This open access book bridges the gap between playing with robots in school and studying robotics at the upper undergraduate and

graduate levels to prepare for careers in industry and research. Robotic algorithms are presented formally, but using only mathematics known by high-school and first-year college students, such as calculus, matrices and probability. Concepts and algorithms are explained through detailed diagrams and calculations. Elements of Robotics presents an overview of different types of robots and the components used to build robots, but focuses on robotic algorithms: simple algorithms like odometry and feedback control, as well as algorithms for advanced topics like localization, mapping, image processing, machine learning and swarm robotics. These algorithms are demonstrated in simplified contexts that enable detailed computations to be performed and feasible activities to be posed. Students who study these simplified demonstrations will be well prepared for advanced study of robotics. The algorithms are presented at a relatively abstract level, not tied to any specific robot. Instead a generic robot is defined that uses elements common to most educational robots: differential drive with two motors, proximity sensors and some method of displaying output to the user. The theory is supplemented with over 100 activities, most of which can be successfully

implemented using inexpensive educational robots. Activities that require more computation can be programmed on a computer. Archives are available with suggested implementations for the Thymio robot and standalone programs in Python.
A Dynamical Systems Approach Pearson Educación
Recent advances in RbD have identified a number of key issues for ensuring a generic approach to the transfer of skills across various agents and contexts. This book focuses on the two generic questions of what to imitate and how to imitate and proposes active teaching methods.
Robotics, Vision and Control Morgan & Claypool Publishers
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.

Experimental Robotics VI Springer Science & Business Media

This book presents the development of SLAM-based mobile robot control systems as an integrated approach that combines the localization, mapping and motion control fields, and reviews several techniques that represent the basics of the mathematical description of wheeled robots, their navigation and path planning approaches, localization and map creating techniques. It examines SLAM paradigms and Bayesian recursive state and map estimation techniques, which include Kalman and particle filtering, and enable the development of a SLAM-based integrated system for the inspection task performed. The system’s development is divided into two phases: a single-robot approach and multirobot inspection system. The book describes an original approach to 2D SLAM

in multi-floor buildings that covers each 2D level map, as well as continuous 3D pose tracking, and views the multirobot inspection system as a group of homogeneous mobile robots. The last part of the book is dedicated to multirobot map creation and the development of path planning solutions, which allow the robots' homogeneous behavior and configuration to be used to develop a multirobot system without theoretical limitations on the number of robots used.

Introduction to AI Robotics, second edition CRC Press

Want to develop novel robot applications, but don't know how to write a mapping or object-recognition system? You're not alone, but you're certainly not without help. By combining real-world examples with valuable knowledge from the Robot Operating System (ROS) community, this practical book provides a set of motivating recipes for solving specific robotics use cases. Ideal for enthusiasts, from students in robotics clubs to professional robotics scientists and engineers, each recipe describes a complete solution using ROS open source libraries and tools. You'll learn how to complete tasks described in the recipes, as well as how to configure and recombine components for other tasks. If you're familiar with Python, you're ready to go. Learn fundamentals,

including key ROS concepts, tools, and patterns Program robots that perform an increasingly complex set of behaviors, using the powerful packages in ROS See how to easily add perception and navigation abilities to your robots Integrate your own sensors, actuators, software libraries, and even a whole robot into the ROS ecosystem Learn tips and tricks for using ROS tools and community resources, debugging robot behavior, and using C++ in ROS

Selected Contributions of the Ninth International Workshop on the Algorithmic Foundations of Robotics Springer Nature

Develop an extendable smart robot capable of performing a complex series of actions with Python and Raspberry Pi Key Features Get up to speed with the fundamentals of robotic programming and build intelligent robots Learn how to program a voice agent to control and interact with your robot's behavior Enable your robot to see its environment and avoid barriers using sensors Book Description We live in an age where the most complex or repetitive tasks are automated. Smart robots have the potential to revolutionize how we perform all kinds of tasks with high accuracy and efficiency. With this second edition of Learn Robotics Programming, you'll see how a combination of the Raspberry Pi and

Python can be a great starting point for robot programming. The book starts by introducing you to the basic structure of a robot and shows you how to design, build, and program it. As you make your way through the book, you'll add different outputs and sensors, learn robot building skills, and write code to add autonomous behavior using sensors and a camera. You'll also be able to upgrade your robot with Wi-Fi connectivity to control it using a smartphone. Finally, you'll understand how you can apply the skills that you've learned to visualize, lay out, build, and code your future robot building projects. By the end of this book, you'll have built an interesting robot that can perform basic artificial intelligence operations and be well versed in programming robots and creating complex robotics projects using what you've learned. What you will learn Leverage the features of the Raspberry Pi OS Discover how to configure a Raspberry Pi to build an AI-enabled robot Interface motors and sensors with a Raspberry Pi Code your robot to develop engaging and intelligent robot behavior Explore AI behavior such as speech recognition and visual processing Find out how you can control AI robots with a mobile phone over Wi-Fi Understand how to choose the right parts and assemble your robot Who this book is for This second edition

of Learn Robotics Programming is for programmers, developers, and robotics enthusiasts who want to develop a fully functional robot and leverage AI to build interactive robots. Basic knowledge of the Python programming language will help you understand the concepts covered in this robot programming book more effectively. *Mathematics, Models, and Methods* Springer 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/explor atory 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.

Robot Programming by Demonstration MIT Press

A comprehensive introduction to new approaches in artificial intelligence and robotics that are inspired by self-organizing biological processes and structures. New approaches to artificial intelligence spring from the idea that intelligence emerges as much from cells, bodies, and societies as it does from evolution, development, and learning. Traditionally, artificial intelligence has been concerned with reproducing the abilities of human brains; newer approaches take inspiration from a wider range of biological structures that that are capable of autonomous self-organization. Examples of these new approaches include evolutionary computation and evolutionary electronics, artificial neural networks, immune systems, biorobotics, and swarm intelligence—to mention only a few. This book offers a comprehensive introduction to the emerging field of biologically inspired artificial intelligence that can be used as an upper-level text or as a reference for researchers. Each chapter presents computational approaches inspired by a different biological system; each begins with background information about the biological system and

then proceeds to develop computational models that make use of biological concepts. The chapters cover evolutionary computation and electronics; cellular systems; neural systems, including neuromorphic engineering; developmental systems; immune systems; behavioral systems—including several approaches to robotics, including behavior-based, bio-mimetic, epigenetic, and evolutionary robots; and collective systems, including swarm robotics as well as cooperative and competitive co-evolving systems. Chapters end with a concluding overview and suggested reading. *A Practical Introduction to the Robot Operating System* Springer A Survey on Policy Search for Robotics provides an overview of successful policy search methods in the context of robot learning, where high-dimensional and continuous state-action space challenge any Reinforcement Learning (RL) algorithm. It distinguishes between model-free and model-based policy search methods. Statistical Relational Artificial Intelligence Springer Science & Business Media Introduction -- Math fundamentals -- Numerical methods -- Dynamics -- Optimal estimation -- State estimation -- Control -- Perception -- Localization and mapping -- Motion planning

Introduction to Robotics Cambridge University Press
No matter what your perspective is, what your goals are, or how experienced you are, Artificial Life research is always a learning experience. The variety of phe nomena that the people who gathered in Lausanne reported and discussed for the fifth time since 1991 at the European Conference on Artificial Life (ECAL) has not been programmed, crafted, or assembled by analytic design. It has evolved, emerged, or appeared spontaneously from a process of artificial evolution, se-organisation, or development. Artificial Life is a field where biological and artificial sciences meet and blend together, where the dynamics of biological life are reproduced in the memory of computers, where machines evolve, behave, and communicate like living organ isms, where complex life-like entities are synthesised from electronic chromo somes and artificial chemistries. The impact of Artificial Life in science, phi losophy, and technology is tremendous. Over the years the synthetic approach has established itself as a powerful method for investigating several complex phenomena of life. From a philosophical standpoint, the notion of life and of in telligence is continuously reformulated in relation to the

dynamics of the system under observation and to the embedding environment, no longer a privilege of carbon-based entities with brains and eyes. At the same time, the possibility of engineering machines and software with life-like properties such as evolvability, self-repair, and self-maintainance is gradually becoming reality, bringing new perspectives in engineering and applications. *Robot Rover Visual Navigation* Springer 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.

Build intelligent robots that perform human tasks using AI techniques MIT Press

The Fifth International Symposium on Distributed Autonomous Robotic Systems (DARS 2000) dealt with new strategies to realize complex, modular, robust, and fault-tolerant robotic systems. Technologies, algorithms, and system architectures for distributed autonomous robotic systems were presented and discussed during the meeting. DARS 2000 was truly an international event, with participants represent ing eleven countries from Europe, Asia, and the Americas. All of the papers in this volume were presented at DARS 2000, and were selected on the basis of peer re views to ensure quality and relevance. These papers have the common goal of con tributing solutions to realize robust and intelligent multirobot systems. The topics of the symposium address a wide range of issues that are important in the

development of decentralized robotic systems. These topics include architec tures, communication, biological inspirations, reconfigurable robots, localization, exploration and mapping, distributed sensing, multi robot motion coordination, tar get assignment and tracking, multirobot learning, and cooperative object transport. DARS clearly requires a broad area of interdisciplinary technologies related not only to robotics and computer engineering, but also to biology and psychology. The DARS symposium is the leading established conference on distributed au tonomous systems. The First, Second, and Third International Symposia on Distrib uted Autonomous Robotic Systems (DARS '92, DARS '94, and DARS '96) were held at the Institute of Physical and Chemical Research (RIKEN), Saitama, Japan.

Artificial Intelligence for Robotics Springer Bring a new degree of interconnectivity to your world by building your own intelligent robots Key Features Leverage fundamentals of AI and robotics Work through use cases to implement various machine learning algorithms Explore Natural Language Processing (NLP) concepts for efficient decision making in robots Book Description Artificial Intelligence for Robotics starts with an introduction to Robot Operating Systems

(ROS), Python, robotic fundamentals, and the software and tools that are required to start out with robotics. You will learn robotics concepts that will be useful for making decisions, along with basic navigation skills. As you make your way through the chapters, you will learn about object recognition and genetic algorithms, which will teach your robot to identify and pick up an irregular object. With plenty of use cases throughout, you will explore natural language processing (NLP) and machine learning techniques to further enhance your robot. In the concluding chapters, you will learn about path planning and goal-oriented programming, which will help your robot prioritize tasks. By the end of this book, you will have learned to give your robot an artificial personality using simulated intelligence. What you will learn Get started with robotics and artificial intelligence Apply simulation techniques to give your robot an artificial personality Understand object recognition using neural networks and supervised learning techniques Pick up objects using genetic algorithms for manipulation Teach your robot to listen using NLP via an expert system Use machine learning and computer vision to teach your robot how to avoid obstacles Understand path planning, decision trees, and search algorithms in order to enhance your robot

Who this book is for If you have basic knowledge about robotics and want to build or enhance your existing robot's intelligence, then Artificial Intelligence for Robotics is for you. This book is also for enthusiasts who want to gain knowledge of AI and robotics.

Probabilistic Robotics MIT Press 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.

Programming Robots with ROS Springer

An easy-to-follow guide that will help you build robots using with ease KEY FEATURES ● Simplified coverage on fundamentals of building a robot platform. ● Learn to program Raspberry Pi for interacting with hardware. ● Cutting-edge coverage on autonomous motion, mapping, and path planning algorithms for advanced robotics. DESCRIPTION Practical Robotics in C++ teaches the complete spectrum of Robotics, right from the setting up a computer for a robot controller to putting power to the wheel motors. The book brings you the workshop knowledge of the electronics, hardware, and software for building a mobile robot platform. You will learn how to use sensors to detect obstacles, how to train your robot to build itself a map and plan an obstacle-avoiding path, and how to structure your code for modularity and interchangeability with other robot projects. Throughout the book, you can experience the demonstrations of complete coding of robotics with the use of simple and clear C++ programming. In addition, you will explore how to leverage the Raspberry Pi GPIO hardware interface pins and existing libraries to make an incredibly capable machine on the most affordable computer platform ever. WHAT YOU WILL LEARN ● Write code

for the motor drive controller. ● Build a Map from Lidar Data. ● Write and implement your own autonomous path-planning algorithm. ● Write code to send path waypoints to the motor drive controller autonomously. ● Get to know more about robot mapping and navigation. WHO THIS BOOK IS FOR This book is most suitable for C++ programmers who have keen interest in robotics and hardware programming. All you need is just a good understanding of C++ programming to get the most out of this book. TABLE OF CONTENTS 1. Choose and Set Up a Robot Computer 2. GPIO Hardware Interface Pins Overview and Use 3. The Robot Platform 4. Types of Robot Motors and Motor Control 5. Communication with Sensors and other Devices 6. Additional Helpful Hardware 7. Adding the Computer to Control your Robot 8. Robot Control Strategy 9. Coordinating the Parts 10. Maps for Robot Navigation 11. Robot Tracking and Localization 12. Autonomous Motion 13. Autonomous Path Planning 14. Wheel Encoders for Odometry 15. Ultrasonic Range Detectors 16. IMUs: Accelerometers, Gyroscopes, and Magnetometers 17. GPS and External Beacon Systems 18. LIDAR Devices and Data 19. Real Vision with Cameras 20. Sensor Fusion 21. Building and Programming an

Autonomous Robot *Robotics and Cognitive Approaches to Spatial Mapping* Cambridge University Press
Probabilistic RoboticsMIT Press
Elements of Robotics Springer Science & Business Media
A modern look at state estimation, targeted at students and practitioners of robotics, with emphasis on three-dimensional applications.
Factor Graphs for Robot Perception Packt Publishing Ltd
Robotics is at the cusp of dramatic transformation. Increasingly complex robots with unprecedented autonomy are finding new applications, from medical surgery, to construction, to home services. Against this background, the algorithmic foundations of robotics are becoming more crucial than ever, in order to build robots that are fast, safe, reliable, and adaptive. Algorithms enable robots to perceive, plan, control, and learn. The design and analysis of robot algorithms raise new fundamental questions that span computer science, electrical engineering, mechanical engineering, and mathematics. These algorithms are also finding applications beyond robotics, for example, in modeling molecular motion and creating digital characters for video games and architectural simulation. The Workshop on Algorithmic

Foundations of Robotics (WAFR) is a highly selective meeting of leading researchers in the field of robot algorithms. Since its creation in 1994, it has published some of the field's most important and lasting contributions. This book contains the proceedings of the 9th WAFR, held on December 13-15, 2010 at the National University of Singapore. The 24 papers included in this book span a wide variety of topics from new theoretical insights to novel applications.

Mechanics and Control

MIT Press

Reviews the use of factor graphs for the modeling and solving of large-scale inference problems in robotics. Factor graphs are introduced as an economical representation within which to formulate the different inference problems, setting the stage for the subsequent sections on practical methods to solve them.

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