Features Robots

Gordon McComb

Handling Uncertainty and Networked Structure in Robot Control Lucian Buşoniu,Levente Tamás,2016-02-06 This book focuses on two challenges posed in robot control by the increasing adoption of robots in the everyday human environment: uncertainty and networked communication. Part I of the book describes learning control to address environmental uncertainty. Part II discusses state estimation, active sensing, and complex scenario perception to tackle sensing uncertainty. Part III completes the book with control of networked robots and multi-robot teams. Each chapter features in-depth technical coverage and case studies highlighting the applicability of the techniques, with real robots or in simulation. Platforms include mobile ground, aerial, and underwater robots, as well as humanoid robots and robot arms. Source code and experimental data are available at http://extras.springer.com. The text gathers contributions from academic and industry experts, and offers a valuable resource for researchers or graduate students in robot control and perception. It also benefits researchers in related areas, such as computer vision, nonlinear and learning control, and multi-agent systems.

Mobile Robot Localization and Map Building Jose A. Castellanos,Juan D. Tardós,2012-12-06 During the last decade, many researchers have dedicated their efforts to constructing revolutionary machines and to providing them with forms of artificial intelligence to perform some of the most hazardous, risky or monotonous tasks historically assigned to human beings. Among those machines, mobile robots are undoubtedly at the cutting edge of current research directions. A rough classification of mobile robots can be considered: on the one hand, mobile robots oriented to human-made indoor

environments; on the other hand, mobile robots oriented to unstructured outdoor environments, which could include flying oriented robots, space-oriented robots and underwater robots. The most common motion mechanism for surface mobile robots is the wheel-based mechanism, adapted both to flat surfaces, found in human-made environments, and to rough terrain, found in outdoor environments. However, some researchers have reported successful developments with leg-based mobile robots capable of climbing up stairs, although they require further investigation. The research work presented here focuses on wheel-based mobile robots that navigate in human-made indoor environments. The main problems described throughout this book are: Representation and integration of uncertain geometric information by means of the Symmetries and Perturbations Model (SPmodel). This model combines the use of probability theory to represent the imprecision in the location of a geometric element, and the theory of symmetries to represent the partiality due to characteristics of each type of geometric element. A solution to the first location problem, that is, the computation of an estimation for the mobile robot location when the vehicle is completely lost in the environment. The problem is formulated as a search in an interpretation tree using efficient matching algorithms and geometric constraints to reduce the size of the solution space. The book proposes a new probabilistic framework adapted to the problem of simultaneous localization and map building for mobile robots: the Symmetries and Perturbations Map (SPmap). This framework has been experimentally validated by a complete experiment which profited from ground-truth to accurately validate the precision and the appropriateness of the approach. The book emphasizes the generality of the solutions proposed to the different problems and their independence with respect to the exteroceptive

sensors mounted on the mobile robot. Theoretical results are complemented by real experiments, where the use of multisensor-based approaches is highlighted.

Designing Sociable Robots Cynthia Breazeal,2004-08-20 Cynthia Breazeal here presents her vision of the sociable robot of the future, a synthetic creature and not merely a sophisticated tool. A sociable robot will be able to understand us, to communicate and interact with us, to learn from us and grow with us. It will be socially intelligent in a humanlike way. Eventually sociable robots will assist us in our daily lives, as collaborators and companions. Because the most successful sociable robots will share our social characteristics, the effort to make sociable robots is also a means for exploring human social intelligence and even what it means to be human. Breazeal defines the key components of social intelligence for these machines and offers a framework and set of design issues for their realization. Much of the book focuses on a nascent sociable robot she designed named Kismet. Breazeal offers a concrete implementation for Kismet, incorporating insights from the scientific study of animals and people, as well as from artistic disciplines such as classical animation. This blending of science, engineering, and art creates a lifelike quality that encourages people to treat Kismet as a social creature rather than just a machine. The book includes a CD-ROM that shows Kismet in action.

Robots and People Jeff de la Rosa,2023-04-06 Do you wonder about how robots might exist alongside people? How can robots help us live better, more fulfilling lives? This book will introduce readers to the ways that robots can assist humans and help us accomplish tasks we can't do alone. They'll learn about robot astronauts, humanoid robots, androids, the uncanny valley,

the Turing test, and more! The Hello, My Name Is feature will introduce students to a variety of reallife robots and their capabilities and features. For more content on the technical world of robots, check out other titles in the STEMfocused Robots series!

Whole-Body Control for Multi-Contact Balancing of Humanoid Robots Bernd Henze,2021-11-03 This book aims at providing algorithms for balance control of legged, torque-controlled humanoid robots. A humanoid robot normally uses the feet for locomotion. This paradigm is extended by addressing the challenge of multi-contact balancing, which allows a humanoid robot to exploit an arbitrary number of contacts for support. Using multiple contacts increases the size of the support polygon, which in turn leads to an increased robustness of the stance and to an increased kinematic workspace of the robot. Both are important features for facilitating a transition of humanoid robots from research laboratories to real-world applications, where they are confronted with multiple challenging scenarios, such as climbing stairs and ladders, traversing debris, handling heavy loads, or working in confined spaces. The distribution of forces and torques among the multiple contacts is a challenging aspect of the problem, which arises from the closed kinematic chain given by the robot and its environment.

Smart Robotics with LEGO MINDSTORMS Robot Inventor Aaron Maurer,2021-05-07 Discover how to use the LEGO MINDSTORMS Inventor kit and boost your confidence in robotics Key FeaturesGain confidence in building robots using creative designsLearn advanced robotic features and find out how to integrate them to build a robotWork with the block coding language used in robotics software in a practical wayBook Description LEGO MINDSTORMS Robot Inventor is the latest addition to the LEGO MINDSTORMS theme. It features unique designs

that you can use to build robots, and also enable you to perform activities using the robot inventor application. You'll begin by exploring the history of LEGO MINDSTORMS, and then delve into various elements of the Inventor kit. Moving on, you'll start working on different projects which will prepare you to build a variety of smart robots. The first robotic project involves designing a claw to grab objects, and helps you to explore how a smart robot is used in everyday life and in industry. The second project revolves around building a working guitar that can be played and modified to meet the needs of the user. As you advance, you'll explore the concept of biomimicry as you discover how to build a scorpion robot. In addition to this, you'll also work on a classic robotic challenge by building a sumobot. Throughout the book, you'll come across a variety of projects that will provide you with hands-on experience in building creative robots, such as building a Dragster, Egg Decorator, and Plankton from Spongebob Squarepants. By the end of this LEGO book, you'll have got to grips with the concepts behind building a robot, and also found creative ways to integrate them using the application based on your creative insights and ideas. What you will learnDiscover how the Robot Inventor kit works, and explore its parts and the elements inside themDelve into the block coding language used to build robotsFind out how to create interactive robots with the help of sensorsUnderstand the importance of real-world robots in today's landscapeRecognize different ways to build new ideas based on existing solutionsDesign basic to advanced level robots using the Robot Inventor kitWho this book is for This book is for robot enthusiasts, LEGO lovers, hobbyists, educators, students, and anyone looking to learn about the new LEGO Robot Inventor kit. This book is designed to go beyond the basic build through to intermediate and advanced builds, and enables you to

add your personal flair to the builds and codes.

Raspberry Pi Robotic Blueprints Richard Grimmett,2015-10-30 Utilize the powerful ingredients of Raspberry Pi to bring to life your amazing robots that can act, draw, and have fun with laser tags About This Book Learn to implement a number of features offered by Raspberry Pi to build your own amazing robots Understand how to add vision and voice to your robots. This fast-paced practical guide comprises a number of creative projects to take your Raspberry Pi knowledge to the next level Who This Book Is For This all-encompassing guide was created for anyone who is interested in expanding their knowledge in applying the peripherals of Raspberry Pi. If you have a fancy for building complex-looking robots with simple, inexpensive, and readily available hardware, then this book is ideal for you. Prior understanding of Raspberry Pi with simple mechanical systems is recommended. What You Will Learn Add sensors to your robot so that it can sense the world around it Know everything there is to know about accessing motors and servos to provide movement to the robotic platform Explore the feature of adding vision to your robot so it can “see” the world around it Refine your robot with the skill of speech recognition so that it can receive commands Polish your robot by adding speech output so it can communicate with the world around it Maximize the use of servos in Raspberry Pi to create a drawing robot Strengthen your robot by adding wireless communication skills so you can see what the robot is seeing and control it from a distance Build an unbelievable autonomous hexcopter controlled by Raspberry Pi In Detail The Raspberry Pi is a series of credit card-sized single-board computers developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi

is known as a tiny computer built on a single circuit board. It runs a Linux operating system, and has connection ports for various peripherals so that it can be hooked up to sensors, motors, cameras, and more. Raspberry Pi has been hugely popular among hardware hobbyists for various projects, including robotics. This book gives you an insight into implementing several creative projects using the peripherals provided by Raspberry Pi. To start, we'll walk through the basic robotics concepts that the world of Raspberry Pi offers us, implementing wireless communication to control your robot from a distance. Next, we demonstrate how to build a sensible and a visionary robot, maximizing the use of sensors and step controllers. After that, we focus on building a wheeled robot that can draw and play hockey. To finish with a bang, we'll build an autonomous hexcopter, that is, a flying robot controlled by Raspberry Pi. By the end of this book, you will be a maestro in applying an array of different technologies to create almost any imaginable robot. Style and approach This book is an easy-to-follow, project-based guide that throws you directly into the action of creating almost any imaginable robot through blueprints. It is full of step by step instructions and screenshots to help you build amazing robots in no time at all.

Robot Dorling Kindersley Publishing Staff,Laura Buller,Clive Gifford,Andrea Mills,2018-09-03 The future is here - are you ready for it? From mechanical automata to modern-day androids, explore more than 100 robots and discover how they work, who made them, and how they affect the lives of humans around the world. From drones used in battle to robot helpers taking care of hospital patients, Robot shows how robotics and artificial intelligence (AI) are becoming part of everyday life. Each robot, including service robots packing food and rescue robots finding people after a disaster, has its own

profile to explain its features and uses.The book is divided into clear sections by the jobs a robot might do, so it's easy to compare and find out about robots from different areas of science and life. There are also focused articles on specific features of robotics, such as the ability to learn, which will help you learn more about the technology behind these fascinating machines.Packed with vibrant graphics, punchy colours, and a mind-bending array of information, this book makes one thing clear- the robot revolution is here to stay

Building Smart LEGO MINDSTORMS EV3 Robots Kyle Markland,2018-04-04 Build and program smart robots with the EV3. Key Features Efficiently build smart robots with the LEGO MINDSTORMS EV3 Discover building techniques and programming concepts that are used by engineers to prototype robots in the real world This project-based guide will teach you how to build exciting projects such as the objecta-tracking tank, ultimate all-terrain vehicle, remote control race car, or even a GPS-navigating autonomous vehicle Book Description Smart robots are an ever-increasing part of our daily lives. With LEGO MINDSTORMS EV3, you can now prototype your very own small-scale smart robot that uses specialized programming and hardware to complete a mission. EV3 is a robotics platform for enthusiasts of all ages and experience levels that makes prototyping robots accessible to all. This book will walk you through six different projects that range from intermediate to advanced level. The projects will show you building and programming techniques that are used by engineers in the real world, which will help you build your own smart robot. You'll see how to make the most of the EV3 robotics platform and build some awesome smart robots. The book starts by introducing some real-world examples of smart robots. Then, we'll walk you through six different

projects and explain the features that allow these robots to make intelligent decisions. The book will guide you as you build your own object-tracking tank, a box-climbing robot, an interactive robotic shark, a quirky bipedal robot, a speedy remote control race car, and a GPS-navigating robot. By the end of this book, you'll have the skills necessary to build and program your own smart robots with EV3. What you will learn Understand the characteristics that make a robot smart Grasp proportional beacon following and use proximity sensors to track an object Discover how mechanisms such as rack-and-pinion and the worm gear work Program a custom GUI to make a robot more user friendly Make a fun and quirky interactive robot that has its own personality Get to know the principles of remote control and programming car-style steering Understand some of the mechanisms that enable a car to drive Navigate to a destination with a GPS receiver Who this book is for This book is for hobbyists, robotic engineers, and programmers who understand the basics of the EV3 programming language and are familiar with building with LEGO Technic and want to try some advanced projects. If you want to learn some new engineering techniques and take your experience with the EV3 to the next level, then this book is for you.

Robot Manipulators Etienne Dombre,Wisama Khalil,2013-03-01 This book presents the most recent research results on modeling andcontrol of robot manipulators. Chapter 1 gives unified tools to derive direct andinverse geometric, kinematic and dynamic models of serial robotsand addresses the issue of identification of the geometric anddynamic parameters of these models. Chapter 2 describes the main features of serial robots,the different architectures and the methods used to obtain directand inverse geometric, kinematic and dynamic models, paying specialattention to singularity

analysis. Chapter 3 introduces global and local tools forperformance analysis of serial robots. Chapter 4 presents an original optimization techniquefor point-to-point trajectory generation accounting for robotdynamics. Chapter 5 presents standard control techniques in thejoint space and task space for free motion (PID, computed torque,adaptive dynamic control and variable structure control) andconstrained motion (compliant force-position control). In Chapter 6, the concept of vision-based control isdeveloped and Chapter 7 is devoted to specific issue ofrobots with flexible links. Efficient recursive Newton-Euleralgorithms for both inverse and direct modeling are presented, aswell as control methods ensuring position setting and vibrationdamping.

Visual Perception for Humanoid Robots David Israel González Aguirre,2018-09-01 This book provides an overview of model-based environmental visual perception for humanoid robots. The visual perception of a humanoid robot creates a bidirectional bridge connecting sensor signals with internal representations of environmental objects. The objective of such perception systems is to answer two fundamental questions: What & where is it? To answer these questions using a sensor-to-representation bridge, coordinated processes are conducted to extract and exploit cues matching robot's mental representations to physical entities. These include sensor & actuator modeling, calibration, filtering, and feature extraction for state estimation. This book discusses the following topics in depth: • Active Sensing: Robust probabilistic methods for optimal, high dynamic range image acquisition are suitable for use with inexpensive cameras. This enables ideal sensing in arbitrary environmental conditions encountered in human-centric spaces. The book quantitatively shows the importance of equipping robots with

dependable visual sensing. • Feature Extraction & Recognition: Parameter-free, edge extraction methods based on structural graphs enable the representation of geometric primitives effectively and efficiently. This is done by eccentricity segmentation providing excellent recognition even on noisy & low-resolution images. Stereoscopic vision, Euclidean metric and graph-shape descriptors are shown to be powerful mechanisms for difficult recognition tasks. • Global Self-Localization & Depth Uncertainty Learning: Simultaneous feature matching for global localization and 6D self-pose estimation are addressed by a novel geometric and probabilistic concept using intersection of Gaussian spheres. The path from intuition to the closed-form optimal solution determining the robot location is described, including a supervised learning method for uncertainty depth modeling based on extensive ground-truth training data from a motion capture system. The methods and experiments are presented in self-contained chapters with comparisons and the state of the art. The algorithms were implemented and empirically evaluated on two humanoid robots: ARMAR III-A & B. The excellent robustness, performance and derived results received an award at the IEEE conference on humanoid robots and the contributions have been utilized for numerous visual manipulation tasks with demonstration at distinguished venues such as ICRA, CeBIT, IAS, and Automatica.

Selected Topics in Micro/Nano-robotics for Biomedical Applications Yi Guo,2012-09-26 Micro/Nano-robotics for Biomedical Applications features a system approach and incorporates modern methodologies in autonomous mobile robots for programmable and controllable micro/nano-robots aiming at biomedical applications. The book provides chapters of instructional materials in micro/nanorobotics for biomedical applications. The book

features lecture units on micro/nanorobot components and techniques, including sensors, actuator, power supply, and micro/nano-fabrication and assembly. It also contains case studies on using micro/nano-robots in biomedical environments and in biomedicine, as well as a design example to conceptually develop a Vitamin-pill sized robot to enter human's gastrointestinal tract. Laboratory modules to teach robot navigation and cooperation methods suitable to biomedical applications will be also provided based on existing simulation and robot platforms.

Robot Vision A. Pugh,2013-06-29 Over the past five years robot vision has emerged as a subject area with its own identity. A text based on the proceedings of the Symposium on Computer Vision and Sensor-based Robots held at the General Motors Research Laboratories, Warren, Michigan in 1978, was published by Plenum Press in 1979. This book, edited by George G. Dodd and Lothar Rosso!, probably represented the first identifiable book covering some aspects of robot vision. The subject of robot vision and sensory controls (RoViSeC) occupied an entire international conference held in the Hilton Hotel in Stratford, England in May 1981. This was followed by a second RoViSeC held in Stuttgart, Germany in November 1982. The large attendance at the Stratford conference and the obvious interest in the subject of robot vision at international robot meetings, provides the stimulus for this current collection of papers. Users and researchers entering the field of robot vision for the first time will encounter a bewildering array of publications on all aspects of computer vision of which robot vision forms a part. It is the grey area dividing the different aspects of computer vision which is not easy to identify. Even those involved in research sometimes find difficulty in separating the essential differences between vision for

automated inspection and vision for robot applications. Both of these are to some extent applications of pattern recognition with the underlying philosophy of each defining the techniques used.

Human-Robot Interaction Paolo Barattini,Federico Vicentini,Gurvinder Singh Virk,Tamas Haidegger,2019-04-12 Human-Robot Interaction: Safety, Standardization, and Benchmarking provides a comprehensive introduction to the new scenarios emerging where humans and robots interact in various environments and applications on a daily basis. The focus is on the current status and foreseeable implications of robot safety, approaching these issues from the standardization and benchmarking perspectives. Featuring contributions from leading experts, the book presents state-of-the-art research, and includes real-world applications and use cases. It explores the key leading sectors—robotics, service robotics, and medical robotics—and elaborates on the safety approaches that are being developed for effective human-robot interaction, including physical robot-human contacts, collaboration in task execution, workspace sharing, human-aware motion planning, and exploring the landscape of relevant standards and guidelines. Features Presenting a comprehensive introduction to human-robot interaction in a number of domains, including industrial robotics, medical robotics, and service robotics Focusing on robot safety standards and benchmarking Providing insight into current developments in international standards Featuring contributions from leading experts, actively pursuing new robot development

Robot Operating System (ROS) Anis Koubaa,2020-08-21 This book is the fifth volume in the successful book series Robot Operating System: The Complete Reference. The objective of the book is to provide the reader with

comprehensive coverage on the Robot Operating System (ROS), which is currently considered to be the primary development framework for robotics applications, and the latest trends and contributing systems. The content is divided into six parts. Pat I presents for the first time the emerging ROS 2.0 framework, while Part II focuses on multi-robot systems, namely on SLAM and Swarm coordination. Part III provides two chapters on autonomous systems, namely self-driving cars and unmanned aerial systems. In turn, Part IV addresses the contributions of simulation frameworks for ROS. In Part V, two chapters explore robotic manipulators and legged robots. Finally, Part VI presents emerging topics in monocular SLAM and a chapter on fault tolerance systems for ROS. Given its scope, the book will offer a valuable companion for ROS users and developers, helping them deepen their knowledge of ROS capabilities and features.

Recent Advances in Robot Learning Judy A. Franklin,Tom M. Mitchell,Sebastian Thrun,2012-12-06 Recent Advances in Robot Learning contains seven papers on robot learning written by leading researchers in the field. As the selection of papers illustrates, the field of robot learning is both active and diverse. A variety of machine learning methods, ranging from inductive logic programming to reinforcement learning, is being applied to many subproblems in robot perception and control, often with objectives as diverse as parameter calibration and concept formulation. While no unified robot learning framework has yet emerged to cover the variety of problems and approaches described in these papers and other publications, a clear set of shared issues underlies many robot learning problems. Machine learning, when applied to robotics, is situated: it is embedded into a real-world system that tightly integrates perception, decision making and execution. Since

robot learning involves decision making, there is an inherent active learning issue. Robotic domains are usually complex, yet the expense of using actual robotic hardware often prohibits the collection of large amounts of training data. Most robotic systems are real-time systems. Decisions must be made within critical or practical time constraints. These characteristics present challenges and constraints to the learning system. Since these characteristics are shared by other important real-world application domains, robotics is a highly attractive area for research on machine learning. On the other hand, machine learning is also highly attractive to robotics. There is a great variety of open problems in robotics that defy a static, hand-coded solution. Recent Advances in Robot Learning is an edited volume of peer-reviewed original research comprising seven invited contributions by leading researchers. This research work has also been published as a special issue of Machine Learning (Volume 23, Numbers 2 and 3).

How to Make a Robot Gordon McComb,2018-03-15 Learn the basics of modern robotics while building your own intelligent robot from scratch! You'll use inexpensive household materials to make the base for your robot, then add motors, power, wheels, and electronics. But wait, it gets better: your creation is actually five robots in one! -- build your bot in stages, and add the features you want. Vary the functions to create a robot that's uniquely yours. Mix and match features to make your own custom robot: Flexible Motorized Base -- a playpen for all kinds of programming experiments Obstacle Detector -- whiskers detect when your robot has bumped into things Object Avoider -- ultrasonic sound lets your robot see what's in front of it Infrared Remote Control -- command your robot from your easy chair Line Follower -- use optics to navigate your bot; have races with other robot

builders! You will learn how switches, ultrasonics, infrared detectors, and optical sensors work. Install an Arduino microcontroller board and program your robot to avoid obstacles, provide feedback with lights and sound, and follow a tracking line. In this book you will combine multiple disciplines -- electronics, programming, and engineering -- to successfully build a multifunctional robot. You'll discover how to: construct a motorized base set up an Arduino to function as the brain use whisker switches to detect physical contact avoid obstacles with ultrasonic sensors teach your robot to judge distances use a universal remote to control your robot install and program a servo motor respond to input with LEDs, buzzers, and tones mount line-following sensors under your robot And more. Everything is explained with lots and lots of full-color line drawings. No prior experience is necessary. You'll have fun while you learn a ton!

Robot Operating System (ROS) Anis Koubaa,2016-02-09 The objective of this book is to provide the reader with a comprehensive coverage on the Robot Operating Systems (ROS) and latest related systems, which is currently considered as the main development framework for robotics applications. The book includes twenty-seven chapters organized into eight parts. Part 1 presents the basics and foundations of ROS. In Part 2, four chapters deal with navigation, motion and planning. Part 3 provides four examples of service and experimental robots. Part 4 deals with real-world deployment of applications. Part 5 presents signal-processing tools for perception and sensing. Part 6 provides software engineering methodologies to design complex software with ROS. Simulations frameworks are presented in Part 7. Finally, Part 8 presents advanced tools and frameworks for ROS including multi-master extension, network introspection, controllers and cognitive systems. This

book will be a valuable companion for ROS users and developers to learn more ROS capabilities and features.

Robot Operating System (ROS) Anis Koubaa,2019-06-28 This is the fourth volume of the successful series Robot Operating Systems: The Complete Reference, providing a comprehensive overview of robot operating systems (ROS), which is currently the main development framework for robotics applications, as well as the latest trends and contributed systems. The book is divided into four parts: Part 1 features two papers on navigation, discussing SLAM and path planning. Part 2 focuses on the integration of ROS into quadcopters and their control. Part 3 then discusses two emerging applications for robotics: cloud robotics, and video stabilization. Part 4 presents tools developed for ROS; the first is a practical alternative to the roslaunch system, and the second is related to penetration testing. This book is a valuable resource for ROS users and wanting to learn more about ROS capabilities and features.

Robots That Talk and Listen Judith Markowitz,2015-01-29 The book provides a forward-looking examination of speech and language in robots from technical, functional, and social perspectives.Contributors address cultural foundations as well as the linguistic skills and technical features robots need for engaging in a dialogue.

Ignite the flame of optimism with is motivational masterpiece, **Features Robots** . In a downloadable PDF format (PDF Size: *), this ebook is a beacon of encouragement. Download now and let the words propel you towards a brighter, more motivated tomorrow.

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