Introduction To Mobile Robot Control Elsevier Insights

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Mobile Robotics: A Practical Introduction
Computational Principles of Mobile Robotics

ALEAH CARNEY

Mobile Microrobotics Springer Science & Business Media
Introducing mobile humanoid robots into human environments requires the systems to physically interact and execute multiple concurrent tasks. The monograph at hand presents a whole-body torque controller for dexterous and safe robotic manipulation. This control approach enables a mobile humanoid robot to simultaneously meet several control objectives with different pre-defined levels of priority, while providing the skills for compliant physical contacts with humans and the environment. After a general introduction into the topic of whole-body control, several essential reactive tasks are developed to extend the repertoire of robotic control objectives. Additionally, the classical Cartesian impedance is extended to the case of mobile robots. All of these tasks are then combined and integrated into an overall, priority-based control law. Besides the experimental validation of the approach, the formal proof of asymptotic stability for this hierarchical controller is presented. By interconnecting the whole-body controller with an artificial intelligence, the immense potential of the integrated approach for complex real-world applications is shown. Several typical household chores, such as autonomously wiping a window or sweeping the floor with a broom, are successfully performed on the mobile humanoid robot Rollin' Justin of the German Aerospace Center (DLR). The results suggest the presented controller for a large variety of fields of application such as service robotics, human-robot cooperation in industry, telepresence in medical applications, space robotics scenarios, and the operation of mobile robots in dangerous and hazardous environments.
Applications of Mobile Robots Morgan & Claypool Publishers
As mobile robots become more common in general knowledge and practices, as opposed to simply in research labs, there is an increased need for the introduction and methods to Simultaneous Localization and Mapping (SLAM) and its techniques and concepts related to robotics. Simultaneous Localization and Mapping for Mobile Robots: Introduction and Methods investigates the complexities of the theory of probabilistic localization and mapping of mobile robots as well as providing the most current and concrete developments. This reference source aims to be useful for practitioners, graduate and postgraduate students, and active researchers alike.
Wheeled Mobile Robotics Springer
An all-in-one resource for designing and implementing embedded control in mobile robotics In Embedded Control for Mobile Robotic Applications, a distinguished trio of researchers delivers an authoritative and fulsome resource for understanding embedded control and robotics. The book includes coverage of a variety of embedded platforms, their use in controller implementation,

stability analyses of designed controllers, and two new approaches for designing embedded controllers. The authors offer a full chapter on Field-Programmable-Gate-Array (FPGA) architecture development for controller design that is perfect for both practitioners and students taking robotics courses and provide a companion website that includes MATLAB codes for simulation and embedded platform-specific code for mobile robotic applications (in Embedded C and Verilog). The two approaches discussed by the authors—the top-down methodology and the bottom-up methodology—are of immediate practical utility to both practicing professionals in the field and students studying control applications and mobile robotics. The book also offers: A thorough introduction to embedded control, including processor, IC, and design technology, as well as a discussion of limitations in embedded control design Comprehensive explorations of the bottom-up and top-down methods, including computations using CORDIC, interval arithmetic, sliding surface design, and switched nonlinear systems Practical discussions of generic FPGA architecture design, including Verilog, PID controllers, DC motors and Encoder, and a systematic approach for designing architecture using FSMD In-depth examinations of discrete-time controller design, including the approximation to discrete-time transfer function and embedded implementation stability Perfect for practitioners working in embedded control design and control applications in robotics, Embedded Control for Mobile Robotic Applications will also earn a place in the libraries of academicians, researchers, senior undergraduate students, and graduate students in these fields.

Dynamics and Control of Autonomous Space Vehicles and Robotics John Wiley & Sons

Controlling Robots using Blynk, Virtuino, Cayenne, Thingspeak, FirebaseKey features The book provides gradual pace of basics to advanced interfacing and programming with Ti launch pad for IoT applications. It provides a unique style for IoT applications with program codes. It discusses various applications where the Internet of Things plays an important role, and considers a number of different independent prototypes for various mobile robotics platform control methods. The control of robot with different mobile apps like Blynk, Virtuino, Cayenne, Thingspeak, Firebase are included for vast coverage of scope. Step by step programming, to get started with Ti launch Pad Case studies to provide solution to real time problems The case studies and programming in book are tested on real hardware during handling the industrial and student projects. Description This book provides a platform to the readers, where they can understand the applications of 'Internet of Things' to control the robotic platform. It covers the basic knowledge of the mobile apps with their designing steps and programming. The objective of the book is to discuss various applications of robotic platform where 'Internet of things' can play an important role. This book comprises of total seventeen chapters for designing different independent prototypes

for the various control methods. It covers introduction to IoT and basic components to design a robotic platform. The system demonstration is done with the help of Ti Launch Pad and other interfacing devices. The control of robot with different mobile apps like Blynk, Virtuino, Cayenne, Thingspeak, Firebase are included for vast coverage of scope.It would be beneficial for the people who want to get started with hardware based robotic prototypes with IoT. This book is entirely based on the practical experience of the authors while undergoing projects with the students and industries.What will you learn Interfacing of Ti launch Pad and NodeMCU with Input/Output Devices Serial Communication between Ti Launch Pad and NodeMCU Robot Control Using the Blynk, Virtuino App Environment Monitoring Robot with BLYNK App Sensory Data Acquisition Robot Using a ThingSpeak Server Robot Control with Cayenne App, Local Server and NodeMCU, Firebase Server Who this book is for Students pursuing BE/BSc/ME/MSc/BTech/MTech in Computer Science, Electronics, Electrical. Table of contents1. Introduction2. Components of a Robotic Platform3. Interfacing of Ti launch Pad with Input/Output Devices4. Interfacing of NodeMCU with Input/Output Devices5. Serial Communication between Ti Launch Pad and NodeMCU6. Robot Control Using the Blynk App7. Robot Control Using the Virtuino App8. Environment Monitoring Robot with BLYNK App9. Sensory Data Acquisition Robot Using a ThingSpeak Server 10. Robot Control with Cayenne App11. Robot Control with Local Server and NodeMCU12. Robot Control with a Firebase Server13. XBee and Wi-Fi Modem Based Robot Control14. Fire Fighting Robot15. The Internet of Things Robotic Arm16. The Smart Orchard with a Robotic Arm Sprinkler17. Smart Farming with the IoT About the authorDr. Anita Gehlot is currently associated with Lovely Professional University as Associate Professor with more than ten years of experience in academics. She has twenty patents in her account. She has published more than fifty research papers in referred journals and conference. She has organized a number of workshops, summer internships and expert lectures for students. She has been invited as session chair keynote speaker to international/national conferences and faculty development program. Dr. Rajesh Singh is currently associated with Lovely Professional University as Professor with more than fifteen years of experience in academics. He has been awarded as gold medalist in M.Tech and honors in his B.E. His area of expertise includes embedded systems, robotics, wireless sensor networks and Internet of Things. He has organized and conducted a number of workshops, summer internships and expert lectures for students as well as faculty. He has twenty-three patents in his account. He has published around hundred research papers in referred journals/conferences. His LinkedIn Profile: linkedin.com/in/dr-rajesh-singh-6380845aHis Website: orcid.org/0000-0002-3164-8905 Dr. Lovi Raj Gupta is the Executive Dean, Faculty of Technology & Sciences, Lovely Professional University. He is a leading light in the

field of Technical and Higher education in the country. His research-focused approach and an insightful innovative intervention of technology in education have won him much accolades and laurels.In 2001, he was appointed as Assistant Controller (Technology), Ministry of IT, Govt. of India by the Honorable President of India in the Office of the Controller of Certifying Authorities (CCA). In 2013, he was accorded the role in the National Advisory Board for What Can I Give Mission - Kalam Foundation of Dr. APJ Abdul Kalam. In 2011, he received the MIT Technology Review Grand Challenge Award followed by the coveted Infosys InfyMakers Award in the year 2016. He has ten patents to his account. His LinkedIn Profile: linkedin.com/in/loviraj Bhupendra Singh is Managing Director of Schematics Microelectronics and provides Product design and R&D support to industries and Universities. He has completed BCA, PGDCA, M.Sc. (CS), M.Tech and has more than eleven years of experience in the field of Computer Networking and Embedded systems. He has published twelve books in the area of Embedded Systems and Internet of Things. His Blog: schematicslab.blogspot.in / His LinkedIn Profile: linkedin.com/in/bhupisir

Introduction to Mobile Robot Control Springer Science & Business Media

Now in its third edition, this textbook is a comprehensive introduction to the multidisciplinary field of mobile robotics, which lies at the intersection of artificial intelligence, computational vision, and traditional robotics. Written for advanced undergraduates and graduate students in computer science and engineering, the book covers algorithms for a range of strategies for locomotion, sensing, and reasoning. The new edition includes recent advances in robotics and intelligent machines, including coverage of human-robot interaction, robot ethics, and the application of advanced AI techniques to end-to-end robot control and specific computational tasks. This book also provides support for a number of algorithms using ROS 2, and includes a review of critical mathematical material and an extensive list of sample problems. Researchers as well as students in the field of mobile robotics will appreciate this comprehensive treatment of state-of-the-art methods and key technologies.

Mobile Robot Systems: Advanced Designing and Development BPB Publications

This book presents the concept of cognition in a clear, lucid and highly comprehensive style. It provides an in-depth analysis of mathematical models and algorithms, and demonstrates their application with real life experiments.

Autonomous Robots MIT Press

This monograph discusses issues related to estimation, control, and motion planning for mobile robots operating in rough terrain, with particular attention to planetary exploration rovers. Rough terrain robotics is becoming increasingly important in space exploration, and industrial applications. However, most current motion planning and control algorithms are not well suited to rough terrain mobility, since they do not consider the physical characteristics of

the rover and its environment. Specific addressed topics are: wheel terrain interaction modeling, including terrain parameter estimation and wheel terrain contact angle estimation; rough terrain motion planning; articulated suspension control; and traction control. Simulation and experimental results are presented that show that the desribed algorithms lead to improved mobility for robotic systems in rough terrain.

Mobile Robots John Wiley & Sons

Niku offers comprehensive, yet concise coverage of robotics that will appeal to engineers. Robotic applications are drawn from a wide variety of fields. Emphasis is placed on design along with analysis and modeling. Kinematics and dynamics are covered extensively in an accessible style. Vision systems are discussed in detail, which is a cutting-edge area in robotics. Engineers will also find a running design project that reinforces the concepts by having them apply what they've learned.

Mobile Robotics Butterworth-Heinemann

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

Wheeled Mobile Robot Control Springer Nature

Intelligent Mobile Robot Navigation builds upon the application of fuzzy logic to the area of intelligent control of mobile robots. Reactive, planned, and teleoperated techniques are considered, leading to the development of novel fuzzy control systems for perception and navigation of nonholonomic autonomous vehicles. The unique feature of this monograph lies in its comprehensive treatment of the problem, from the theoretical development of the various schemes down to the real-time implementation of algorithms on mobile robot prototypes. As such, the book spans different domains ranging from mobile robots to intelligent transportation systems, from automatic control to artificial intelligence.

Mobile Robots Cambridge University Press

Mobile Robotics: A Practical Introduction (2nd edition) is an excellent introduction to the foundations and methods used for designing completely autonomous mobile robots. A fascinating, cutting-edge, research topic, autonomous mobile robotics is now taught in more and more universities. In this book you are introduced to the fundamental concepts of this complex field via twelve detailed case studies that show how to build and program real working robots. Topics covered in clued learning, autonomous navigation in unmodified, noisy and unpredictable environments, and high fidelity robot simulation. This new edition has been updated to include a new chapter on novelty detection, and provides a very practical introduction to mobile robotics for a general scientific audience. It is essential reading for 2nd and 3rd year undergraduate students and postgraduate students studying robotics, artificial intelligence, cognitive science and robot engineering. The update and overview of core concepts in mobile robotics will assist and encourage practitioners of the field and set challenges to explore new avenues of research in

this exiting field. The author is Senior Lecturer at the Department of Computer Science at the University of Essex. "A very fine overview over the relevant problems to be solved in the attempt to bring intelligence to a moving vehicle." Professor Dr. Ewald von Puttkamer, University of Kaiserslautern "Case studies show ways of achieving an impressive repertoire of kinds of learned behaviour, navigation and map-building. The book is an admirable introduction to this modern approach to mobile robotics and certainly gives a great deal of food for thought. This is an important and though-provoking book." Alex M. Andrew in Kybernetes Vol 29 No 4 and Robotica Vol 18

Introduction to Autonomous Mobile Robots, second edition Springer Science & Business Media

The economic potential of autonomous mobile robots will increase tremendously during the next years. Service robots such as cleaning machines and inspection or assistance robots will bring us great support in our daily lives. This textbook provides an introduction to the methods of controlling these robotic systems. Starting from mobile robot kinematics, the reader receives a systematic overview of the basic problems as well as methods and algorithms used for solving them. Localisation, object recognition, map building, navigation and control architectures for autonomous vehicles will be discussed in detail. In conclusion, a survey of specific service robot applications is included as well. This book is a very useful introduction to mobile robotics for beginners as well as advanced students and engineers.

Mobile Robotics Springer Science & Business Media

Methods by which robots can learn control laws that enable real-time reactivity using dynamical systems; with applications and exercises. This book presents a wealth of machine learning techniques to make the control of robots more flexible and safe when interacting with humans. It introduces a set of control laws that enable reactivity using dynamical systems, a widely used method for solving motion-planning problems in robotics. These control approaches can replan in milliseconds to adapt to new environmental constraints and offer safe and compliant control of forces in contact. The techniques offer theoretical advantages, including convergence to a goal, non-penetration of obstacles, and passivity. The coverage of learning begins with low-level control parameters and progresses to higher-level competencies composed of combinations of skills. Learning for Adaptive and Reactive Robot Control is designed for graduate-level courses in robotics, with chapters that proceed from fundamentals to more advanced content. Techniques covered include learning from demonstration, optimization, and reinforcement learning, and using dynamical systems in learning control laws, trajectory planning, and methods for compliant and force control . Features for teaching in each chapter: applications, which range from arm manipulators to whole-body control of humanoid robots; pencil-and-paper and programming exercises; lecture videos, slides, and MATLAB code examples available on the author’s website . an eTextbook

platform website offering protected material[EPS2] for instructors including solutions.

Introduction to Robotics Elsevier
This book consists of 18 chapters divided in four sections: Robots for Educational Purposes, Health-Care and Medical Robots, Hardware - State of the Art, and Localization and Navigation. In the first section, there are four chapters covering autonomous mobile robot Emmy III, KCLBOT - mobile nonholonomic robot, and general overview of educational mobile robots. In the second section, the following themes are covered: walking support robots, control system for wheelchairs, leg-wheel mechanism as a mobile platform, micro mobile robot for abdominal use, and the influence of the robot size in the psychological treatment. In the third section, there are chapters about I2C bus system, vertical displacement service robots, quadruped robots - kinematics and dynamics model and Epi.q (hybrid) robots. Finally, in the last section, the following topics are covered: skid-steered vehicles, robotic exploration (new place recognition), omnidirectional mobile robots, ball-wheel mobile robots, and planetary wheeled mobile robots.

Introduction to Autonomous Mobile Robots, second edition MIT Press
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.

Robotics John Wiley & Sons
Presents the normal kinematic and dynamic equations for robots, including mobile robots, with coordinate transformations and various control strategies This fully updated edition examines the use of mobile robots for sensing objects of interest, and focus primarily on control, navigation, and remote sensing. It also includes an entirely new section on modeling and control of autonomous underwater vehicles (AUVs), which exhibits unique complex three-dimensional dynamics. Mobile Robots: Navigation, Control and Sensing, Surface Robots and AUVs, Second Edition starts with a chapter on kinematic models for mobile robots. It then offers a detailed chapter on robot control, examining several different configurations of mobile robots. Following sections look at robot attitude and navigation. The application of Kalman Filtering is covered. Readers are also provided with a section on remote sensing and sensors. Other chapters discuss: target tracking, including multiple targets with multiple sensors; obstacle mapping and its application to robot navigation; operating a robotic manipulator; and

remote sensing via UAVs. The last two sections deal with the dynamics modeling of AUVs and control of AUVs. In addition, this text: Includes two new chapters dealing with control of underwater vehicles Covers control schemes including linearization and use of linear control design methods, Lyapunov stability theory, and more Addresses the problem of ground registration of detected objects of interest given their pixel coordinates in the sensor frame Analyzes geo-registration errors as a function of sensor precision and sensor pointing uncertainty Mobile Robots: Navigation, Control and Sensing, Surface Robots and AUVs is intended for use as a textbook for a graduate course of the same title and can also serve as a reference book for practicing engineers working in related areas.

Mobile Robotics for Multidisciplinary Study
Springer Science & Business Media
Robot Motion Control 2009 presents very recent results in robot motion and control. Forty short papers have been chosen from those presented at the sixth International Workshop on Robot Motion and Control held in Poland in June 2009. The authors of these papers have been carefully selected and represent leading institutions in this field. The following recent developments are discussed: design of trajectory planning schemes for holonomic and nonholonomic systems with optimization of energy, torque limitations and other factors, new control algorithms for industrial robots, nonholonomic systems and legged robots, different applications of robotic systems in industry and everyday life, like medicine, education, entertainment and others, multiagent systems consisting of mobile and flying robots with their applications. The book is suitable for graduate students of automation and robotics, informatics and management, mechatronics, electronics and production engineering systems as well as scientists and researchers working in these fields.

Learning for Adaptive and Reactive Robot Control
Springer
Mobile Robots and Embedded Systems are presented in this unique book at an introductory to intermediate level. It is structured in three parts, dealing with Embedded Systems (hardware and software design, actuators, sensors, PID control, multitasking), Mobile Robot Design (driving, balancing, walking, and flying robots), and Mobile Robot Applications (Mapping, Robot Soccer, Genetic Algorithms, Neural Networks, Behavior-based systems, and Simulation). The book is written as a text for courses in Computer Science, Computer Engineering, IT, or Mechatronics, as well as a guide for robot hobbyists and researchers.

RAMSETE
MIT Press
The book includes topics, such as: path planning, avoiding obstacles, following the path, go-to-goal control, localization, and visual-based motion control. The theoretical concepts are illustrated with a developed control architecture with soft computing and artificial intelligence methods. The proposed vision-based motion control strategy involves three stages. The first stage consists of the overhead camera calibration and the configuration of the working environment. The

second stage consists of a path planning strategy using several traditional path planning algorithms and proposed planning algorithm. The third stage consists of the path tracking process using previously developed Gauss and Decision Tree control approaches and the proposed Type-1 and Type-2 controllers. Two kinematic structures are utilized to acquire the input values of controllers. These are Triangle Shape-Based Controller Design, which was previously developed and Distance-Based Triangle Structure that is used for the first time in conducted experiments. Four different control algorithms, Type-1 fuzzy logic, Type-2 Fuzzy Logic, Decision Tree Control, and Gaussian Control have been used in overall system design. The developed system includes several modules that simplify characterizing the motion control of the robot and ensure that it maintains a safe distance without colliding with any obstacles on the way to the target. The topics of the book are extremely relevant in many areas of research, as well as in education in courses in computer science, electrical and mechanical engineering and in mathematics at the graduate and undergraduate levels. Autonomous Land Vehicles 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