Robot Control

Bruno Siciliano,Lorenzo Sciavicco,Luigi Villani,Giuseppe Oriolo

Introduction to Mobile Robot Control Spyros G Tzafestas,2013-10-03 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

Modern Robotics Kevin M. Lynch,Frank C. Park,2017-05-25 A modern and unified treatment of the mechanics, planning, and control of robots, suitable for a first course in robotics.

Learning for Adaptive and Reactive Robot Control Aude Billard,Sina Mirrazavi,Nadia Figueroa,2022-02-08 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.

Advances in Robot Control Sadao Kawamura,Mikhail Svinin,2007-07-17 This volume surveys three decades of modern robot control theory and describes how the work of Suguru Arimoto shaped its development. Twelve survey articles written by experts associated with Suguru Arimoto at various stages in his career treat the subject comprehensively. This book provides an important reference for graduate students and researchers, as well as for mathematicians, engineers and scientists whose work involves robot control theory.

Theory of Robot Control Carlos Canudas de Wit,Bruno Siciliano,Georges Bastin,2012-12-06 A study of the latest research results in the theory of robot control, structured so as to echo the gradual development of robot control over the last fifteen years. In three major parts, the editors deal with the modelling and control of rigid and flexible robot manipulators and mobile robots. Most of the results on rigid robot manipulators in part I are now well established, while for flexible manipulators in part II, some problems still remain unresolved. Part III deals with the control of mobile robots, a challenging area for future research. The whole is rounded off with an appendix reviewing basic definitions and the mathematical background for control theory. The particular combination of topics makes this an invaluable source of information for both graduate students and researchers.

New Trends in Robot Control Jawhar Ghommam,Nabil Derbel,Quanmin Zhu,2020-02-13 This book presents solutions to control problems in a number of robotic systems and provides a wealth of worked-out examples with full analytical and numerical details, graphically illustrated to aid in reader comprehension. It also presents relevant studies on and applications of robotic system control approaches, as well as the latest findings from interdisciplinary theoretical studies. Featuring chapters on advanced control (fuzzy, neural, backstepping, sliding mode, adaptive, predictive, diagnosis, and fault-tolerant control), the book will equip readers to easily tailor the techniques to their own applications. Accordingly, it offers a valuable resource for researchers, engineers, and students in the field of robotic systems.

Robot Control Efren Gorrostieta Hurtado,2016-10-19 This book includes a selection of research papers in robot control applications. The description of projects using robotic systems in areas such as vision, navigation, path planning, trajectories, non-holonomic systems, mobile robotics, robot control with very specific structures, as well as artificial intelligence systems is pointed out. It also presents several tools and mathematical concepts that allow the development and operation of robotic systems. Additionally, the development of different ideas in control systems that are useful and hopefully enriching for the reader are also presented in this book.

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.

Wheeled Mobile Robot Control Nardênio Almeida Martins,Douglas Wildgrube Bertol,2021-08-12 This book focuses on the development and methodologies of trajectory control of differential-drive wheeled nonholonomic mobile robots. The methodologies are based on kinematic models (posture and configuration) and dynamic models, both subject to uncertainties and/or disturbances. The control designs are developed in rectangular coordinates obtained from the first-order sliding mode control in combination with the use of soft computing techniques, such as fuzzy logic and artificial neural networks. Control laws, as well as online learning and adaptation laws, are obtained using the stability analysis for both the developed kinematic and dynamic controllers, based on Lyapunov’s stability theory. An extension to the formation control with multiple differential-drive wheeled nonholonomic mobile robots in trajectory tracking tasks is also provided. Results of simulations and experiments are presented to verify the effectiveness of the proposed control strategies for trajectory tracking situations, considering the parameters of an industrial and a research differential-drive wheeled nonholonomic mobile robot, the PowerBot. Supplementary materials such as source codes and scripts for simulation and visualization of results are made available with the book.

Robotics, Vision and Control Peter Corke,2011-09-05 The author has maintained two open-source MATLAB Toolboxes for more than 10 years: one for robotics and one for vision. The key strength of the Toolboxes provide a set of tools that allow the user to work with real problems, not trivial examples. For the student the book makes the algorithms accessible, the Toolbox code can be read to gain understanding, and the examples illustrate how it can be used —instant gratification in just a couple of lines of MATLAB code. The code can also be the starting point for new work, for researchers or students, by writing programs based on Toolbox functions, or modifying the Toolbox code itself. The purpose of this book is to expand on the tutorial material provided with the toolboxes, add many more examples, and to weave this into a narrative that covers

robotics and computer vision separately and together. The author shows how complex problems can be decomposed and solved using just a few simple lines of code, and hopefully to inspire up and coming researchers. The topics covered are guided by the real problems observed over many years as a practitioner of both robotics and computer vision. It is written in a light but informative style, it is easy to read and absorb, and includes a lot of Matlab examples and figures. The book is a real walk through the fundamentals of robot kinematics, dynamics and joint level control, then camera models, image processing, feature extraction and epipolar geometry, and bring it all together in a visual servo system. Additional material is provided at http://www.petercorke.com/RVC

Robotics Bruno Siciliano,Lorenzo Sciavicco,Luigi Villani,Giuseppe Oriolo,2010-08-20 Based on the successful Modelling and Control of Robot Manipulators by Sciavicco and Siciliano (Springer, 2000), Robotics provides the basic know-how on the foundations of robotics: modelling, planning and control. It has been expanded to include coverage of mobile robots, visual control and motion planning. A variety of problems is raised throughout, and the proper tools to find engineering-oriented solutions are introduced and explained. The text includes coverage of fundamental topics like kinematics, and trajectory planning and related technological aspects including actuators and sensors. To impart practical skill, examples and case studies are carefully worked out and interwoven through the text, with frequent resort to simulation. In addition, end-of-chapter exercises are proposed, and the book is accompanied by an electronic solutions manual containing the MATLAB® code for computer problems; this is available free of charge to those adopting this volume as a textbook for courses.

New Developments and Advances in Robot Control Nabil Derbel,Jawhar Ghommam,Quanmin Zhu,2019-01-24 This book highlights relevant studies and applications in the area of robotics, which reflect the latest research, from interdisciplinary theoretical studies and computational algorithm development, to representative applications. It presents chapters on advanced control, such as fuzzy, neural, backstepping, sliding mode, adaptive, predictive, diagnosis and fault tolerant control etc. and addresses topics including cloud robotics, cable-driven robots, two-wheeled robots, mobile robots, swarm robots, hybrid vehicle, and drones. Each chapter employs a uniform structure: background, motivation, quantitative development (equations), case studies/illustration/tutorial (simulations, experiences, curves, tables, etc.), allowing readers to easily tailor the techniques to their own applications.

Human-in-the-Loop Robot Control and Learning Luka Peternel,Jan Babič,Erhan Oztop,Tetsunari Inamura,Dingguo Zhang,2020-01-22 In the past years there has been considerable effort to move robots from industrial environments to our daily lives where they can collaborate and interact with humans to improve our life quality. One of the key challenges in this direction is to make a suitable robot control system that can adapt to humans and interactively learn from humans to facilitate the efficient and safe co-existence of the two. The applications of such robotic systems include: service robotics and physical human-robot collaboration, assistive and rehabilitation robotics, semi-autonomous cars, etc. To achieve the goal of integrating robotic systems into these applications, several important research directions must be explored. One such direction is the study of skill transfer, where a human operator’s skilled executions are used to obtain an autonomous controller. Another important direction is shared control, where a robotic controller and humans control the same body, tool, mechanism, car, etc. Shared control, in turn invokes very rich research questions such as co-adaptation between the human and the robot, where the two agents can benefit from each other’s skills or must adapt to each other’s behavior to achieve effective cooperative task executions. The aim of this Research Topic is to help bridge the gap between the state-of-the-art and above-mentioned goals through novel multidisciplinary approaches in human-in-the-loop robot control and learning.

Robot Control Mark W. Spong,Frank L. Lewis,Chaouki T. Abdallah,1993

Intelligent Control of Robotic Systems D. Katic,M. Vukobratovic,2013-03-14 As robotic systems make their way into standard practice, they have opened the door to a wide spectrum of complex applications. Such applications usually demand that the robots be highly intelligent. Future robots are likely to have greater sensory capabilities, more intelligence, higher levels of manual dexter ity, and adequate mobility, compared to humans. In order to ensure high-quality control and performance in robotics, new intelligent control techniques must be developed, which are capable of coping with task complexity, multi-objective decision making, large volumes of perception data and substantial amounts of heuristic information. Hence, the pursuit of intelligent autonomous robotic systems has been a topic of much fascinating research in recent years. On the other hand, as emerging technologies, Soft Computing paradigms consisting of complementary elements of Fuzzy Logic, Neural Computing and Evolutionary Computation are viewed as the most promising methods towards intelligent robotic systems. Due to their strong learning and cognitive ability and good tolerance of uncertainty and imprecision, Soft Computing techniques have found wide application in the area of intelligent control of robotic systems.

Robot Control Claude Samson,Michel Le Borgne,Bernard Espiau,1991 A complete approach to the problem of controlling robot manipulators needs to bring together three scientific branches: computer science, mechanics, and automatic control.

Remote Control Robotics Craig Sayers,2012-12-06 The author begins with a basic introduction to robot control and then considers the important problems to be overcome: delays or noisy control lines, feedback and response information, and predictive displays. Readers are assumed to have a basic understanding of robotics, though this may be their first exposure to the subject of telerobotics. Both professional engineers and roboticists will find this an invaluable introduction to this subject.

Neural & Bio-inspired Processing and Robot Control Huanqing Wang,2019-01-24 This Research Topic presents bio-inspired and neurological insights for the development of intelligent robotic control algorithms. This aims to bridge the inter-disciplinary gaps between neuroscience and robotics to accelerate the pace of research and development.

Robot Control 1988 (SYROCO'88) U. Rembold,2014-05-23 Containing 88 papers, the emphasis of this volume is on the control of advanced robots. These robots may be self-contained or part of a system. The applications of such robots vary from manufacturing, assembly and material handling to space work and rescue operations. Topics presented at the Symposium included sensors and robot vision systems as well as the planning and control of robot actions. Main topics covered include the design of control systems and their implementation; advanced sensors and multisensor systems; explicit robot programming; implicit (task-orientated) robot programming; interaction between programming and control systems; simulation as a programming aid; AI techniques for advanced robot systems and autonomous robots.

Control of Robot Manipulators in Joint Space Rafael Kelly,Victor Santibáñez Davila,Julio Antonio Loría Perez,2006-03-30 Tutors can design entry-level courses in robotics with a strong orientation to the fundamental discipline of manipulator control pdf solutions manual Overheads will save a great deal of time with class preparation and will give students a low-effort basis for more detailed class notes Courses for senior undergraduates can be designed around Parts I – III; these can be augmented for masters courses using Part IV

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