Modeling and Control Of Robot Manipulators | b1041b26eb250bfb461b914c6b5af8f5

Modeling and Control Simulation of Articulating Robot Arm Using Fuzzy LogicModeling and Control of Vehicular and Robotic SystemsModeling, Simulation and Control of a Parallel RobotHumanoid RobotsModeling and Control of a Robot Manipulator Using Neural NetworksModeling and Control of Flexible Robot ManipulatorsModeling, Identification & Control of RobotsModeling and Control of Robot ManipulatorsRomansy 19 - Robot Design, Dynamics and ControlModeling and Control for Robotic AssistantsRobot Modeling and ControlModeling and Control of a Tracked Mobile Robot for Pipeline InspectionRobot ModellingRobot Modeling and ControlFlexible Robot ManipulatorsModeling and Control of a Tracked Mobile Robot for Pipeline InspectionModelling and Control of Robot ManipulatorsRoboticsModeling and Control of Electrohydraulic Robot ManipulatorAdvanced Studies of Flexible Robotic ManipulatorsMultibody System Dynamics, Robotics and ControlModeling and Control of a Delta-3 RobotParametric Modeling and Control of Robot Manipulator Using Decomposed Connectionist NetworksAdvances in RoboticsDesign, Modeling and Control of Aerial Robots for Physical Interaction and ManipulationRobot Modeling and ControlModeling and Control of a Class of Aerial Robotic SystemsAutonomous RobotsHuman Modeling for Bio-Inspired RoboticsControl of Robot Manipulators in Joint SpaceRoboticsModeling and Control of Robot ManipulatorsModeling and Control of a Tracked Mobile Robot for Pipeline InspectionSolutions Manual for Modelling and Control of Robot ManipulatorsElastic Robot JointsKinematic Modeling and Control System Development of a Robot ArmNonlinear Control of Vehicles and RobotsKinematic Modeling, Identification, and Control of Robotic ManipulatorsAdvanced Dynamics Modeling, Duality and Control of Robotic SystemsRobot Manipulators This book provides detailed fundamental theoretical reviews and preparations necessary for developing advanced dynamics modeling and control strategies for various types of robotic systems. This research book specifically addresses and discusses the uniqueness issue of representing orientation or rotation, and further proposes an innovative isometric embedding approach. The novel approach can not only reduce the dynamic formulation for robotic systems into a compact form, but it also offers a new way to realize the orientational trajectory-tracking control procedures. In addition, the book gives a comprehensive introduction to fundamentals of mathematics and physics that are required for modeling robot dynamics and developing effective control algorithms. Many computer simulations and realistic 3D animations to verify the new theories and algorithms are included in the book as well. It also presents and discusses the principle of duality involved in robot kinematics, statics, and dynamics. The duality principle can guide the dynamics modeling and analysis into a right direction for a variety of robotic systems in different types from open serial-chain to closed parallel-chain mechanisms. It intends to serve as a diversified research reference to a wide range of audience, including undergraduate juniors and seniors, graduate students, researchers, and engineers interested in the areas of robotics, control and applications. Nonlinear Control of Vehicles and Robots develops a unified approach to the dynamic modeling of robots in terrestrial, aerial and marine environments. The main classes of nonlinear systems and stability methods are summarized and basic nonlinear control methods, useful in manipulator and vehicle control, are presented. Formation control of ground robots and ships is discussed. The book also deals with the modeling and control of robotic systems in the presence of non-smooth nonlinearities. Robust adaptive tracking control of robotic systems with unknown payload and friction in the presence of uncertainties is treated. Theoretical and practical aspects of the control algorithms under discussion are detailed. Examples are included throughout the book allowing the reader to apply the control and modeling techniques in their own research and development work. Some of these examples demonstrate state estimation based on the use of advanced sensors as part of the control system. This book focuses on the modeling and control of elastic robot joints for which each axis of the robotic manipulator is controlled as a single-input-single-output (SISO) system with disturbances, otherwise known as independent joint control. It also shows how to account for joint elasticities in a centralized controller when treating the robotic manipulator as a coupled multiple-input-multiple-output (MIMO) system. The book analyzes modeling and control solutions, supported by specially elaborated simulation examples and an experimental case study. Modeling and Control of Vehicular and Robotic Systems provides a comprehensive coverage of mathematical modeling and model-based control of autonomous vehicular and robotic systems based on three broad application areas, namely, rigid robot systems (with special emphasis on active vision heads, which are rare in contemporary literature), ground vehicles, and surface vehicles. Two main drawbacks of classical methods of model based controller synthesis and implementation, i.e. the need of an accurate knowledge of the dynamics that is a strong requirement in practice and velocity feedback of all degrees-of-freedom are thoroughly addressed. To overcome these deficiencies, design and implementation issues of online adaptive neural
networks-based dynamic compensators and controller-observer systems have been included. The related issues of modeling, controller design, stability analysis, sensor requirements and options, and numerical simulations are also presented. Fundamental and technological topics are blended uniquely and developed clearly in nine chapters with a gradually increasing level of complexity. A wide variety of relevant problems is raised throughout, and the proper tools to find engineering-oriented solutions are introduced and explained, step by step. Fundamental coverage includes: Kinematics; Statics and dynamics of manipulators; Trajectory planning and motion control in free space. Technological aspects include: Actuators; Sensors; Hardware/software control architectures; Industrial robot-control algorithms. Furthermore, established research results involving description of end-effector orientation, closed kinematic chains, kinematic redundancy and singularities, dynamic parameter identification, robust and adaptive control and force/motion control are provided. To provide readers with a homogeneous background, three appendices are included on: Linear algebra; Rigid-body mechanics; Feedback control. To acquire practical skill, more than 50 examples and case studies are carefully worked out and interwoven through the text, with frequent resort to simulation. In addition, more than 80 end-of-chapter exercises are proposed, and the book is accompanied by a solutions manual containing the MATLAB code for computer problems; this is available from the publisher free of charge to those adopting this work as a textbook for courses. Written by two of Europe’s leading robotics experts, this book provides the tools for a unified approach to the modelling of robotic manipulators, whatever their mechanical structure. No other publication covers the three fundamental issues of robotics: modelling, identification and control. It covers the development of various mathematical models required for the control and simulation of robots. World class authority · Unique range of coverage not available in any other book · Provides a complete course on robotic control at an undergraduate and graduate level-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. A New Edition Featuring Case Studies and Examples of the Fundamentals of Robot Kinematics, Dynamics, and Control In the 2nd Edition of Robot Modeling and Control, students will cover the theoretical fundamentals and the latest technological advances in robot kinematics. With so much advancement in technology, from robotics to motion planning, society can implement more powerful and dynamic algorithms than ever before. This in-depth reference guide educates readers in four distinct parts; the first two serve as a guide to the fundamentals of robotics and motion control, while the last two dive more in-depth into control theory and nonlinear system analysis. With the new edition, readers gain access to new case studies and thoroughly researched information covering topics such as: Motion-planning, collision avoidance, trajectory optimization, and control of robots Popular topics within the robotics industry and how they apply to various technologies An expanded set of examples, simulations, problems, and case studies Open-ended suggestions for students to apply the knowledge to real-life situations A four-part reference essential for both undergraduate and graduate students, Robot Modeling and Control serves as a foundation for a solid education in robotics and motion planning. The volume contains 19 contributions by international experts in the field of multibody system dynamics, robotics and control. The book aims to bridge the gap between the modeling of mechanical systems by means of multibody dynamics formulations and robotics. In the classical approach, a multibody dynamics model contains a very high level of detail, however, the application of such models to robotics or control is usually limited. The papers aim to connect the different scientific communities in multibody dynamics, robotics and control. Main topics are flexible multibody systems, humanoid robots, elastic robots, nonlinear control, optimal path planning, and identification. This book describes the design, mathematical modeling, control system development and experimental validation of a versatile mobile pipe inspection robot. It also discusses a versatile robotic system for pipeline inspection, together with an original, adaptable tracked mobile robot featuring a patented motion unit. Pipeline inspection is a common field of application for mobile robots because the monitoring of inaccessible, long and narrow pipelines is a very difficult task for humans. The main design objective is to minimize the number of robots needed to inspect different types of horizontal and vertical pipelines, with both smooth and rough surfaces. The book includes extensive information on the various design phases, mathematical modeling, simulations and control system development. In closing, the prototype
construction process and testing procedures are presented and supplemented with laboratory and field experiments. 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 IVA New Edition Featuring Case Studies and Examples of the Fundamentals of Robot Kinematics, Dynamics, and Control. In the 2nd Edition of Robot Modeling and Control, students will cover the theoretical fundamentals and the latest technological advances in robot kinematics. With so much advancement in technology, from robotics to motion planning, society can implement more powerful and dynamic algorithms than ever before. This in-depth reference guide educates readers in four distinct parts; the first two serve as a guide to the fundamentals of robotics and motion control, while the last two dive more in-depth into control theory and nonlinear system analysis. With the new edition, readers gain access to new case studies and thoroughly researched information covering topics such as: Motion-planning, collision avoidance, trajectory optimization, and control of robots Popular topics within the robotics industry and how they apply to various technologies An expanded set of examples, simulations, problems, and case studies Open-ended suggestions for students to apply the knowledge to real-life situations A four-part reference essential for both undergraduate and graduate students, Robot Modeling and Control serves as a foundation for a solid education in robotics and motion planning. Parallel robots modeling and analysis.- Parallel robots design, calibration and control.- Robot design.- Robot control.- Mobile robots design, modeling and control.- Humans and humanoids.- Perception. The papers in this volume provide a vision of the evolution of the robotics disciplines and indicate new directions in which these disciplines are foreseen to develop. Paper topics include, but are not limited to, novel robot design and robot modules/components, service, rehabilitation, mobile robots, humanoid robots, challenges in control, modeling, kinematical and dynamical analysis of robotic systems, innovations in sensor systems for robots and perception, and recent advances in robotics. In particular, many contributions on parallel robotics from leading researchers in this domain are included. This book reports recent and new developments in modeling, simulation and control of flexible robot manipulators. The material is presented in four distinct components: a range of modeling approaches including classical techniques based on the Lagrange equation formulation, parametric approaches based on linear input/output models using system identification techniques and neuro-modeling approaches; numerical modeling/simulation techniques for dynamic characterization of flexible manipulators using the finite difference, finite element, symbolic manipulation and customized software techniques; a range of open-loop and closed-loop control techniques based on classical and modern intelligent control methods including soft-computing and smart structures for flexible manipulators; and software environments for analysis, design, simulation and control of flexible manipulators. Advances in Robotics - Modeling, Control and Applications is suitable for advanced undergraduate students and postgraduate students. It takes a practical approach rather than a conceptual approach. It offers a truly reader-friendly way to get to the subject, providing a definitive guide in this vibrant and evolving discipline. This book is an invaluable companion for students from their first encounter with the subject to more advanced studies, while the high quality artworks are designed to present the key concepts with simplicity, clarity and consistency. There are totally 18 chapters in this book. Chapter 1 proposes a simple control system for a biped robot using nonlinear oscillators based on the physiological concept of central pattern generator and physiological evidence of phase resetting. Chapter 2 presents work that attempts to extract principles by which spiders and other species achieve these features. Chapter 3 proposes methods for a robot manipulator with a racket to do two kinds of ball juggling, the paddle juggling and the wall juggling, based on discrete control systems of states of the hit ball. Chapter 4 proposed a new control algorithm in a robot arm based on active tactile slippage sensation. Chapter 5 provides a look at some possibilities of modern voice analysis technologies in the field of ambient assisted living, which seems to be a promising application for robotic systems. Chapter 6 focuses on adaptive filtering techniques for acoustics application. Adaptive acoustic in an important topic for signal processing in robots since robot sound inputs are usually recollected through acoustic sensors. Chapter 7 aims at examining the method and equipment of preliminary-announcement of the upcoming operation of a mobile robot moving on a two-dimensional plane to those who are in the surroundings. Chapter 8 introduces two kinds of instruction learning systems for partner robots: (1) a hand image instruction learning system; and (2) three kinds of voice learning systems, using Kohonen’s self-organizing map (SOM) and its variations such as Transient-SOM (T-SOM), Parameter-less SOM (PL-T-SOM) and Parameter-less Growing SOM (PL-G-SOM). Chapter 9 presents the study on throw-over movement informing a receiver of the object landing distance as an example of the informative motion for human synergistic robots. In Chapter 10, the author examines the application of a touch screen to an operational interface of a mobile robot remote operation system.
Chapter 11 describes low processing approach for identification of obstacles in a robotic soccer team. Chapter 12 couples a general purpose stat/space representation with a reactive algorithm for mobile robot navigation. In Chapter 13, the author designs an general-purposed affective behavior decision system based on linear dynamics to solve the limitation that affective model is difficult to be applied to various social robots without redesigning. Chapter 14 proposes a control mechanism based on multiple-criteria decision making for autonomous control of ambient environment. Chapter 15 proposes an information gathering support system in post-disaster environment by utilizing a robot sensor network in which a teleoperated mobile robot deploys wireless sensor nodes (SNs). Chapter 16 proposes fault accommodation procedure in discrete-event robots. Chapter 17 deals with application of robotic technology for performing risky tasks, mainly for de-mining operations. Finally, Chapter 18 briefly describes an application of robot in medial health. This book provides a step-by-step survey of the theory and applications of industrial robots. It includes case studies, numerical examples, and sample robot programs. Robot Modeling develops a mathematical model that is general in purpose and applicable to any robot. As advances are made in robotic hardware, the complexity of tasks they are capable of performing also increases. One goal of modern robotics is to introduce robotic platforms that require very little augmentation of their environments to be effective and robust. Therefore the challenge for a roboticist is to develop algorithms and control strategies that leverage knowledge of the task while retaining the ability to be adaptive, adjusting to perturbations in the environment and task assumptions. This work considers approaches to these challenges in the context of a wet-lab robotic assistant. The tasks considered are cooperative transport with limited communication between team members, and robot-assisted rapid experiment preparation requiring pouring reagents from open containers useful for research and development scientists. For cooperative transport, robots must be able to plan collision-free trajectories and agree on a final destination to minimize internal forces on the carried load. Robot teammates are considered, where robots must reach consensus to minimize internal forces. The case of a human leader, and robot follower is then considered, where robots must use non-verbal information to estimate the human leader's intended pose for the carried load. For experiment preparation, the robot must pour precisely from open containers with known fluid in a single attempt. Two scenarios examined are when the geometries of the pouring and receiving containers and behaviors are known, and when the pourer must be approximated. An analytical solution is presented for a given geometry in the first instance. In the second instance, a combination of online system identification and leveraging of model priors is used to achieve the precision-pour in a single attempt with considerations for long-term robot deployment. The main contributions of this work are considerations and implementations for making robots capable of performing complex tasks with an emphasis on combining model-based and data-driven approaches for best performance. This book describes the design, mathematical modeling, control system development and experimental validation of a versatile mobile pipe inspection robot. It also discusses a versatile robotic system for pipeline inspection, together with an original, adaptable tracked mobile robot featuring a patented motion unit. Pipeline inspection is a common field of application for mobile robots because the monitoring of inaccessible, long and narrow pipelines is a very difficult task for humans. The main design objective is to minimize the number of robots needed to inspect different types of horizontal and vertical pipelines, with both smooth and rough surfaces. The book includes extensive information on the various design phases, mathematical modeling, simulations and control system development. In closing, the prototype construction process and testing procedures are presented and supplemented with laboratory and field experiments. The objective of this dissertation is to advance the state-of-the-art in the kinematic modeling, identification, and control of robotic manipulators with rigid links in an effort to improve robot kinematic performance. The positioning accuracy of commercially-available industrial robotic manipulators depends upon a kinematic model which describes the robot geometry in a parametric form. Manufacturing error in the machining and assembly of manipulators lead to discrepancies between the design parameters and the physical structure. Improving the kinematic performance thus requires the identification of the actual kinematic parameters of each individual robot. The identified kinematic parameters are referred to as the arm signature. Existing robot kinematic models, such as the Denavit-Hartenberg model, are not directly applicable to kinematic parameter identification. In this dissertation we introduce a new kinematic model, called the 5-Model, which is applicable to kinematic parameter identification, and use it as the foundation for our development of a general technique for identifying the kinematic parameters of any robot with rigid links. Human Modelling for Bio-inspired Robotics: Mechanical Engineering in Assistive Technologies presents the most cutting-edge research outcomes in the area of mechanical and control aspects of human functions for macro-scale (human size) applications. Intended to provide researchers both in academia and industry with key content on which to base their developments, this book is organized and written by senior experts in their fields. Human Modelling for Bio-Inspired Robotics: Mechanical Engineering in Assistive Technologies offers a system-level investigation into human
mechanisms that inspire the development of assistive technologies and humanoid robotics, including topics in modelling of anatomical, musculoskeletal, neural and cognitive systems, as well as motor skills, adaptation and integration. Each chapter is written by a subject expert and discusses its background, research challenges, key outcomes, application, and future trends. This book will be especially useful for academic and industry researchers in this exciting field, as well as graduate-level students to bring them up to speed with the latest technology in mechanical design and control aspects of the area. Previous knowledge of the fundamentals of kinematics, dynamics, control, and signal processing is assumed. Presents the most recent research outcomes in the area of mechanical and control aspects of human functions for macro-scale (human size) applications Covers background information and fundamental concepts of human modelling Includes modelling of anatomical, musculoskeletal, neural and cognitive systems, as well as motor skills, adaptation, integration, and safety issues Assumes previous knowledge of the fundamentals of kinematics, dynamics, control, and signal processing Humanoid Robots: Modeling and Control provides systematic presentation of the models used in the analysis, design and control of humanoid robots. The book starts with a historical overview of the field, a summary of the current state of the art achievements and an outline of the related fields of research. It moves on to explain the theoretical foundations in terms of kinematic, kineto-static and dynamic relations. Further on, a detailed overview of biped balance control approaches is presented. Models and control algorithms for cooperative object manipulation with a multi-finger hand, a dual-arm and a multi-robot system are also discussed. One of the chapters is devoted to selected topics from the area of motion generation and control and their applications. The final chapter focuses on simulation environments, specifically on the step-by-step design of a simulator using the Matlab® environment and tools. This book will benefit readers with an advanced level of understanding of robotics, mechanics and control such as graduate students, academic and industrial researchers and professional engineers. Researchers in the related fields of multi-legged robots, biomechanics, physical therapy and physics-based computer animation of articulated figures can also benefit from the models and computational algorithms presented in the book. Provides a firm theoretical basis for modelling and control algorithm design Gives a systematic presentation of models and control algorithms Contains numerous implementation examples demonstrated with 43 video clipsAerial robots, meaning robots with flying capabilities, are essentially robotic platforms, which are autonomously controlled via some sophisticated control engineering tools. Similar to aerial vehicles, they can overcome the gravitational forces thanks to their design and/or actuation type. What makes them different from the conventional aerial vehicles, is the level of their autonomy. Reducing the complexity for piloting of such robots/vehicles provide the human operator more freedom and comfort. With their increasing autonomy, they can perform many complicated tasks by their own (such as surveillance, monitoring, or inspection), leaving the human operator the most high-level decisions to be made, if necessary. In this way they can be operated in hazardous and challenging environments, which might posses high risks to the human health. Thanks to their wide range of usage, the ongoing researches on aerial robots is expected to have an increasing impact on the human life. Aerial Physical Interaction (APhI) is a case, in which the aerial robot exerts meaningful forces and torques (wrench) to its environment while preserving its stable flight. In this case, the robot does not try avoiding every obstacle in its environment, but prepare itself for embracing the effect of a physical interaction, furthermore turn this interaction into some meaningful robotic tasks. Aerial manipulation can be considered as a subset of APhI, where the flying robot is designed and controlled in purpose of manipulating its environment. A clear motivation of using aerial robots for physical interaction, is to benefit their great workspace and agility. Moreover, developing robots that can perform not only APhI but also aerial manipulation can bring the great workspace of the flying robots together with the vast dexterity of the manipulating arms. This thesis work is addressing the design, modeling and control problem of these aerial robots for the purpose of physical interaction and manipulation. Using the nonlinear mathematical models of the robots at hand, in this thesis several different control methods (IDA-PBC, Exact Linearization, Differential Flatness Based Control) for APhl and aerial manipulation tasks have been developed and proposed. Furthermore, novel design tools (e.g. new rigid/elastic manipulating arms, hardware, software) to be used together with miniature aerial robots are presented within this thesis, which contributes to the robotics society not only in terms of concrete theory but also practical implementation and experimental robotics. This book presents the most recent research results on modeling and control of robot manipulators. Chapter 1 gives unified tools to derive direct and inverse geometric, kinematic and dynamic models of serial robots and addresses the issue of identification of the geometric and dynamic parameters of these models. Chapter 2 describes the main features of serial robots, the different architectures and the methods used to obtain direct and inverse geometric, kinematic and dynamic models, paying special attention to singularity analysis. Chapter 3 introduces global and local tools for performance analysis of serial robots. Chapter 4 presents an original optimization technique for point-to-point trajectory generation accounting for robot dynamics. Chapter 5
presents standard control techniques in the joint space and task space for free motion (PID, computed
torque, adaptive dynamic control and variable structure control) and constrained motion (compliant
force-position control). In Chapter 6, the concept of vision-based control is developed and Chapter 7 is
devoted to specific issue of robots with flexible links. Efficient recursive Newton-Euler algorithms for
both inverse and direct modeling are presented, as well as control methods ensuring position setting
and vibration damping. It is at least two decades since the conventional robotic manipulators have
become a common manufacturing tool for different industries, from automotive to pharmaceutical. The
proven benefits of utilizing robotic manipulators for manufacturing in different industries motivated
scientists and researchers to try to extend the applications of robots to many other areas by inventing
several new types of robots other than conventional manipulators. The new types of robots can be
categorized in two groups: redundant (and hyper-redundant) manipulators, and mobile (ground, marine,
and aerial) robots. These groups of robots, known as advanced robots, have more freedom for their
mobility, which allows them to do tasks that the conventional manipulators cannot do. Engineers have
taken advantage of the extra mobility of the advanced robots to make them work in constrained
environments, ranging from limited joint motions for redundant (or hyper-redundant) manipulators to
obstacles in the way of mobile (ground, marine, and aerial) robots. Since these constraints usually
depend on the work environment, they are variable. Engineers have had to invent methods to allow the
robots to deal with a variety of constraints automatically. A robot that is equipped with those methods is
called an Autonomous Robot. Autonomous Robots: Kinematics, Path Planning, and Control covers the
kinematics and dynamic modeling/analysis of Autonomous Robots, as well as the methods suitable for
their control. The text is suitable for mechanical and electrical engineers who want to familiarize
themselves with methods of modeling/analysis/control that have been proven efficient through
research. Flexible robotic manipulators pose various challenges in research as compared to rigid robotic
manipulators, ranging from system design, structural optimization, and construction to modeling,
sensing, and control. Although significant progress has been made in many aspects over the last one-
and-a-half decades, many issues are not resolved yet, and simple, effective, and reliable controls of
flexible manipulators still remain an open quest. Clearly, further efforts and results in this area will
contribute significantly to robotics (particularly automation) as well as its application and education in
general control engineering. To accelerate this process, the leading experts in this important area
present in this book the state of the art in advanced studies of the design, modeling, control and
applications of flexible manipulators. Sample Chapter(s). Chapter 1: Flexible-link Manipulators: Modeling,
Nonlinear Control and Observer (235 KB). Contents: Flexible-Link Manipulators: Modeling, Nonlinear
Control and Observer (M A Arteaga & B Siciliano); Energy-Based Control of Flexible Link Robots (S S
Ge); Trajectory Planning and Compliant Control for Two Manipulators to Deform Flexible Materials (O Al-
Jarrah et al.); Force Control of Flexible Manipulators (F Matsuno); Experimental Study on the Control of
Flexible Link Robots (D Wang); Sensor Output Feedback Control of Flexible Robot Arms (Z-H Luo); On
GA Based Robust Control of Flexible Manipulators (Z-Q Xiao & L-L Cui); Analysis of Poles and Zeros for
Tapered Link Designs (D L Girvin & W J Book); Optimum Shape Design of Flexible Manipulators with Tip
Loads (J L Russell & Y-Q Gao); Mechatronic Design of Flexible Manipulators (P-X Zhou & Z-Q Xiao); A
Comprehensive Study of Dynamic Behaviors of Flexible Robotic Links: Modeling and Analysis (Y-Q Gao
& F-Y Wang). Readership: Researchers, lecturers and graduate students in robotics & automated
systems, electrical & electronic engineering, and industrial engineering. An open-source robot controller
using an off-the-shelf motion controller has been developed. This approach takes advantage of the built-
in capabilities for trajectory generation, low-level motor control, user-friendly programming and
communication interfaces. It gives the system designer access to low-level control signals and PID
loops, which are normally not accessible in a proprietary robot controller. Any external device can be
easily synchronized to this type of controller through its communication channels. User program
becomes simple line commands to execute coordinated motion of the robot. A 3D simulation model was
built to verify the kinematic equations. Robot control program was developed to control the real robot.
The simulated and real robot motion had good agreement indicating the new controller functions
well.""The coverage is unparalleled in both depth and breadth. No other text that I have seen offers a
better complete overview of modern robotic manipulation and robot control."" -- " Bradley Bishop,
United States Naval Academy Based on the highly successful classic, "Robot Dynamics and Control," by
Spong and Vidyasagar (Wiley, 1989), Robot Modeling and Control offers a thoroughly up-to-date, self-
contained introduction to the field. The text presents basic and advanced material in a style that is at
once readable and mathematically rigorous. Key FeaturesA step-by-step computational approach helps
you derive and compute the forward kinematics, inverse kinematics, and Jacobians for the most
common robot designs. Detailed coverage of vision and visual servo control enables you to program
robots to manipulate objects sensed by cameras. An entire chapter on dynamics prepares you to
compute the dynamics of the most common manipulator designs. The most common motion planning
and trajectory generation algorithms are presented in an elementary style. The comprehensive treatment of motion and force control includes both basic and advanced methods. The text's treatment of geometric nonlinear control is more readable than in more advanced texts. Many worked examples and an extensive list of problems illustrate all aspects of the theory. About the authors Mark W. Spong is Donald Biggar Willett Professor of Engineering at the University of Illinois at Urbana-Champaign. Dr. Spong is the 2005 President of the IEEE Control Systems Society and past Editor-in-Chief of the IEEE Transactions on Control Systems Technology. Seth Hutchinson is currently a Professor at the University of Illinois in Urbana-Champaign, and a senior editor of the IEEE Transactions on Robotics and Automation. He has published extensively on the topics of robotics and computer vision. Mathukumalli Vidyasagar is currently Executive Vice President in charge of Advanced Technology at Tata Consultancy Services (TCS), India's largest IT firm. Dr. Vidyasagar was formerly the director of the Centre for Artificial Intelligence and Robotics (CAIR), under Government of India's Ministry of Defense.

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