
Robot Arm Modeling And Control 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 synergetic 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-purpose affects 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.

Kinematic Modeling, Identification, and Control of Robotic Manipulators 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.

A Journey from Robot to Digital Human A modern and unified treatment of the mechanics, planning, and control of robots, suitable for a first course in robotics.

Mechatronics and Robotics Neutrino '96 is indispensable for students and researchers of neutrino physics. It contains up-to-date reviews and discussions on topics such as Solar Neutrino Physics, Neutrino Oscillations, Intrinsic Neutrino Properties, and Neutrino Cosmology and Astronomy.
Modeling and Control of a Two-arm Elastic Robot in Gravity

Design, Modeling and Control of Aerial Robots for Physical Interaction and Manipulation 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 bipedal 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 clips.

Intelligent Control and Automation

Intell Galileo and Intell Galileo Gen 2 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

A Mathematical Introduction to Robotic Manipulation

Kinematic Control of Redundant Robot Arms Using Neural Networks 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.

Serial and Parallel Robot Manipulators

Biologically Inspired Control of Humanoid Robot Arms Robot Modeling and Kinematics teaches the fundamental topics of robotics, using cutting-edge visualization software and computer tools to illustrate topics and provide a comprehensive process of teaching and learning. The book provides an introduction to robotics with an emphasis on the study of robotic arms, their mathematical description, and the equations describing their motion. It teaches how to model robotic arms efficiently and analyze their kinematics. The kinematics of robot manipulators is also presented beginning with the use of simple robot mechanisms and progressing to the most complex robot manipulator structures. While mathematically rigorous, the book’s focus is on ease of understanding of the concepts with interactive animated computer graphics illustrations and modeling software that allow clear understanding of the material covered in the book. All necessary computations are concisely explained and software is provided that greatly eases the computational burden normally associated with robotics. Written for use in a robotics course or as a professional reference, Robot Modeling and Kinematics is an essential resource that provides a thorough understanding of the topics of modeling and kinematics.

Robot Force Control Technical topics include biological systems, vehicle dynamics and control, adaptive control, consensus control, cooperative control, control of communication networks, control of networked systems, control of distributed parameter systems, decentralized control, delay systems, discrete event systems, fault detection, fault tolerant systems, flexible structures, flight control, formation flying, fuzzy systems, hybrid systems, system identification, iterative learning control, model predictive control, linear parameter varying systems, linear matrix inequalities, machine learning, manufacturing systems, robotics, multi agent systems, neural networks, nonlinear control, observers, optimal control, optimization, path planning, navigation, robust control, sensor fusion, sliding mode control, stochastic systems, switched systems, uncertain systems, game theory

Advances in Modelling and Control of Soft Robots This book provides readers with a solid set of diversified and essential tools for the theoretical modeling and control of complex robotic systems, as well as for digital human modeling and realistic motion generation. Following a comprehensive introduction to the fundamentals of robotic kinematics, dynamics and control systems design, the author extends robotic modeling procedures and motion algorithms to a much higher-dimensional, larger scale and more sophisticated research area, namely digital human modeling. Most of the methods are illustrated by MATLAB® codes and sample graphical visualizations, offering a unique closed loop between conceptual understanding and visualization. Readers are guided through practicing and creating 3D graphics for robot arms as well as digital human models in MATLAB®, and through driving them for real-time animation. This work is intended to serve as a robotics textbook with an extension to digital human modeling for
senior undergraduate and graduate engineering students. At the same time, it represents a comprehensive reference guide for all researchers, scientists and professionals eager to learn the fundamentals of robotic systems as well as the basic methods of digital human modeling and motion generation.

Humanoid Robots The first integrated treatment of many of the most important recent developments in using detailed dynamic models of robots to improve their control.

Robot Manipulator Control This edition covers different topics from mechatronics and robotics, including mechatronics basics, robotics, arms and manipulators, sensors and actuators in mechatronics. Section 1 focuses on mechatronics basics, describing a brief history of industrial robotics in the 20th century; an IoT model for cyber-physical manufacturing systems; 3+1 SysML view-model in model integrated mechatronics; design and development of mechatronic application in agricultural irrigation device. Section 2 focuses on robotics arms and manipulators, describing design and development of a competitive low-cost robot arm with four degrees of freedom; an adaptive robust approach to modeling and control of flexible arm robots; interactive heuristic d* path planning solution based on PSO for two-link robotic arm in dynamic environment; optimal task placement of a serial robot manipulator for manipulability and mechanical power optimization; kinematic analysis and simulation of high-speed plate carrying manipulator based on Matlab. Section 3 focuses on sensors in mechatronics, describing flexible impact force sensor; a sensing and robot navigation of hybrid sensor network; a study on vehicle detection and tracking using wireless sensor networks; deployment of pre-industrial autonomous microsensor sensor in Saudi Arabia's injection seawater system. Section 4 focuses on actuators, describing a survey of modeling and control of piezoelectric actuators; experimental investigation of photostriuctive materials for MEMS application; theory and simulation analysis of the mode shape and normal shape actuators and sensors; experimental study of the response of transonic diffuser flow to a piezoceramic actuator at diffuser throat; an ARX-based PID-sliding mode control on velocity tracking control of a stick-slip PZ-electro-driven actuator.

Modelling and Control of Robot Manipulators

Robot Modelling Results of the International Conference on Intelligent Computing, ICIC 2006; Lecture Notes in Computer Science (LNCS), Lecture Notes in Artificial Intelligence (LNAI), Lecture Notes in Bioinformatics (LNB), Lecture Notes in Control and Information Sciences (LNCS). 142 revised full papers are organized in topical sections: Blind Source Separation; Intelligent Sensor Networks; Intelligent Control and Automation; and Data Fusion, Knowledge Discovery, and Data Mining. Includes a Special Session on Smart and Intelligent Home Technology.

Design, Modeling and Control of a Dual-arm Robot for Machining Robot Manipulator Control offers a complete survey of control systems for serial-link robot arms and acknowledges how robotic device performance hinges upon a well-developed control system. Containing over 750 essential equations, this thoroughly up-to-date Second Edition, the book explicates theoretical and mathematical requisites for controls design and summarizes various techniques in computer simulation and implementation of controllers. It also addresses procedures and issues in computed-torque, robust, adaptive, neural network, and force control. New chapters relay practical information on commercial robot manipulators and devices and cutting-edge methods in neural network control.

Dynamics Modeling and Control of a Flexible Robot Arm A Mathematical Introduction to Robotic Manipulation presents a mathematical formulation of the kinematics, dynamics, and control of robot manipulators. It uses an elegant set of mathematical tools that emphasizes the geometry of robot motion and allows a large class of robotic manipulation problems to be analyzed within a unified framework. The foundation of the book is a derivation of robot kinematics using the product of the exponentials formula. The authors explore the kinematics of open-chain manipulators and multifingered robot hands, present an analysis of the dynamics and control of robot systems, discuss the specification and control of internal forces and internal motions, and address the implications of the nonholonomic nature of rolling contact are addressed, as well. The wealth of information, numerous examples, and exercises make A Mathematical Introduction to Robotic Manipulation valuable as both a reference for robotics researchers and a text for students in advanced robotics courses.

Robot Modeling and Kinematics Aerial 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 pose 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 APHI 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.

The Koopman Operator in Systems and Control 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.

Modeling, Identification and Control of Robots

Kinematic Modeling and Control System Development of a Robot Arm One of the fundamental requirements for the success of a robot task is the capability to handle interaction between manipulator and environment. The quantity that describes the state of interaction more effectively is the contact force at the manipulator's end effector. High values of contact force are generally undesirable since they may stress both the manipulator and the manipulated object; hence the need to seek for effective force control strategies. The book provides a theoretical and experimental treatment of robot interaction control. In the framework of model-based operational space control, stiffness control and impedance control are presented as the basic strategies for indirect force control; a key feature is the coverage of six-degree-of-freedom interaction tasks and manipulator kinematic redundancy. Then, direct force control strategies are presented which are obtained from motion control schemes suitably modified by the closure of an outer force regulation feedback loop. Finally, advanced force and position control strategies are presented which include passivity-based, adaptive and output feedback control schemes. Remarkably, all control schemes are experimentally tested on a setup consisting of a seven-joint industrial robot with open control architecture and force/torque sensor. The topic of robot force control is not treated in depth in robotics textbooks, in spite of its crucial importance for practical manipulation tasks. In the few books addressing this topic, the material is often limited to single-degree-of-freedom tasks. On the other hand, several results are available in the robotics literature but no dedicated monograph exists. The book is thus aimed at filling this gap by providing a theoretical and experimental treatment of robot force control.

Advanced Studies of Flexible Robotic Manipulators 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.

Modelling And Control Of Mechanisms And Robots The IEEE RSJ International Conference on Intelligent Robots and Systems (IROS) provides an international forum for worldwide robotics community to explore the frontier of science and technology in intelligent robots and smart machines, and to stimulate innovative ideas, exchange technological perspectives and assess future directions. In addition to technical sessions and multi media presentations, IROS conferences also hold panel discussions, workshops, tutorials, exhibits and technical tours to enhance technical communications among the attendees.

Oscillation Modes Modeling and Control for Flexible Robot Arm 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, Vision and Control This book investigates a biologically inspired method of robot arm control, developed with the objective of synthesising human-like motion dynamically, using nonlinear, robust and adaptive control techniques in practical robot systems. The control method caters to a rising interest in humanoid robots and the need for appropriate control schemes to match these systems. Unlike the classic kinematic schemes used in industrial manipulators, the dynamic approaches proposed here promote human-like motion with better exploitation of the robot's physical structure. This also benefits human-robot interaction. The control schemes proposed in this book are inspired by a wealth of human-motion literature that indicates the drivers of motion to be dynamic, model-based and optimal. Such considerations lend themselves nicely to achievement via nonlinear control techniques without the necessity for extensive and complex biological models. The operational-space method of robot control forms the basis of many of the techniques investigated in this book. The method includes attractive features such as the decoupling of motion into task and posture components. Various developments are made in each of these elements. Simple cost functions inspired by biomechanical "effort" and "discomfort" generate realistic posture motion. Sliding-mode techniques overcome robustness shortcomings for
practical implementation. Arm compliance is achieved via a method of model-free adaptive control that also deals with actuator saturation via anti-windup compensation. A neural-network-centered learning-by-observation scheme generates new task motions, based on motion-capture data recorded from human volunteers. In other parts of the book, motion capture is used to test theories of human movement. All developed controllers are applied to the reaching motion of a humanoid robot arm and are demonstrated to be practically realizable. This book is designed to be of interest to those wishing to achieve dynamics-based human-like robot-arm motion in academic research, advanced study or certain industrial environments. The book provides motivations, extensive reviews, research results and detailed explanations. It is not only suited to practising control engineers, but also applicable for general roboticists who wish to develop control systems expertise in this area.

Modeling and Control of a Flexible Space Robot to Capture a Tumbling Debris

Advanced Studies of Flexible Robotic Manipulators Presents pioneering and comprehensive work on engaging movement in robotic arms, with a specific focus on neural networks. The book provides comprehensive understanding on neural network control of redundant robot arms by using theoretical tools and simulations. Kinematic Control of Redundant Robot Arms Using Neural Networks is divided into three parts: Neural Networks for Serial Robot Arm Control; Neural Networks for Parallel Robot Control; and Neural Networks for Cooperative Control. The book starts by covering zeroing neural networks for control, and follows up with chapters on adaptive dynamic programming neural networks for control; projection neural networks for robot arm control; and neural learning and control co-design for robot arm control. Next, it looks at robust neural controller design for robot arm control and teaches readers how to use neural networks to avoid robot singularity. It then instructs on neural network-based Stewart platform control and neural network-based learning and control co-design for Stewart platform control. The book finishes with a section on zeroing neural networks for robot arm motion generation. Provides comprehensive understanding on robot arm control aided with neural networks. Presents neural network-based control techniques for single robot arms, parallel robot arms (Stewart platforms), and cooperative robot arms. Provides a comparison of, and the advantages of, using neural networks for control purposes rather than traditional control based methods. Includes simulation and modeling tasks (e.g., MATLAB) for onward application for research and engineering development. By focusing on robot arm control aided by neural networks whilst examining central topics surrounding the field, Kinematic Control of Redundant Robot Arms Using Neural Networks is an excellent book for graduate students and academic and industrial researchers studying neural dynamics, neural networks, analog and digital circuits, mechatronics, and mechanical engineering.

Modern Robotics 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 Liao); 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.

A Time Series Modeling Approach for Feedback Control of Robot Arm Positioning Errors

2019 American Control Conference (ACC) Robot arms have been developing since 1960’s, and those are widely used in industrial factories such as welding, painting, assembly, transportation, etc. Nowadays, the robot arms are indispensable for automation of factories. Moreover, applications of the robot arms are not limited to the industrial factory but expanded to living space or outer space. The robot arm is an integrated technology, and its technological elements are actuators, sensors, mechanism, control and system, etc.

Robot Dynamics And Control This self-contained introduction to practical robot kinematics and dynamics includes a comprehensive treatment of robot control. It provides background material on terminology and linear transformations, followed by coverage of kinematics and inverse kinematics, dynamics, manipulator control, robust control, force control, use of feedback in nonlinear systems, and adaptive control. Each topic is supported by examples of specific applications. Derivations and proofs are included in many cases. The book includes many worked examples, examples illustrating all aspects of the theory, and problems.

Robot Arm Modeling and Simulation

Model-Based Control of a Robot Manipulator Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers provides detailed information about Intel® Galileo and Intel® Galileo Gen 2 boards for all software developers interested in Arduino and the Linux platform. The book covers the new Arduino APIs and is an introduction for developers on the Arduino platform. This book also includes software and hardware design guidelines to teach the reader how to build a hardware platform.
Robot Modeling and Control

Robot Arms This book provides a broad overview of state-of-the-art research at the intersection of the Koopman operator theory and control theory. It also reviews novel theoretical results obtained and efficient numerical methods developed within the framework of Koopman operator theory. The contributions discuss the latest findings and techniques in several areas of control theory, including model predictive control, optimal control, observer design, systems identification and structural analysis of controlled systems, addressing both theoretical and numerical aspects and presenting open research directions, as well as detailed numerical schemes and data-driven methods. Each contribution addresses a specific problem. After a brief introduction of the Koopman operator framework, including basic notions and definitions, the book explores numerical methods, such as the dynamic mode decomposition (DMD) algorithm and Arnoldi-based methods, which are used to represent the operator in a finite-dimensional basis and to compute its spectral properties from data. The main body of the book is divided into three parts: theoretical results and numerical techniques for observer design, synthesis analysis, stability analysis, parameter estimation, and identification; data-driven techniques based on DMD, which extract the spectral properties of the Koopman operator from data for the structural analysis of controlled systems; and Koopman operator techniques with specific applications in systems and control, which range from heat transfer analysis to robot control. A useful reference resource on the Koopman operator theory for control theorists and practitioners, the book is also of interest to graduate students, researchers, and engineers looking for an introduction to a novel and comprehensive approach to systems and control, from pure theory to data-driven methods.

Modeling and Control Simulation of Articulating Robot Arm Using Fuzzy Logic The robotics is an important part of modern engineering and is related to a group of branches such as electric

2018 IEEE RSJ International Conference on Intelligent Robots and Systems (IROS) 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 S-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.

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