

Biped Locomotion

Miomir Vukobratovic, Branislav Borovac, Dusan Surla, Dragan Stokic

Biped Locomotion:

Biped Locomotion Miomir Vukobratovic, Branislav Borovac, Dusan Surla, Dragan Stokic, 2012-12-06 Here for the first time in one book is a comprehensive and systematic approach to the dynamic modeling and control of biped locomotion robots A survey is included of various approaches to the control of biped robots and a new approach to the control of biped systems based on a complete dynamic model is presented in detail The stability of complete biped system is presented for the first time as a highly nonlinear dynamic system Also included is new software for the synthesis of a dynamically stable walk for arbitrary biped systems presented here for the first time A survey of various realizations of biped systems and numerous numerical examples are given The reader is given a deep insight into the entire area of biped locomotion The book covers all relevant approaches to the subject and gives the most complete account to date of dynamic modeling control and realizations of biped systems Biped Locomotion Miomir Vukobratovic, Branislav Borovac, Dusan Surla, Dragan Stokic, 1990-02-26 Here for the first time in one book is a comprehensive and systematic approach to the dynamic modeling and control of biped locomotion robots A survey is included of various approaches to the control of biped robots and a new approach to the control of biped systems based on a complete dynamic model is presented in detail The stability of complete biped system is presented for the first time as a highly nonlinear dynamic system Also included is new software for the synthesis of a dynamically stable walk for arbitrary biped systems presented here for the first time A survey of various realizations of biped systems and numerous numerical examples are given The reader is given a deep insight into the entire area of biped locomotion The book covers all relevant approaches to the subject and gives the most complete account to date of dynamic modeling control and realizations of biped systems Feedback Control of Dynamic Bipedal Robot Locomotion Eric R. Westervelt, Jessy W. Grizzle, Christine Chevallereau, Jun Ho Choi, Benjamin Morris, 2018-10-03 Bipedal locomotion is among the most difficult challenges in control engineering Most books treat the subject from a quasi static perspective overlooking the hybrid nature of bipedal mechanics Feedback Control of Dynamic Bipedal Robot Locomotion is the first book to present a comprehensive and mathematically sound treatment of feedback design for achieving stable agile and efficient locomotion in bipedal robots In this unique and groundbreaking treatise expert authors lead you systematically through every step of the process including Mathematical modeling of walking and running gaits in planar robots Analysis of periodic orbits in hybrid systems Design and analysis of feedback systems for achieving stable periodic motions Algorithms for synthesizing feedback controllers Detailed simulation examples Experimental implementations on two bipedal test beds The elegance of the authors approach is evident in the marriage of control theory and mechanics uniting control based presentation and mathematical custom with a mechanics based approach to the problem and computational rendering Concrete examples and numerous illustrations complement and clarify the mathematical discussion A supporting Web site offers links to videos of several experiments along with MATLAB code for several of the models This one of a kind book builds a solid understanding of the

theoretical and practical aspects of truly dynamic locomotion in planar bipedal robots **Biped Robots** Armando Carlos De Pina Filho, 2011-02-04 Biped robots represent a very interesting research subject with several particularities and scope topics such as mechanical design gait simulation patterns generation kinematics dynamics equilibrium stability kinds of control adaptability biomechanics cybernetics and rehabilitation technologies. We have diverse problems related to these topics making the study of biped robots a very complex subject and many times the results of researches are not totally satisfactory However with scientific and technological advances based on theoretical and experimental works many researchers have collaborated in the evolution of the biped robots design looking for to develop autonomous systems as well as to help in rehabilitation technologies of human beings Thus this book intends to present some works related to the study of biped robots developed by researchers worldwide Autonomous Systems - Self-Organization, Management, and Control Bernd Mahr, Huanye Sheng, 2008-09-15 The 2008 TUB SJTU joint workshop on Autonomous Systems Self Organization Management and Control was held on October 6 2008 at Shanghai Jiao Tong University Shanghai China The workshop sponsored by Shanghai Jiao Tong University and Technical University of Berlin brought together scientists and researchers from both universities to present and discuss the latest progress on autonomous systems and its applications in diverse areas Autonomous systems are designed to integrate machines computing sensing and software to create intelligent systems capable of interacting with the complexities of the real world Autonomous systems represent the physical embodiment of machine intelligence Topics of interest include but are not limited to theory and modeling for autonomous systems organization of autonomous systems learning and perception complex systems multi agent systems robotics and control applications of autonomous systems Fast Motions in Biomechanics and Robotics Moritz Diehl, Katja Mombaur, 2007-07-13 In the past decades much progress has been made in the field of walking robots The current state of technology makes it possible to create humanoid robots that nearly walk like a human being climb stairs or avoid small stacles However the dream of a robot running as fast and as elegantly as a human is still far from becoming reality Control of such fast motions is still a big technological issue in robotics and the maximum running speed of contemporary robots is still much smaller than that of human track runners The conventional control approach that most of these robots are based on does not seem to be suitable to increase the running speeds up to a biological level In order to address this challenge we invited an interdisciplinary community of researchers from robotics biomechanics control engineering and applied mathematics to come together in Heidelberg at the Symposium Fast Motions in Biomechanics and Robotics Optimization Feedback Control which was held at the International Science Forum IWH on September 7 9 2005 The number of participants in this symposium was kept small in order to promote discussions and enable a fruitful exchange of ideas Modeling, Simulation and Optimization of Bipedal Walking Katja Mombaur, Karsten Berns, 2013-02-28 The model based investigation of motions of anthropomorphic systems is an important interdisciplinary research topic involving specialists from many fields such as

Robotics Biomechanics Physiology Orthopedics Psychology Neurosciences Sports Computer Graphics and Applied Mathematics This book presents a study of basic locomotion forms such as walking and running is of particular interest due to the high demand on dynamic coordination actuator efficiency and balance control Mathematical models and numerical simulation and optimization techniques are explained in combination with experimental data which can help to better understand the basic underlying mechanisms of these motions and to improve them Example topics treated in this book are Modeling techniques for anthropomorphic bipedal walking systems Optimized walking motions for different objective functions Identification of objective functions from measurements Simulation and optimization approaches for humanoid robots Biologically inspired control algorithms for bipedal walking Generation and deformation of natural walking in computer graphics Imitation of human motions on humanoids Emotional body language during walking Simulation of biologically inspired actuators for bipedal walking machines Modeling and simulation techniques for the development of prostheses Functional electrical stimulation of walking Climbing and Walking Robots Karsten Berns, Rudiger Dillmann, 2001-11-28 Recent advances in robot technology from around the world Climbing and Walking Robots From Biology to Industrial Applications is a collection of papers presented at the 2001 CLAWAR conference Featuring current work from leading robotics labs around the globe this book presents the latest in robotics across industries and suggests directions for future research Topics include design methodology bipedal locomotion fluid actuators sensor systems control architecture and simulation and more Relevant to mechanical engineers and robotics specialists in both industry and academia these **Autonomous Robots** George A. Bekey, 2005-05-20 An papers showcase the field s latest technological advances introduction to the science and practice of autonomous robots that reviews over 300 current systems and examines the underlying technology Autonomous robots are intelligent machines capable of performing tasks in the world by themselves without explicit human control Examples range from autonomous helicopters to Roomba the robot vacuum cleaner In this book George Bekey offers an introduction to the science and practice of autonomous robots that can be used both in the classroom and as a reference for industry professionals He surveys the hardware implementations of more than 300 current systems reviews some of their application areas and examines the underlying technology including control architectures learning manipulation grasping navigation and mapping Living systems can be considered the prototypes of autonomous systems and Bekey explores the biological inspiration that forms the basis of many recent developments in robotics He also discusses robot control issues and the design of control architectures After an overview of the field that introduces some of its fundamental concepts the book presents background material on hardware control from both biological and engineering perspectives software architecture and robot intelligence It then examines a broad range of implementations and applications including locomotion wheeled legged flying swimming and crawling robots manipulation both arms and hands localization navigation and mapping The many case studies and specific applications include robots built for research

industry and the military among them underwater robotic vehicles walking machines with four six and eight legs and the famous humanoid robots Cog Kismet ASIMO and ORIO The book concludes with reflections on the future of robotics the potential benefits as well as the possible dangers that may arise from large numbers of increasingly intelligent and Intelligent Robotics Systems: Inspiring the NEXT Kairuddin Omar, Md. Jan Nordin, Prahlad Vadakkepat, Anton Satria Prabuwono, Siti Norul Huda Sheikh Abdullah, Jacky Baltes, Shamsudin Mohd Amin, Wan Zuha Wan Hassan, Mohammad Faidzul Nasrudin, 2013-08-16 This book constitutes the refereed proceedings of the 16th FIRA Robo World Congress FIRA 2013 held in Kuala Lumpur Malaysia in August 2013 The congress consisted of the following three conferences 5th International Conference on Advanced Humanoid Robotics Research ICAHRR 5th International Conference on Education and Entertainment Robotics ICEER and 4th International Robotics Education Forum IREF The 38 revised full papers presented were carefully reviewed and selected from 112 submissions They cover various topics related to the technical developments and achievements in the field of robotics **Towards Intelligent Engineering and Information Technology** Imre J. Rudas, János Fodor, 2009-09-30 Intelligent engineering systems try to replicate fundamental abilities of humans and nature in order to achieve sufficient progress in solving complex problems In an ideal case multi disciplinary applications of different modern engineering fields can result in synergistic effects Information technology and computer modeling are the underlying tools that play a major role at any stages of developing intelligent systems Chapters in the present volume have been written by eminent scientists from different parts of the world dealing with challenging problems for efficient modeling of intelligent systems The reader can find different characteristics and methodologies of computational intelligence with real life applications Various facets of intelligent engineering and information technology are addressed Starting with theoretical issues from pseudo analysis to parametric classes of digital fuzzy conjunctions for hardware implementation of fuzzy systems diverse aspects of control including quantum as well as fuzzy control and hybrid approaches intelligent robotics dealing with mobile and autonomous robots and new trends approaches and results on information technology machines materials and manufacturing and issues of intelligent systems and complex processes are covered

Perspectives in Mathematical System Theory, Control, and Signal Processing Jan C. Willems, Shinji Hara, Yoshito Ohta, Hisaya Fujioka, 2010-03-10 This Festschrift published on the occasion of the sixtieth birthday of Yutaka mamoto YY as he is occasionally casually referred to contains a collection of articles by friends colleagues and former Ph D students of YY They are a tribute to his friendship and his scientic vision and oeuvre which has been a source of inspiration to the authors Yutaka Yamamoto was born in Kyoto Japan on March 29 1950 He studied applied mathematics and general engineering science at the Department of Applied Mathematics and Physics of Kyoto University obtaining the B S and M Sc degrees in 1972 and 1974 His M Sc work was done under the supervision of Professor Yoshikazu Sawaragi In 1974 he went to the Center for Mathematical System T ory of the University of Florida in Gainesville He obtained the M Sc and Ph D degrees both

in Mathematics in 1976 and 1978 under the direction of Professor Rudolf Kalman RAAD 2012, 2012 Handbook on **Soft Robotics** Thrishantha Nanayakkara, 2024-12-02 This book explains how to design and control a soft robot in understandable language In addition it provides a comprehensive coverage of the essential theory and techniques used in soft robotics that can be used by graduate students in soft robotics. The book covers several key areas in soft robots ranging from design and fabrication to modelling and control It also includes many case studies and examples The book clearly explains mathematical concepts and uses illustrative explanation to help engineers and junior graduate students understand the physical meaning of the key concepts and approaches in soft robotics Reading this book gives professional engineers and students a sound knowledge of soft robotics that they can take to their careers and research Climbina and Walkina Robots and the Supporting Technologies for Mobile Machines G. Muscato, D. Longo, 2003-11-07 Bringing together academics researchers and industrialists Climbing and Walking Robots 2003 CLAWAR 2003 provides a forum for cross fertilization in the different specialities so that both state of the art and industrial applications can be reported on Original contributions both industrial and those in new emerging fields provide a full picture of climbing and walking robots The interest in climbing and walking robots CLAWAR has increased considerably over recent years addressing many application fields such as exploration intervention in extreme environments personal services emergency rescue operations transportation entertainment etc and envisage humanoid robots evolving into mechatronic replicas of ourselves Topics covered include Biological Inspired Systems Medical Systems Control of CLAWAR Design Methodology System Modelling and Simulation Modularity and System Architecture Gait Generation and Stability of CLAWAR Biped Locomotion Multi legged Locomotion Micro Machines Applications Climbing Robots Actuators Sensors Navigation and Sensors Fusion CLAWAR Network Workpackages Advances in Automation and Robotics, Vol.1 Gary Lee, 2011-11-19 The international conference on Automation and Robotics ICAR2011 is held during December 12 13 2011 in Dubai UAE The proceedings of ICAR2011 have been published by Springer Lecture Notes in Electrical Engineering which include 163 excellent papers selected from more than 400 submitted papers The conference is intended to bring together the researchers and engineers technologists working in different aspects of intelligent control systems and optimization robotics and automation signal processing sensors systems modeling and control industrial engineering production and management This part of proceedings includes 81 papers contributed by many researchers in relevant topic areas covered at ICAR2011 from various countries such as France Japan USA Korea and China etc Many papers introduced their advanced research work recently some of them gave a new solution to problems in the field with powerful evidence and detail demonstration Others stated the application of their designed and realized systems The session topic of this proceeding is intelligent control and robotics and automation which includes papers about Distributed Control Systems Intelligent Fault Detection and Identification Machine Learning in Control Neural Networks based Control Systems Fuzzy Control Genetic Algorithms Robot Design Human robots Interfaces Network

Robotics and Autonomous Systems Industrial Networks and Automation Modeling Simulation and Architectures Vision Recognition and Reconstruction Virtual Reality Image Processing and so on All of papers here involved the authors numerous time and energy will be proved valuable in their research field Sincere thanks to the committee and all the authors moreover anonymous reviewers from many fields and organizations That is a power for all of us to go on research work for the world

Global Perspectives on Robotics and Autonomous Systems: Development and Applications Habib, Maki K.,2023-08-01 There is an increasing demand to develop intelligent robotics and autonomous systems to deal with dynamically changing and complex unstructured and unpredictable environments Such robots should be able to handle task varieties environment dynamics and goal variations and their complexity This also highlights the need for having intelligent robotics and autonomous systems with capabilities assuring reliable and robust functions resolving real time complex problems that are associated with many applications across diverse domains This requires unconventional ways to develop creative and innovative energy efficient and eco and environmentally friendly solutions that consider new ways of creative thinking while drawing inspiration from nature as a model leading to creating new designs intelligent systems intelligent structures mechanisms reconfigurability and more Global Perspectives on Robotics and Autonomous Systems Development and Applications describes the evolution of robotics and autonomous systems their development their technologies and their applications This book discusses the concept of autonomy requirements and its role in shaping the behavior of these robots so that they can make their own effective and safe decisions and act on them reliably while assuring real life requirements Covering topics such as digital transformation fused deposition modeling FDM and organizational unbundling process this premier reference source is an essential resource for engineers computer scientists industry professionals manufacturers smart systems developers data analysts students and educators of higher educations researchers and academicians

Informatics in Control, Automation and Robotics Kurosh Madani, Dimitri Peaucelle, Oleg Gusikhin, 2017-11-02 The book addresses the latest advances in research and development in the field of informatics in control robotics and automation With more than twenty revised and extended articles covering the theoretical aspects as well as applications and their implementation it offers a factual and well balanced overview of the state of the art in the field In addition it highlights the trends in control of intelligent robots The book is an up to date source of information and inspiration for researchers engineers and PhD students

Machine Learning and Systems Engineering Sio-Iong Ao, Burghard B. Rieger, Mahyar Amouzegar, 2010-10-05 A large international conference on Advances in Machine Learning and Systems Engineering was held in UC Berkeley California USA October 20 22 2009 under the auspices of the World Congress on Engineering and Computer Science WCECS 2009 Machine Learning and Systems Engineering contains forty six revised and extended research articles written by prominent researchers participating in the conference Topics covered include Expert system Intelligent decision making Knowledge based systems Knowledge extraction Data analysis tools Computational biology

Optimization algorithms Experiment designs Complex system identification Computational modeling and industrial applications Machine Learning and Systems Engineering offers the state of the art of tremendous advances in machine learning and systems engineering and also serves as an excellent reference text for researchers and graduate students working on machine learning and systems engineering *Proceedings of the 2015 Chinese Intelligent Automation Conference* Zhidong Deng, Hongbo Li, 2015-04-07 Proceedings of the 2015 Chinese Intelligent Automation Conference presents selected research papers from the CIAC 15 held in Fuzhou China The topics include adaptive control fuzzy control neural network based control knowledge based control hybrid intelligent control learning control evolutionary mechanism based control multi sensor integration failure diagnosis reconfigurable control etc Engineers and researchers from academia industry and the government can gain valuable insights into interdisciplinary solutions in the field of intelligent automation

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