

3d Modelling Of Biped Robot Locomotion With Walking

This volume highlights new trends and challenges in research on agents and the new digital and knowledge economy, and includes 23 papers classified into the following categories: business process management, agent-based modeling and simulation, and anthropic-oriented computing. All papers were originally presented at the 11th International KES Conference on Agents and Multi-Agent Systems – Technologies and Applications (KES-AMSTA 2017) held June 21–23, 2017 in Vilamoura, Algarve, Portugal. Today's economy is driven by technologies and knowledge. Digital technologies can free, shift and multiply choices, and often intrude on the territory of other industries by providing new ways of conducting business operations and creating value for customers and companies. The topics covered in this volume include software agents, multi-agent systems, agent modeling, mobile and cloud computing, big data analysis, business intelligence, artificial intelligence, social systems, computer embedded systems and nature inspired manufacturing, etc., all of which contribute to the modern Digital Economy. The results presented here will be of theoretical and practical value to researchers and industrial practitioners working in the fields of artificial intelligence, collective computational intelligence, innovative business models, the new digital and knowledge economy and, in particular, agent and multi-agent systems, technologies, tools and applications.

The primary goal of AutoCAD 2015 Tutorial - Second Level: 3D Modeling is to introduce the aspects of computer based three dimensional modeling. This text is intended to be used as a training guide for both students and professionals. The chapters in this book cover AutoCAD 2015 and proceed in a pedagogical fashion to guide you from constructing 3D wire frame models, 3D surface models, and 3D solid models to making multiview drawings and rendering images. The text takes a hands-on, exercise-intensive approach to all the important 3D modeling techniques and concepts. This book contains a series of twelve tutorial style chapters designed to introduce CAD users to 3D modeling with AutoCAD 2015. Users upgrading from a previous release of the AutoCAD software will also find this text helpful. The basic premise of this book is that the more 3D designs you create using AutoCAD 2015 the better you learn the software. With this in mind each tutorial introduces a new set of commands and concepts, building on previous chapters. By going through this book readers will establish a good basis for exploring and growing in the exciting field of Computer Aided Engineering. 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.

The present book includes a set of selected extended papers from the 12th International Conference on Informatics in Control, Automation and Robotics (ICINCO 2015), held in Colmar, France, from 21 to 23 July 2015. The conference brought together researchers, engineers and practitioners interested in the application of informatics to Control, Automation and Robotics. Four simultaneous tracks will be held, covering Intelligent Control Systems, Optimization, Robotics, Automation, Signal Processing, Sensors, Systems Modelling and Control, and Industrial Engineering, Production and Management. Informatics applications are pervasive in many areas of Control, Automation and Robotics. ICINCO 2015 received 214 submissions, from 42 countries, in all continents. After a double blind paper review performed by the Program Committee, 14% were accepted as full papers and thus selected for oral presentation. Additional papers were accepted as short papers and posters. A further selection was made after the Conference, based also on the assessment of presentation quality and audience interest, so that this book includes the extended and revised versions of the very best papers of ICINCO 2015. Commitment to high quality standards is a major concern of ICINCO that will be maintained in the next editions, considering not only the stringent paper acceptance ratios but also the quality of the program committee, keynote lectures, participation level and logistics.

are convinced that SIMPAR has succeeded in giving a first answer to this search, and it can be followed by proper scientific and engineering actions in the near future.

Mechanics, Motion Control, Sensing and Programming, Synthesis and Design, Legged Locomotion and Biomechanical Aspects of Robots and Manipulators – world view of the state of the art. Characterization: This volume presents the latest contribution to the theory and practice of modern robotics given by the world recognized scientists from Australia, Canada, Europe, Japan, Mexico, Singapore and USA.

By the dawn of the new millennium, robotics has undergone a major tra-

formation in scope and dimensions. This expansion has been brought about by the maturity of the field and the advances in its related technologies. From a largely dominant industrial focus, robotics has been rapidly expanding into the challenges of the human world. The new generation of robots is expected to safely and dependably co-habitat with humans in homes, workplaces, and communities, providing support in services, entertainment, education, health care, manufacturing, and assistance. Beyond its impact on physical robots, the body of knowledge robotics has produced is revealing a much wider range of applications reaching across diverse research areas and scientific disciplines, such as: biomechanics, haptics, neurosciences, virtual simulation, animation, surgery, and sensor networks among others. In return, the challenges of the new emerging areas are providing an abundant source of stimulation and insights for the field of robotics. It is indeed at the intersection of disciplines that the most striking advances happen. The goal of the series of Springer Tracts in Advanced Robotics (STAR) is to bring, in a timely fashion, the latest advances and developments in robotics on the basis of their significance and quality. It is our hope that the wider dissemination of research developments will stimulate more exchanges and collaborations among the research community and contribute to further advancement of this rapidly growing field.

This book includes papers from the 5th International Conference on Robot Intelligence Technology and Applications held at KAIST, Daejeon, Korea on December 13–15, 2017. It covers the following areas: artificial intelligence, autonomous robot navigation, intelligent robot system design, intelligent sensing and control, and machine vision. The topics included in this book are deep learning, deep neural networks, image understanding, natural language processing, speech/voice/text recognition, reasoning & inference, sensor integration/fusion/perception, multisensor data fusion, navigation/SLAM/localization, distributed intelligent algorithms and techniques, ubiquitous computing, digital creatures, intelligent agents, computer vision, virtual/augmented reality, surveillance, pattern recognition, gesture recognition, fingerprint recognition, animation and virtual characters, and emerging applications. This book is a valuable resource for robotics scientists, computer scientists, artificial intelligence researchers and professionals in universities, research institutes and laboratories.

These two volumes constitute the refereed proceedings of the First International Conference on Intelligent Robotics and Applications, ICIRA 2008, held in Wuhan, China, in October 2008. The 265 revised full papers presented were thoroughly reviewed and selected from 552 submissions; they are devoted but not limited to robot motion planning and manipulation; robot control; cognitive robotics; rehabilitation robotics; health care and artificial limb; robot learning; robot vision; human-machine interaction & coordination; mobile robotics; micro/nano mechanical systems; manufacturing automation; multi-axis surface machining; realworld applications. Studies on robotics applications have grown substantially in recent years, with swarm

robotics being a relatively new area of research. Inspired by studies in swarm intelligence and robotics, swarm robotics facilitates interactions between robots as well as their interactions with the environment. The Handbook of Research on Design, Control, and Modeling of Swarm Robotics is a collection of the most important research achievements in swarm robotics thus far, covering the growing areas of design, control, and modeling of swarm robotics. This handbook serves as an essential resource for researchers, engineers, graduates, and senior undergraduates with interests in swarm robotics and its applications.

The interest in climbing and walking robots (CLAWAR) has intensified in recent years, and novel solutions for complex and very diverse applications have been anticipated by means of significant progress in this area of robotics. The shift of robotics from manufacturing to services is clearly gaining pace as witnessed by the growth in activities in the CLAWAR area. Moreover, the amalgamation of original ideas and related innovations, search for new potential applications and the use of state of the art support technologies indicate that important steps are likely in the near future and the results could have a significant beneficial socio-economic impact. This book reports on state of the art latest research and development findings and results presented in the CLAWAR 2005 Conference. These are presented in 131 technical articles by authors from 27 countries worldwide. The book is structured into 21 sections, which include some of the traditional topics featured in previous CLAWAR conferences with a set of new topics such as bioengineering, flexible manipulators, personal assistance applications, non-destructive test applications, security and surveillance applications and space applications of robotics. The editors are grateful to colleagues within the committee structure of the CLAWAR 2005 for their help in the review process of the articles and their support throughout this project.

This book constitutes the refereed proceedings of the 4th International Conference on Interactive Collaborative Robotics, ICR 2019, held in Istanbul, Turkey, in August 2019. The 32 papers presented in this volume were carefully reviewed and selected from 46 submissions. They deal with challenges of human-robot interaction; robot control and behavior in social robotics and collaborative robotics; and applied robotic and cyber-physical systems.

Volumes CCIS 51 and LNCS 5812 constitute the proceedings of the Fourth International Symposium on Intelligence Computation and Applications, ISICA 2009, held in Huangshi, China, during October 23-25. ISICA 2009 attracted over 300 submissions. Through rigorous reviews, 58 papers were included in LNCS 5821, and 54 papers were collected in CCIS 51. ISICA conferences are one of the first series of international conferences on computational intelligence that combine elements of learning, adaptation, evolution and fuzzy logic to create programs as alternative solutions to artificial intelligence.

Bipedal Robots Modeling, Design and Walking Synthesis John Wiley & Sons

The book focuses on original approaches intended to support the development of biologically inspired cognitive architectures. It bridges together different disciplines, from classical artificial intelligence to linguistics, from neuro- and social sciences to design and creativity, among others. The chapters, based on contributions presented at the Ninth Annual Meeting of the BICA Society, held in on August 23-24, 2018, in Prague, Czech Republic, discuss emerging methods, theories and ideas towards the

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realization of general-purpose humanlike artificial intelligence or fostering a better understanding of the ways the human mind works. All in all, the book provides engineers, mathematicians, psychologists, computer scientists and other experts with a timely snapshot of recent research and a source of inspiration for future developments in the broadly intended areas of artificial intelligence and biological inspiration. Legged robots are a promising locomotion system, capable of performing tasks that conventional vehicles cannot. Even more exciting is the fact that this is a rapidly developing field of study for researchers from a variety of disciplines. However, only a few books have been published on the subject of multi-legged robots. The main objective of this book is to describe some of the major control issues concerning walking robots that the authors have faced over the past 10 years. A second objective is to focus especially on very large hydraulically driven hexapod robot locomotion weighing more than 2,000 kg, making this the first specialized book on this topic. The 10 chapters of the book touch on diverse relevant topics such as design aspects, implementation issues, modeling for control, navigation and control, force and impedance control-based walking, fully autonomous walking, walking and working tasks of hexapod robots, and the future of walking robots. The construction machines of the future will very likely resemble hydraulically driven hexapod robots like the ones described in this book – no longer science fiction but now a reality.

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 Modeling 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

"This book presents the proceedings of the First International Conference on Biologically Inspired Cognitive Architectures (BICA 2010), which is also the First Annual Meeting of the BICA Society. A cognitive architecture is a computational framework for the design of intelligent, even conscious, agents. It may draw inspiration from many sources, such as pure mathematics, physics or abstract theories of cognition. A

biologically inspired cognitive architecture (BICA) is one which incorporates formal mechanisms from computational models of human and animal cognition, which currently provide the only physical examples with the robustness, flexibility, scalability and consciousness that artificial intelligence aspires to achieve. The BICA approach has several different goals: the broad aim of creating intelligent software systems without focusing on any one area of application; attempting to accurately simulate human behavior or gain an understanding of how the human mind works, either for purely scientific reasons or for applications in a variety of domains; understanding how the brain works at a neuronal and sub-neuronal level; or designing artificial systems which can perform the cognitive tasks important to practical applications in human society, and which at present only humans are capable of. The papers presented in this volume reflect the cross-disciplinarity and integrative nature of the BICA approach and will be of interest to anyone developing their own approach to cognitive architectures. Many insights can be found here for inspiration or to import into one's own architecture, directly or in modified form."--Publisher description.

The book presents several approaches in the key areas of practice for which the MATLAB software package was used. Topics covered include applications for: -Motors -Power systems -Robots -Vehicles The rapid development of technology impacts all areas. Authors of the book chapters, who are experts in their field, present interesting solutions of their work. The book will familiarize the readers with the solutions and enable the readers to enlarge them by their own research. It will be of great interest to control and electrical engineers and students in the fields of research the book covers. This is the proceedings of IFToMM CK 2017, the 7th International Workshop on Computational Kinematics that was held in Futuroscope-Poitiers, France in May 2017. Topics treated include: kinematic design and synthesis, computational geometry in kinematics, motion analysis and synthesis, theory of mechanisms, mechanism design, kinematical analysis of serial and parallel robots, kinematical issues in biomechanics, molecular kinematics, kinematical motion analysis and simulation, geometric constraint solvers, deployable and tensegrity structures, robot motion planning, applications of computational kinematics, education in computational kinematics, and theoretical foundations of kinematics. Kinematics is an exciting area of computational mechanics and plays a central role in a great variety of fields and industrial applications nowadays. Apart from research in pure kinematics, the field deals with problems of practical relevance that need to be solved in an interdisciplinary manner in order for new technologies to develop. The results presented in this book should be of interest for practicing and research engineers as well as Ph.D. students from the fields of mechanical and electrical engineering, computer science, and computer graphics. This two-volume set (CCIS 158 and CCIS 159) constitutes the refereed proceedings of the International Workshop on Computer Science for Environmental Engineering and Ecoinformatics, CSEEE 2011, held in Kunming, China, in July 2011. The 150 revised full papers presented in both volumes were carefully reviewed and selected from a large number of submissions. The papers are organized in topical sections on computational intelligence; computer simulation; computing practices and applications; ecoinformatics; image processing information retrieval; pattern recognition; wireless communication and mobile computing; artificial intelligence and pattern classification; computer networks and Web; computer software, data handling and applications; data

communications; data mining; data processing and simulation; information systems; knowledge data engineering; multimedia applications.

This book provides an overview of model-based environmental visual perception for humanoid robots. The visual perception of a humanoid robot creates a bidirectional bridge connecting sensor signals with internal representations of environmental objects. The objective of such perception systems is to answer two fundamental questions: What & where is it? To answer these questions using a sensor-to-representation bridge, coordinated processes are conducted to extract and exploit cues matching robot's mental representations to physical entities. These include sensor & actuator modeling, calibration, filtering, and feature extraction for state estimation. This book discusses the following topics in depth: • Active Sensing: Robust probabilistic methods for optimal, high dynamic range image acquisition are suitable for use with inexpensive cameras. This enables ideal sensing in arbitrary environmental conditions encountered in human-centric spaces. The book quantitatively shows the importance of equipping robots with dependable visual sensing. • Feature Extraction & Recognition: Parameter-free, edge extraction methods based on structural graphs enable the representation of geometric primitives effectively and efficiently. This is done by eccentricity segmentation providing excellent recognition even on noisy & low-resolution images. Stereoscopic vision, Euclidean metric and graph-shape descriptors are shown to be powerful mechanisms for difficult recognition tasks. • Global Self-Localization & Depth Uncertainty Learning: Simultaneous feature matching for global localization and 6D self-pose estimation are addressed by a novel geometric and probabilistic concept using intersection of Gaussian spheres. The path from intuition to the closed-form optimal solution determining the robot location is described, including a supervised learning method for uncertainty depth modeling based on extensive ground-truth training data from a motion capture system. The methods and experiments are presented in self-contained chapters with comparisons and the state of the art. The algorithms were implemented and empirically evaluated on two humanoid robots: ARMAR III-A & B. The excellent robustness, performance and derived results received an award at the IEEE conference on humanoid robots and the contributions have been utilized for numerous visual manipulation tasks with demonstration at distinguished venues such as ICRA, CeBIT, IAS, and Automatica.

The three volume set LNAI 7506, LNAI 7507 and LNAI 7508 constitutes the refereed proceedings of the 5th International Conference on Intelligent Robotics and Applications, ICIRA 2012, held in Montreal, Canada, in October 2012. The 197 revised full papers presented were thoroughly reviewed and selected from 271 submissions. They present the state-of-the-art developments in robotics, automation and mechatronics. This volume covers the topics of robot actuators and sensors; robot design, development and control; robot intelligence, learning and linguistics; robot mechanism and design; robot motion analysis and planning; robotic vision, recognition and reconstruction; and planning and navigation.

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

The International Workshop on "Human Interaction with Machines" is the sixth in a successful series of workshops that were established by Shanghai Jiao Tong University and Technische Universität Berlin. The goal of those workshops is to bring together researchers from both universities in order to present research results to an international community. The series of workshops started in 1990 with the International Workshop on "Artificial Intelligence" and was continued with the International Workshop on "Advanced Software Technology" in 1994. Both workshops have been hosted by Shanghai Jiaotong University. In 1998 the third workshop took place in Berlin. This International Workshop on "Communication Based Systems" was essentially based on results from the Graduiertenkolleg on Communication Based Systems that was funded by the German Research Society (DFG) from 1991 to 2000. The fourth International Workshop on "Robotics and its Applications" was held in Shanghai in 2000. The fifth International Workshop on "The Internet Challenge: Technology and Applications" was hosted by TU Berlin in 2002.

Research on humanoid robots has been mostly with the aim of developing robots that can replace humans in the performance of certain tasks. Motion planning for these robots can be quite difficult, due to their complex kinematics, dynamics and environment. It is consequently one of the key research topics in humanoid robotics research and the last few years have witnessed considerable progress in the field. Motion Planning for Humanoid Robots surveys the remarkable recent advancement in both the theoretical and the practical aspects of humanoid motion planning. Various motion planning frameworks are presented in Motion Planning for Humanoid Robots, including one for skill coordination and learning, and one for manipulating and grasping tasks. The problem of planning sequences of contacts that support acyclic motion in a highly constrained environment is addressed and a motion planner that enables a humanoid robot to push an object to a desired location on a cluttered table is described. The main areas of interest include: • whole body motion planning, • task planning, • biped gait planning, and • sensor feedback for motion planning. Torque-level control of multi-contact behavior, autonomous manipulation of moving obstacles, and movement control and planning architecture are also covered. Motion Planning for Humanoid Robots will help readers to understand the current research on humanoid motion planning. It is written for industrial engineers, advanced undergraduate and postgraduate students.

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.

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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

This book presents various techniques to carry out the gait modeling, the gait patterns synthesis, and the control of biped robots. Some general information on the human walking, a presentation of the current experimental biped robots, and the application of walking bipeds are given. The modeling is based on the decomposition on a walking step into different sub-phases depending on the way each foot stands into contact on the ground. The robot design is dealt with according to the mass repartition and the choice of the actuators. Different ways to generate walking patterns are considered, such as passive walking and gait synthesis performed using optimization technique. Control based on the robot modeling, neural network methods, or intuitive approaches are presented. The unilaterality of contact is dealt with using on-line adaptation of the desired motion.

The challenge of creating a real-life computational equivalent of the human mind requires that we better understand at a computational level how natural intelligent systems develop their cognitive and learning functions. In recent years, biologically inspired cognitive architectures have emerged as a powerful new approach toward gaining this kind of understanding (here “biologically inspired” is understood broadly as “brain-mind inspired”). Still, despite impressive successes and growing interest in BICA, wide gaps separate different approaches from each other and from solutions found in biology. Modern scientific societies pursue related yet separate goals, while the mission of the BICA Society consists in the integration of many efforts in addressing the above challenge. Therefore, the BICA Society shall bring together researchers from disjointed fields and communities who devote their efforts to solving the same challenge, despite that they may “speak different languages”. This will be achieved by promoting and facilitating the transdisciplinary study of cognitive architectures, and in the long-term perspective – creating one unifying widespread framework for the human-level cognitive architectures and their implementations. This book is a proceedings of the Third Annual Meeting of the BICA Society, which was hold in Palermo-Italy from October 31 to November 2, 2012. The book describes recent advances and new challenges around the theme of understanding how to create general-purpose humanlike artificial intelligence using inspirations from studies of the brain and the mind.

Bioinspired Legged Locomotion: Models, Concepts, Control and Applications explores the universe of legged robots, bringing in perspectives from engineering, biology, motion science, and medicine to provide a comprehensive overview of the field. With comprehensive coverage, each chapter brings outlines, and an abstract, introduction, new developments, and a summary. Beginning with bio-inspired locomotion concepts, the book's editors present a thorough review of current literature that is followed by a more detailed view of bouncing, swinging, and balancing, the three fundamental sub functions of locomotion. This part is closed with a presentation of conceptual models for locomotion. Next, the book explores bio-inspired body design, discussing the concepts of motion control, stability, efficiency, and robustness. The morphology of legged robots follows this discussion, including biped and quadruped designs. Finally, a section on high-level control and applications discusses neuromuscular models, closing the book with examples of applications and discussions of performance, efficiency, and robustness. At the end, the editors share their perspective on the future directions of each area, presenting state-of-the-art knowledge on the subject using a structured

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and consistent approach that will help researchers in both academia and industry formulate a better understanding of bioinspired legged robotic locomotion and quickly apply the concepts in research or products. Presents state-of-the-art control approaches with biological relevance Provides a thorough understanding of the principles of organization of biological locomotion Teaches the organization of complex systems based on low-dimensional motion concepts/control Acts as a guideline reference for future robots/assistive devices with legged architecture Includes a selective bibliography on the most relevant published articles This book gathers the proceedings of the 15th IFToMM World Congress, which was held in Krakow, Poland, from June 30 to July 4, 2019. Having been organized every four years since 1965, the Congress represents the world's largest scientific event on mechanism and machine science (MMS). The contributions cover an extremely diverse range of topics, including biomechanical engineering, computational kinematics, design methodologies, dynamics of machinery, multibody dynamics, gearing and transmissions, history of MMS, linkage and mechanical controls, robotics and mechatronics, micro-mechanisms, reliability of machines and mechanisms, rotor dynamics, standardization of terminology, sustainable energy systems, transportation machinery, tribology and vibration. Selected by means of a rigorous international peer-review process, they highlight numerous exciting advances and ideas that will spur novel research directions and foster new multidisciplinary collaborations.

These proceedings present a full state-of-the-art picture of the popular and motivating field of climbing and walking robots, featuring recent research by leading climbing and walking robot experts in various industrial and emerging fields.

Intelligence and autonomy are among the most extraordinary capacities blossomed by human evolution. Yet, endowing humanoid robots with these two crucial capabilities is still one of the biggest problems for the robotics community, despite decades of research. On the software side, algorithms for artificial intelligence are still at an embryonic stage. On the hardware side, robotic actuators are a far cry from the muscular human system in terms of flexibility and adaptability, which in turn reduces autonomy and robustness. Underneath the nature of algorithms for intelligence and technology for autonomy, the importance of efficient, scalable implementations of robust software goes without saying. Among the large variety of humanoid robots, the iCub has emerged as one of the most diffused research platforms. It has been developed as part of the RobotCub EU project and subsequently adopted by more than 35 laboratories worldwide. Collaborations across laboratories are encouraged by writing code and libraries openly available. As a consequence, iCub is considered to be the ideal platform for experimenting and advancing open-source software for research in several domains, ranging from motor control to cognitive systems.

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.

Bipedal locomotion is a challenging control engineering problem due to the non-linear dynamics and postural instability of the bipedal form. In addition to these challenges, some dynamical effects such as the ground reaction force are difficult to model accurately in simulation. To this end, it is essential to develop physical hardware to validate walking control strategies and gait generation methods. This thesis develops an on-line walking control strategy for humanoid robots and the electromechanical design of a physical platform for experimental validation. The first part of the thesis presents the development of a 14 degrees-of-freedom (DOF) lower body humanoid robot. The initial electromechanical design of the proposed system is derived from dynamic modeling of a general multibody system. Kinematic trajectories for the lower body joints are extracted from motion captured human gait data to form the preliminary design specifications. The drivetrain components are selected by analyzing the mechanical power requirements, torque-speed profiles, efficiency and thermal characteristics of actuators. The supporting mechanical chassis and power transmission system are designed to raise the center-of-mass (to reduce the swinging inertia of each leg) while minimizing the overall weight of the system. Refining the design of a complex multibody robotic system like the biped is an iterative process. The mechanical model of the system is transferred from Computer-Aided-Design (CAD) software to a dynamic simulator for analysis and the design is revised to improve performance. This iterative approach is necessary as small changes in the mechanical model can have significant impact on the overall dynamics of the system as well as implications for control design. A streamlined prototyping toolchain is developed in this thesis to extract the relevant kinematic/dynamic parameters of a mechanical system in CAD and automatically generate the equivalent system in a dynamic simulator. This toolchain is used to revise the electromechanical design and generate forward dynamics simulations. The second portion of this thesis develops a novel walking control strategy for on-line gait synthesis for 3D bipedal robots based on Wight's Foot Placement Estimator (FPE) algorithm. This algorithm is used to determine the desired swing foot position on the ground to *balance* for a 2D bipedal robot. The FPE algorithm is extended to the general 3D case by selecting a suitable plane in the desired direction of motion. Complete gait cycles are formed by combining a finite state machine with the 2D FPE solution along the selected plane. Gait initiation is accomplished by computing state-dependent task space trajectories on-line to produce a forward momentum along the selected plane. A whole-body motion control framework (Jacobian-based prioritized task space control scheme) tracks the task space trajectories and generates the appropriate joint level command for each state. The joint level commands are tracked by local high gain PD controllers. This framework produces the desired whole-body motion during each

state while satisfying higher priority constraints. Gait termination is accomplished by controlling the swing foot position to track the FPE point on the ground along the selected plane. The proposed control strategy is verified in simulation and experiments. A parallel hardware-in-the-loop (HIL) testing environment is developed for the physical lower body humanoid robot. The motion control framework and joint dynamics used in the proposed walking control strategy are verified through HIL experiments.

This book constitutes the thoroughly refereed post-conference proceedings of the 4th International Conference on Agents and Artificial Intelligence, ICAART 2012, held in Vilamoura, Portugal, in February 2012. The 28 revised full papers presented together with one invited paper were carefully reviewed and selected from 292 submissions. The papers are organized in two topical sections on artificial intelligence and on agents.

The market demand for skills, knowledge and adaptability have positioned robotics to be an important field in both engineering and science. One of the most highly visible applications of robotics has been the robotic automation of many industrial tasks in factories. In the future, a new era will come in which we will see a greater success for robotics in non-industrial environments. In order to anticipate a wider deployment of intelligent and autonomous robots for tasks such as manufacturing, healthcare, entertainment, search and rescue, surveillance, exploration, and security missions, it is essential to push the frontier of robotics into a new dimension, one in which motion and intelligence play equally important roles. The 2010 International Conference on Intelligent Robotics and Applications (ICIRA 2010) was held in Shanghai, China, November 10–12, 2010. The theme of the conference was “Robotics Harmonizing Life,” a theme that reflects the ever-growing interest in research, development and applications in the dynamic and exciting areas of intelligent robotics. These volumes of Springer’s Lecture Notes in Artificial Intelligence and Lecture Notes in Computer Science contain 140 high-quality papers, which were selected at least for the papers in general sessions, with a 62% acceptance rate

Traditionally, ICIRA 2010 holds a series of plenary talks, and we were fortunate to have two such keynote speakers who shared their expertise with us in diverse topic areas spanning the range of intelligent robotics and application activities.

The three-volume set CCIS 1032, CCIS 1033, and CCIS 1034 contains the extended abstracts of the posters presented during the 21st International Conference on Human-Computer Interaction, HCII 2019, which took place in Orlando, Florida, in July 2019. The total of 1274 papers and 209 posters included in the 35 HCII 2019 proceedings volumes was carefully reviewed and selected from 5029 submissions. The 208 papers presented in these three volumes are organized in topical sections as follows: Part I: design, development and evaluation methods and technique; multimodal Interaction; security and trust; accessibility and universal access; design and user experience case studies. Part II: interacting with games; human robot interaction; AI and machine learning in

HCI; physiological measuring; object, motion and activity recognition; virtual and augmented reality; intelligent interactive environments. Part III: new trends in social media; HCI in business; learning technologies; HCI in transport and autonomous driving; HCI for health and well-being.

This book comprises select peer-reviewed papers from the International Conference on VLSI, Signal Processing, Power Electronics, IoT, Communication and Embedded Systems (VSPICE-2020). The book provides insights into various aspects of the emerging fields in the areas Electronics and Communication Engineering as a holistic approach. The various topics covered in this book include VLSI, embedded systems, signal processing, communication, power electronics and internet of things. This book mainly focuses on the most recent innovations, trends, concerns and practical challenges and their solutions. This book will be useful for academicians, professionals and researchers in the area of electronics and communications and electrical engineering.

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