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IFJEV9 - ANNA LILLY

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.

A collection of papers dealing with complete systems of intelligent robots, focusing on autonomy. The contributions cover intelligent perception, intelligent planning and control, and integrated 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.

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 papers showcase the field's latest technological advances.

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.

The book presents the state of the art and recent advances in the area of kinematics of robots and mechanisms. It consists of about fifty outstanding contributions dedicated to various aspects of kinematic modelling and control, emphasising in particular the kinematic performances of robots and mechanisms, workspace and trajectory analysis, numerical and symbolic computational methods and algorithms, analysis, simulation and optimisation. The book is of interest to researchers, graduate students, and engineers specialising in the kinematics of robots and mechanisms. It should also be of interest to those engaged in work relating to kinematic chains, mechatronics, mechanism design, biomechanics and intelligent systems.

The International Symposium on History of Machines and Mechanisms is a new initiative to promote explicitly researches and publications in the field of the History of TMM (Theory of Machines and Mechanisms). It was held at the University of Cassino, Italy, from 11 to 13 May 2000. The Symposium was devoted mainly to the technical aspects of historical developments and therefore it has been addressed mainly to the IFToMM Community. In fact, most the authors of the contributed papers are experts in TMM and related topics. This has been, indeed, a challenge: convincing technical experts to go further in-depth into the background of their topics of expertise. We have received a very positive response, as can be seen by the fact that these Proceedings contain contributions by authors from all around the world. We received about 50 papers, and after review about 40 papers were accepted for both presentation and publishing in the Proceedings. This means also that the History of TMM is of interest everywhere and, indeed, an in-depth knowledge of the past can be of great help in working on the present and in shaping the future with new ideas. I believe that a reader will take advantage of the papers in these Proceedings with further satisfaction and motivation for her or his work (historical or not). These papers cover the wide field of the History of Mechanical Engineering and particularly the History of TMM.

This book includes the thoroughly refereed post-conference proceedings of the 14th RoboCup International Symposium, held in Singapore, in June, 2010 - representing the scientific tracks structured in four sessions entitled simulation and rescue robots; robot perception and localization; robot motion and humanoid robots; and human robot interaction and semantic scene analysis. The 20 revised full papers and 16 revised short papers presented were carefully reviewed and selected from 78 submissions. Documenting the research advances of the RoboCup community since the predecessor symposium, this book constitutes a valuable source of reference and inspiration for R&D professionals interested in RoboCup or in robotics and distributed AI more generally.

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 three volume proceedings LNAI 10534 – 10536 constitutes the refereed proceedings of the European Conference on Machine Learning and Knowledge Discovery in Databases, ECML PKDD 2017, held in Skopje, Macedonia, in September 2017. The total of 101 regular papers presented in part I and part II was carefully reviewed and selected from 364 submissions; there are 47 papers in the applied data science, nectar and demo track. The contributions were organized in topical sections named as follows: Part I: anomaly detection; computer vision; ensembles and meta learning; feature selection and extraction; kernel methods; learning and optimization, matrix and tensor factorization; networks and graphs; neural networks and deep learning. Part II: pattern and sequence mining; privacy and security; probabilistic models and methods; recommendation; regression; reinforcement learning; subgroup discovery; time series and streams; transfer and multi-task learning; unsupervised and semisupervised learning. Part III: applied data science track; nectar track; and demo track.

This book contains papers on a wide range of topics in the area of kinematics, mechanisms, robotics, and design, addressing new research advances and innovations in design education. The content is divided into five main categories headed ‘Historical Perspectives’, ‘Kinematics and Mechanisms’, ‘Robotic Systems’, ‘Legged Locomotion’, and ‘Design Engineering Education’. Contributions take the form of survey articles, historical perspectives, commentaries on trends on education or research, original research contributions, and papers on design education. This volume celebrates the achievements of Professor Kenneth Waldron who has made innumerable and invaluable contributions to these fields in the last fifty years. His leadership and his pioneering work have influenced thousands of people in this discipline.

Walking machines have advantages over traditional vehicles, and have already accomplished tasks that wheeled or tracked robots cannot handle. Nevertheless, their use in industry and services is currently limited in scope. This book brings together methods and techniques that have been developed to deal with obstacles to wider acceptance of legged robots. Part I provides an historical overview. Part II concentrates on control techniques, as applied to Four-legged robots.

This text presents the proceedings of a conference on intelligent autonomous systems. Papers contribute solutions to the task of designing autonomous systems that are capable of operating independently of a human in partially structured and unstructured environments. For specific application, these systems should also learn from their actions in order to improve and optimize planning and execution of new tasks.

What is 16 feet long, 10 feet high, weighs 6,000 pounds, has six legs, and can sprint at 8 mph and step over a 4 foot wall? The Adaptive Suspension Vehicle (ASV) described in this book. Machines That Walk provides the first in depth treatment of the "statically stable walking machine" theory employed in the design of the ASV, the most sophisticated, self contained, and practical walking machine being developed today. Under construction at Ohio State University, the automatically terrain adaptive ASV has one human operator, can carry a 500 pound payload and is expected to have better fuel economy and mobility than that of conventional wheeled and tracked vehicles in rough terrain. The development of the ASV is a milestone in robotics research, and Machines That Walk provides a wealth of research results in mobility, gait, static stability, leg design, and vertical geometry design. The authors' treatment of statically stable gait theory and actuator coordination is by far the most complete available. Shin Min Song is an Assistant Professor in the Department of Mechanical Engineering at the University of Illinois at Chicago. Kenneth J. Waldron is Nordholt Professor in the Department of Mechanical Engineering at Ohio State University.

Advanced Mechatronics and MEMS Devicesdescribes state-of-the-art MEMS devices and introduces the latest technology in electrical and mechanical microsystems. The evolution of design in microfabrication, as well as emerging issues in nanomaterials, micromachining, micromanufacturing and microassembly are all discussed at length in this volume. Advanced Mechatronics also provides a reader with knowledge of MEMS sensors array, MEMS multidimensional accelerometer, artificial skin with imbedded tactile components, as well as other topics in MEMS sensors and transducers. The book also presents a number of topics in advanced robotics and an abundance of applications of MEMS in robotics, like reconfigurable modular snake robots, magnetic MEMS robots for drug delivery and flying robots with adjustable wings, to name a few.

This book presents the most recent advances in the research of machines and mechanisms. It collects 54 reviewed papers presented at the XII International Conference on the Theory of Machines and mechanisms (TMM 2016) held in Liberec, Czech Republic, September 6-8, 2016. This volume offers an international selection of the most important new results and developments, grouped in six different parts, representing a well-balanced overview, and spanning the general theory of machines and mechanisms, through analysis and synthesis of planar and spatial mechanisms, linkages and cams, robots and manipulators, dynamics of machines and mechanisms, rotor dynamics, computational mechanics, vibration and noise in machines, optimization of mechanisms and machines, mechanisms of textile machines, mechatronics to the control and monitoring systems of machines. This conference is traditionally organised every four year under the auspices of the international organisation IFToMM and the Czech Society for Mechanics.

Professor Richard S. Michalski passed away on September 20, 2007. Once we learned about his untimely death we immediately realized that we would no longer have with us a truly exceptional scholar and researcher who for several decades had been inf- encing the work of numerous scientists all over the world - not only in his area of expertise, notably machine learning, but also in the broadly understood areas of data analysis, data mining, knowledge discovery and many others. In fact, his influence was even much broader due to his creative vision, integrity, scientific excellence and exceptionally wide intellectual horizons which extended to history, political science and arts. Professor Michalski’s death was a particularly deep loss to the whole Polish sci- tific community and the Polish Academy of Sciences in particular. After graduation, he began his research career at the Institute of Automatic Control, Polish Academy of Science in Warsaw. In 1970 he left his native country and hold various prestigious positions at top US universities. His research gained impetus and he soon established himself as a world authority in his areas of interest – notably, he was widely cons- ered a father of machine learning.

Neural Networks in Robotics is the first book to present an integrated view of both the application of artificial neural networks to robot control and the neuromuscular models from which robots were created. The behavior of biological systems provides both the inspiration and the challenge for robotics. The goal is to build robots which can emulate the ability of living organisms to integrate perceptual inputs smoothly with motor responses, even in the presence of novel stimuli and changes in the environment. The ability of living systems to learn and to adapt provides the standard against which robotic systems are judged. In order to emulate these abilities, a number of investigators have attempted to create robot controllers which are modelled on known processes in the brain and musculo-skeletal system. Several of these models are described in this book. On the other hand, connectionist (artificial neural network) formulations are attractive for the computation of inverse kinematics and dynamics of robots, because they can be trained for this purpose without explicit programming. Some of the computational advantages and problems of this approach are also presented. For any serious student of robotics, Neural Networks in Robotics provides an indispensable reference to the work of major researchers in the field. Similarly, since robotics is an outstanding application area for artificial neural networks, Neural Networks in Robotics is equally important to workers in connectionism and to students for sensormonitor control in living systems.
This book consists of 18 chapters divided in four sections: Robots for Educational Purposes, Health--Care and Medical Robots, Hardware - State of the Art, and Localization and Navigation. In the first section, there are four chapters covering autonomous mobile robot Emmy III, KCLBOT - mobile nonholonomic robot, and general overview of educational mobile robots. In the second section, the following themes are covered: walking support robots, control system for wheelchairs, leg-wheel mechanism as a mobile platform, micro mobile robot for abdominal use, and the influence of the robot size in the psychological treatment. In the third section, there are chapters about I2C bus system, vertical displacement service robots, quadruped robots - kinematics and dynamics model and Epi.q (hybrid) robots. Finally, in the last section, the following topics are covered: skid-steered vehicles, robotic exploration (new place recognition), omnidirectional mobile robots, ball-wheel mobile robots, and planetary wheeled mobile robots.
Recently, research in robot kinematics has attracted researchers with different theoretical profiles and backgrounds, such as mechanical and electrica! engineering, computer science, and mathematics. It includes topics and problems that are typical for this area and cannot easily be met elsewhere. As a result, a specialised scientific community has developed concentrating its interest in a broad class of problems in this area and representing a conglomeration of disciplines including mechanics, theory of systems, algebra, and others. Usually, kinematics is referred to as the branch of mechanics which treats motion of a body without regard to the forces and moments that cause it. In robotics, kinematics studies the motion of robots for programming, control and design purposes. It deals with the spatial positions, orientations, velocities and accelerations of the robotic mechanisms and objects to be manipulated in a robot workspace. The objective is to find the most effective mathematical forms for mapping between various types of coordinate systems, methods to minimise the numerical complexity of algorithms for real-time control schemes, and to discover and visualise analytical tools for understanding and evaluation of motion properties ofvarious mechanisms used in a robotic system.

Nowadays robotics is one of the most dynamic fields of scientific researches. The shift of robotics researches from manufacturing to services applications is clear. During the last decades interest in studying climbing and walking robots has been increased. This increasing interest has been in many areas that most important ones of them are: mechanics, electronics, medical engineering, cybernetics, controls, and computers. Today’s climbing and walking robots are a combination of manipulative, perceptive, communicative, and cognitive abilities and they are capable of performing many tasks in industrial and non- industrial environments. Surveillance, planetary exploration, emergence rescue operations, reconnaissance, petrochemical applications, construction, entertainment, personal services, intervention in severe environments, transportation, medical and etc are some applications from a very diverse application fields of climbing and walking robots. By great progress in this area of robotics it is anticipated that next generation climbing and walking robots will enhance lives and will change the way the human works, thinks and makes decisions. This book presents the state of the art achievments, recent developments, applications and future challenges of climbing and walking robots. These are presented in 24 chapters by authors throughtot the world The book serves as a reference especially for the researchers who are interested in mobile robots. It also is useful for industrial engineers and graduate students in advanced study.
Mechatronics, a synergistic combination of mechanical, electronic and computing engineering technologies, is a truly multidisciplinary approach to engineering. New products based on mechatronic principles are demonstrating reduced mechanical complexity, increased performance and often previously impossible capabilities. This book contains the papers presented at the UK Mechatronics Forum's 6th International Conference, held in Skövde, Sweden, in September 1998. Many of these high--quality papers illustrate the tremendous influence of mechatronics on such areas as manufacturing machinery, automotive engineering, textiles manufacture, robotics, and real-time control and vision systems. There are also papers describing developments in sensors, actuators, control and data processing techniques, such as fuzzy logic and neural networks, all of which have practical application to mechatronic systems.
The area of intelligent autonomous vehicles or robots has proved to be very active and extensive both in challenging applications as well as in the source of theoretical development. Automation technology is rapidly developing in many areas including: agriculture, mining, traditional manufacturing, automotive industry and space exploration. The 2nd IFAC Conference on Intelligent Autonomous Vehicles 1995 provides the forum to exchange ideas and results among the leading researchers and practitioners in the field. This publication brings together the papers presented at the latest in the series and provides a key evaluation of developments in automation technologies.
Motion and vibration control is a fundamental technology for the development of advanced mechanical systems such as mechatronics, vehicle systems, robots, spacecraft, and rotating machinery. Often the implementation of high performance, low power consumption designs is only possible with the use of this technology. It is also vital to the mitigation of natural hazards for large structures such as high-rise buildings and tall bridges, and to the application of flexible structures such as space stations and satellites. Recent innovations in relevant hardware, sensors, actuators, and software have facilitated new research in this area. This book deals with the interdisciplinary aspects of emerging technologies of motion and vibration control for mechanical, civil and aerospace systems. It covers a broad range of applications (e.g. vehicle dynamics, actuators, rotor dynamics, biologically inspired mechanics, humanoid robot dynamics and control, etc.) and also provides advances in the field of fundamental research e.g. control of fluid/structure integration, nonlinear control theory, etc. Each of the contributors is a recognised specialist in his field, and this gives the book relevance and authority in a wide range of areas.

Popular Science gives our readers the information and tools to improve their technology and their world. The core belief that Popular Science and our readers share: The future is going to be better, and science and technology are the driving forces that will help make it better.
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.
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 - botics. Moreover, the amalgamation of original ideas and related innotions, search for new potential applications and the use of state of the art support technologies permit to foresee an important step forward and a significant socio-economic impact of advanced robot technology in the - ture. This is leading to the creation and consolidation of a mobile service robotics sector where most of the robotics activities are foreseen in the - ture. The technology is now maturing to become of real benefit to society and methods of realizing this potential quickly are being eagerly explored. Robot standards and modularity are key to this and form key components of the research presented here. CLAWAR 2005 is the eighth in a series of international conferences - ganised annually since 1998 with the aim to report on latest research and development findings and to provide a forum for scientific discussion and debate within the mobile service robotics community. The series has grown in its popularity significantly over the years, and has attracted - searchers and developers from across the globe. The CLAWAR 2005 p- ceedings reports state of the art scientific and developmental findings p- sented during the CLAWAR 2005 conference in 131 technical presentations by authors from 27 countries covering the five continents.
The series of IFAC Symposia on Analysis, Design and Evaluation of Man-Machine Systems provides the ideal forum for leading researchers and practitioners who work in the field to discuss and evaluate the latest research and developments. This publication contains the papers presented at the 6th IFAC Symposium in the series which was held in Cambridge, Massachusetts, USA.

The International Symposium on Experimental Robotics (ISER) is a series of bi-annual meetings which are organized in a rotating fashion around North America, Europe and Asia/Oceania. The goal of ISER is to provide a forum for research in robotics that focuses on novelty of theoretical contributions validated by experimental results. The meetings are conceived to bring together, in a small group setting, researchers from around the world who are in the forefront of experimental robotics research. This unique reference presents the latest advances across the various fields of robotics, with ideas that are not only conceived conceptually but also verified experimentally. It collects contributions on the current developments and new directions in the field of experimental robotics, which are based on the papers presented at the Ninth ISER held in Singapore.
Robotic technology advances for a wide variety of applications Climbing and Walking Robots and the Support Technologies for Mobile Machines explores the increasing interest in real-world robotics and the surge in research and invention it has inspired. Featuring the latest advances from leading robotics labs around the globe, this book presents solutions for perennial challenges in robotics and suggests directions for future research. With applications ranging from personal services and entertainment to emergency rescue and extreme environment intervention, the groundbreaking work presented here provides a glimpse of the future.
This is the first book of a series that will focus on MMS (Mechanism and Machine Science). This book also presents IFToMM, the International Federation on the Promotion of MMS and its activity. This volume contains contributions by IFToMM officers who are Chairs of member organizations (MOs), permanent commissions (PCs), and technical committees (TCs), who have reported their experiences and views toward the future of IFToMM and MMS. The book is composed of three parts: the first with general considerations by high-standing IFToMM persons, the second chapter with views by the chairs of PCs and TCs as dealing with specific subject areas, and the third one with reports by the chairs of MOs as presenting experiences and challenges in national and territory communities. This book will be of interest to a wide public who wish to know the status and trends in MMS both at international level through IFToMM and in national/local frames through the leading actors of activities. In addition, the book can be considered also a fruitful source to find out “who’s who” in MMS, historical backgrounds and trends in MMS developments, as well as for challenges and problems in future activity by IFToMM community and in MMS at large.
This book covers the state-of-the-art in both biological and artificial legged locomotion systems. The seven chapters focus on topics ranging from very detailed modelling of the musculo-skeletal system, through mathematical modelling and simulation to theories applicable to locomotion mechanics and control. The final two chapters deal with the mechanics, control and design of artificial legged locomotion systems.

Based on lecture notes on a space robotics course, this book offers a pedagogical introduction to the mechanics of space robots. After presenting an overview of the environments and conditions space robots have to work in, the author discusses a variety of manipulatory devices robots may use to perform their tasks. This is followed by a discussion of robot mobility in these environments and the various technical approaches. The last two chapters are dedicated to actuators, sensors and power systems used in space robots. This book fills a gap in the space technology literature and will be useful for students and for those who have an interest in the broad and highly interdisciplinary field of space robotics, and in particular in its mechanical aspects.
The interest in using legged robots for a variety of terrestrial and space applications has grown steadily since the 1960s. At the present time, a large fraction of these robots relies on electric motors at the joints to achieve mobility. The load distributions inherent to walking, coupled with design constraints, can cause the motors to operate near their maximum torque capabilities or even reach saturation. This is especially true in applications like space exploration, where critical mass and power constraints limit the size of the actuators. Consequently, these robots can benefit greatly from motion optimization algorithms that guarantee successful walking with maximum margin to saturation. Previous gait optimization techniques have emphasized minimization of power requirements, but have not addressed the problem of saturation directly. This dissertation describes gait optimization techniques specifically designed to enable operation as far as possible from saturation during walking. The benefits include increasing the payload mass, preserving actuation capabilities to react to unforeseen events, preventing damage to hardware due to excessive loading, and reducing the size of the motors. The techniques developed in this work follow the approach of optimizing a reference gait one move at a time. As a result, they are applicable to a large variety of purpose-specific gaits, as well as to the more general problem of single pose optimization for multi-limbed walking and climbing robots. The first part of this work explores a zero-interaction technique that was formulated to increase the margin to saturation through optimal displacements of the robot's body in 3D space. Zero-interaction occurs when the robot applies forces only to sustain its weight, without squeezing the ground. The optimization presented here produces a swaying motion of the body while preserving the original footfall locations. Optimal displacements are found by solving a nonlinear optimization problem using sequential quadratic programming (SQP). Improvements of over 20% in the margin to saturation throughout the gait were achieved with this approach in simulation and experiments. The zero-interaction technique is the safest in the absence of precise knowledge of the contact mechanical properties and friction coefficients. The second part of the dissertation presents a technique that uses the null space of contact forces to achieve greater saturation margins. Interaction forces can significantly contribute to saturation prevention by redirecting the net contact force relative to critical joints. A method to obtain the optimal distribution of forces for a given pose via lin-

ear programming (LP) is presented. This can be applied directly to the reference gait, or combined with swaying motion. Improvements of up to 60% were observed in simulation by combining the null space with sway. The zero-interaction technique was implemented and validated on the All Terrain Hex-Limbed Extra-Terrestrial Explorer (ATHLETE), a hexapod robot developed by NASA for the transport of heavy cargo on the surface of the moon. Experiments with ATHLETE were conducted at the Jet Propulsion Laboratory in Pasadena, California, confirming the benefits predicted in simulation. The results of these experiments are also presented and discussed in this dissertation.

The goal of the Seventh International Conference on Intelligent Autonomous Systems (IAS-7) was to exchange and stimulate research ideas that make future robots and systems more intelligent and autonomous. This volume of proceedings contains 71 technical papers by authors from 15 countries.

With the science of robotics undergoing a major transformation just now, Springer's new, authoritative handbook on the subject couldn't have come at a better time. Having broken free from its origins in industry, robotics has been rapidly expanding into the challenging terrain of unstructured environments. Unlike other handbooks that focus on industrial applications, the Springer Handbook of Robotics incorporates these new developments. Just like all Springer Handbooks, it is utterly comprehensive, edited by internationally renowned experts, and replete with contributions from leading researchers from around the world. The handbook is an ideal resource for robotics experts but also for people new to this expanding field.