



(a) Adduction of the fingers.

(b) Abduction of the fingers.

<u>Underactuated Robotic Hands Underactuated Robotic</u> <u>Hands</u>

Xuguang Lan, Xuesong Mei, Caigui Jiang, Fei Zhao, Zhiqiang Tian

Underactuated Robotic Hands Underactuated Robotic Hands:

Underactuated Robotic Hands Lionel Birglen, Thierry Laliberté, Clément M. Gosselin, 2008-02-11 This is a cornerstone publication in robotic grasping The authors have developed an internationally recognized expertise in this area Additionally they designed and built several prototypes which attracted the attention of the scientific community. The purpose of this book is to summarize years of research and to present in an attractive format the expertise developed by the authors on a new technology for grasping which has achieved great success both in theory and in practice Design and Analysis of Selectively Compliant Underactuated Robotic Hands Daniel McConnell Aukes, 2013 A balance between complexity and functional capabilities has been explored since the first years of multi fingered robotic hands In an age where DC motors are the de facto standard for actuation in robotics the problem of needing to operate in a human sized world puts severe constraints and limits on actuator size and placement in hands While many successful examples of fully actuated designs exist these designs generally reflect the trade offs and sacrifices imposed by such constraints In that light underactuation employing fewer actuators than degrees of freedom has gained attention as a method to achieve many of the functional capabilities of fully actuated hands with fewer constraints on actuators and transmissions Underactuated hands also have distinct advantages over fully actuated hands especially when used on mobile robots due to their reduced weight and control complexity and the potential for increased robustness However there is typically a trade off in terms of reduced controllability or manipulability when handling grasped objects When designing underactuated hands extra care must be taken during the design process to ensure that such hands will grasp a wide range of object sizes and shapes robustly particularly when friction is low and uncertain Despite these concerns underactuated hands have become increasingly popular in robotic and prosthetic applications Robotic hands are also a venue in which novel secondary mechanisms are often found Devices such as differentials valves clutches and low power shape changing actuators have been used to improve grasp robustness on a wider range of objects and allow users more grasping and manipulation options However the location and placement of secondary actuators has not been studied in a comprehensive way with respect to the types of actuation methods possible This is due in part to the lack of general analytic tools which enable designers to rapidly investigate their designs prior to the prototyping stage Additionally much of the analysis in the field of robotic hands is done once basic design choices have already been made making subsequent analyses specific only to a set of design parameters specific to those choices The same point can be made regarding quality metrics which suffer from fragmented utilization due to the many different emphases placed on different design requirements The primary goal of this thesis is to provide a framework for the analysis and evaluation of underactuated robotic hands The first chapter discusses both the broad motivations for studying robotic hands and the specific contributions of this thesis The next chapter reviews relevant designs from literature analyses that have accompanied them uses of secondary devices in underactuated hands and the progress that dynamics simulators

have made towards representing reality In the next chapters the issues related to modeling abstract generic hand designs is discussed and a kinematic framework is introduced to derive the force relationships between actuator and grasped object for many mechanisms commonly encountered in underactuated hands Chapter 6 discusses difficulties associated with solving static force equations and several methods are introduced to accomplish this The last of these options relies on three dimensional rigid body dynamic simulations to evaluate the performance of compliant underactuated mechanisms which may encounter conditions such as coulomb friction in contact and and damping at the joints In the next chapters these force relationships are derived and discussed for specific hand designs in the context of a force field representation and several performance metrics are derived which measure a hand s ability both to acquire and retain objects The benefits of secondary actuation mechanisms are then discussed with two specific examples First is the SRI Stanford Meka hand a tendon driven compliant underactuated hand capable of locking individual joints Second is a mechanism implemented on the Seabed Hand which increases the range of graspable objects and allows users to selectively change grasp properties based on their specific control needs Finally the impacts of friction are discussed and the trends from simulations are compared with experimental data From these experiments the benefits of secondary mechanisms can be demonstrated in a frictional world as well Analysis and Control of Underactuated Robotic Hands Lionel Birglen, 2004 **Human and Robot Hands Matteo** Bianchi, Alessandro Moscatelli, 2016-02-24 This book looks at the common problems both human and robotic hands encounter when controlling the large number of joints actuators and sensors required to efficiently perform motor tasks such as object exploration manipulation and grasping The authors adopt an integrated approach to explore the control of the hand based on sensorimotor synergies that can be applied in both neuroscience and robotics Hand synergies are based on goal directed combined muscle and kinematic activation leading to a reduction of the dimensionality of the motor and sensory space presenting a highly effective solution for the fast and simplified design of artificial systems Presented in two parts the first part Neuroscience provides the theoretical and experimental foundations to describe the synergistic organization of the human hand The second part Robotics Models and Sensing Tools exploits the framework of hand synergies to better control and design robotic hands and haptic sensing systems tools using a reduced number of control inputs sensors with the goal of pushing their effectiveness close to the natural one Human and Robot Hands provides a valuable reference for students researchers and designers who are interested in the study and design of the artificial hand Intelligent Robotics and Applications Ming Xie, Youlun Xiong, Caihua Xiong, Zhencheng Hu, 2009-12-16 The market demands for skills knowledge and personalities have positioned robotics as an important field in both engineering and science To meet these challenging mands robotics has already seen its success in automating many industrial tasks in factories And a new era will come for us to see a greater success of robotics in n industrial environments In anticipating a wider deployment of intelligent and auto mous robots for tasks such as manufacturing eldercare homecare edutainment search and rescue de mining surveillance

exploration and security missions it is necessary for us to push the frontier of robotics into a new dimension in which motion and intelligence play equally important roles After the success of the inaugural conference the purpose of the Second Inter tional Conference on Intelligent Robotics and Applications was to provide a venue where researchers scientists engineers and practitioners throughout the world could come together to present and discuss the latest achievement future challenges and exciting applications of intelligent and autonomous robots In particular the emphasis of this year's conference was on robot intelligence for achieving digital manufact ing and intelligent automations This volume of Springer's Lecture Notes in Artificial Intelligence and Lecture Notes in Computer Science contains accepted papers presented at ICIRA 2009 held in Singapore December 16 18 2009 On the basis of the reviews and recommendations by the international Program Committee members we decided to accept 128 papers having technical novelty out of 173 submissions received from different parts of Proceedings of Innovative Research and Industrial Dialogue 2016, 2017-06-07 The Innovative Research and Industrial Dialogue 2016 IRID 16 organized by Advanced Manufacturing Centre AMC of the Faculty of Manufacturing Engineering of UTeM which is held in Main Campus Universiti Teknikal Malaysia Melaka on 20 December 2016 The open access e proceeding contains a compilation of 96 selected manuscripts from this Research event **Advances in Italian** Mechanism Science Vincenzo Niola, Alessandro Gasparetto, 2020-08-19 This book presents the proceedings of the 3rd International Conference of IFToMM ITALY held online on September 9 11 2020 It includes peer reviewed papers on the latest advances in mechanism and machine science discussing topics such as biomechanical engineering computational kinematics the history of mechanism and machine science gearing and transmissions multi body dynamics robotics and mechatronics the dynamics of machinery tribology vibrations rotor dynamics and vehicle dynamics A valuable up to date resource it offers an essential overview of the subject for scientists and practitioners alike and will inspire further investigations and research Advances in Robot Design and Intelligent Control Aleksandar Rodić, Theodor Borangiu, 2016-11-26 This book presents the proceedings of the 25th International Conference on Robotics in Alpe Adria Danube Region RAAD 2016 held in Belgrade Serbia on June 30th July 2nd 2016 In keeping with the tradition of the event RAAD 2016 covered all the important areas of research and innovation in new robot designs and intelligent robot control with papers including Intelligent robot motion control Robot vision and sensory processing Novel design of robot manipulators and grippers Robot applications in manufacturing and services Autonomous systems humanoid and walking robots Human robot interaction and collaboration Cognitive robots and emotional intelligence Medical human assistive robots and prosthetic design Robots in construction and arts and Evolution education legal and social issues of robotics For the first time in RAAD history the themes cloud robots legal and ethical issues in robotics as well as robots in arts were included in the technical program The book is a valuable resource for researchers in fields of robotics engineers who implement robotic solutions in manufacturing services and healthcare and master s and Ph D students working on robotics

projects Automation in Warehouse Development Roelof Hamberg, Jacques Verriet, 2011-10-28 The warehouses of the future will come in a variety of forms but with a few common ingredients Firstly human operational handling of items in warehouses is increasingly being replaced by automated item handling Extended warehouse automation counteracts the scarcity of human operators and supports the quality of picking processes Secondly the development of models to simulate and analyse warehouse designs and their components facilitates the challenging task of developing warehouses that take into account each customer's individual requirements and logistic processes Automation in Warehouse Development addresses both types of automation from the innovative perspective of applied science In particular it describes the outcomes of the Falcon project a joint endeavour by a consortium of industrial and academic partners. The results include a model based approach to automate warehouse control design analysis models for warehouse design concepts for robotic item handling and computer vision and autonomous transport in warehouses Automation in Warehouse Development is targeted at both academic researchers and industrial practitioners It provides state of the art research on warehouse automation and model based warehouse design These topics have been addressed from a systems engineering perspective by researchers from different disciplines including software control and mechanical engineering with a clear focus on the industrial applications of their research Mapping Human Sensory-Motor Skills for Manipulation onto the Design and Control of Robots Matteo Bianchi, Gionata Salvietti, 2019-03-25 Humans are endowed with extraordinary sensory motor capabilities that enable a successful interaction with and exploration of the environment as is the case of human manipulation Understanding and modeling these capabilities represents an important topic not only for neuroscience but also for robotics in a mutual inspiration both to inform the design and control of artificial systems and at the same time to increase knowledge on the biological side Within this context synergies i e goal directed actions that constrain multi DOFs of the human body and can be defined at the kinematic muscular neural level have gained increasing attention as a general simplified approach to shape the development of simple and effective artificial devices The execution of such purposeful sensory motor primitives on the biological side leverages on the interplay of the sensory motor control at central and peripheral level and the interaction of the human body with the external world This interaction is particularly important considering the new concept of robotic soft manipulation i e soft adaptable yet robust robotic hands that can deform with the external environment to multiply their grasping and manipulation capabilities Under this regard a preeminent role is reserved to touch being that skin isour primary organ to shape our knowledge of the external world and hence to modify it in interaction with the efferent parts This Research Topic reports results on the mutual inspiration between neuroscience and robotics and on how it is possible to translate neuroscientific findings on human manipulation into engineering guidelines for simplified systems able to take full advantage from the interaction and hence exploitation of environmental constraints for task accomplishment and knowledge acquisition Mechanism Design for Robotics Saïd Zeghloul, Med Amine Laribi, Marc Arsicault, 2021-05-08 This book

presents the proceedings of the 5th IFToMM Symposium on Mechanism Design for Robotics MEDER 2021 held in Poitiers France 23 25 June 2021 It gathers contributions by researchers from several countries on all major areas of robotic research development and innovation as well as new applications and current trends. The topics covered include theoretical and computational kinematics mechanism design experimental mechanics mechanics of robots control issues of mechanical systems machine intelligence innovative mechanisms and applications linkages and manipulators micro mechanisms dynamics of machinery and multi body systems Given its scope the book offers a source of information and inspiration for researchers seeking to improve their work and gather new ideas for future developments Proceedings of the 2020 <u>USCToMM Symposium on Mechanical Systems and Robotics</u> Pierre Larochelle, J. Michael McCarthy, 2020-04-20 This volume gathers the latest fundamental research contributions innovations and applications in the field of design and analysis of complex robotic mechanical systems machines and mechanisms as presented by leading international researchers at the 1st USCToMM Symposium on Mechanical Systems and Robotics USCToMM MSR 2020 held in Rapid City South Dakota USA on May 14 16 2020 It covers highly diverse topics including soft wearable and origami robotic systems applications to walking flying climbing underground swimming and space systems human rehabilitation and performance augmentation design and analysis of mechanisms and machines human robot collaborative systems service robotics mechanical systems and robotics education and the commercialization of mechanical systems and robotics The contributions which were selected by means of a rigorous international peer review process highlight numerous exciting and impactful research results that will inspire novel research directions and foster multidisciplinary research collaborations among researchers from around the globe

Grasping in Robotics Giuseppe Carbone,2012-11-15 Grasping in Robotics contains original contributions in the field of grasping in robotics with a broad multidisciplinary approach This gives the possibility of addressing all the major issues related to robotized grasping including milestones in grasping through the centuries mechanical design issues control issues modelling achievements and issues formulations and software for simulation purposes sensors and vision integration applications in industrial field and non conventional applications including service robotics and agriculture The contributors to this book are experts in their own diverse and wide ranging fields This multidisciplinary approach can help make Grasping in Robotics of interest to a very wide audience In particular it can be a useful reference book for researchers students and users in the wide field of grasping in robotics from many different disciplines including mechanical design hardware design control design user interfaces modelling simulation sensors and humanoid robotics It could even be adopted as a reference textbook in specific PhD courses

Intelligent Robotics and Applications Xuguang Lan,Xuesong Mei,Caigui Jiang,Fei Zhao,Zhiqiang Tian,2025-01-23 The 10 volume set LNAI 15201 15210 constitutes the proceedings of the 17th International Conference on Intelligent Robotics and Applications ICIRA 2024 which took place in Xi an China during July 31 August 2 2024 The 321 full papers included in these proceedings were carefully reviewed and selected from 489 submissions They

were organized in topical sections as follows Part I Innovative Design and Performance Evaluation of Robot Mechanisms Part II Robot Perception and Machine Learning Cognitive Intelligence and Security Control for Multi domain Unmanned Vehicle Systems Part III Emerging Techniques for Intelligent Robots in Unstructured Environment Soft Actuators and Sensors and Advanced Intelligent and Flexible Sensor Technologies for Robotics Part IV Optimization and Intelligent Control of Underactuated Robotic Systems and Technology and application of modular robots Part V Advanced actuation and intelligent control in medical robotics Advancements in Machine Vision for Enhancing Human Robot Interaction and Hybrid Decision making and Control for Intelligent Robots Part VI Advances in Marine Robotics Visual Linguistic Affective Agents Hybrid augmented Agents for Robotics and Wearable Robots for Assistance Augmentation and Rehabilitation of human movements Part VII Integrating World Models for Enhanced Robotic Autonomy Advanced Sensing and Control Technologies for Intelligent Human Robot Interaction and Mini Invasive Robotics for In Situ Manipulation Part VIII Robot Skill Learning and Transfer Human Robot Dynamic System Learning Modelling and Control AI Driven Smart Industrial Systems and Natural Interaction and Coordinated Collaboration of Robots in Dynamic Unstructured Environments Part IX Robotics in Cooperative Manipulation MultiSensor Fusion and Multi Robot Systems Human machine Co adaptive Interface Brain inspired intelligence for robotics Planning control and application of bionic novel concept robots and Robust Perception for Safe Driving Part X AI Robot Technology for Healthcare as a Service Computational Neuroscience and Cognitive Models for Adaptive Human Robot Interactions Dynamics and Perception of Human Robot Hybrid Systems and Robotics for Rehabilitation Innovations Intelligent Data Engineering and Automated Learning - IDEAL 2020 Cesar Challenges and Future Directions Analide, Paulo Novais, David Camacho, Hujun Yin, 2020-10-29 This two volume set of LNCS 12489 and 12490 constitutes the thoroughly refereed conference proceedings of the 21th International Conference on Intelligent Data Engineering and Automated Learning IDEAL 2020 held in Guimaraes Portugal in November 2020 The 93 papers presented were carefully reviewed and selected from 134 submissions These papers provided a timely sample of the latest advances in data engineering and machine learning from methodologies frameworks and algorithms to applications The core themes of IDEAL 2020 include big data challenges machine learning data mining information retrieval and management bio neuro informatics bio inspiredmodels agents and hybrid intelligent systems real world applications of intelligent techniques and AI The conference was held virtually due to the COVID 19 pandemic Intelligent Computing Techniques and Applications Tusharkanta Samal, Ambarish Panda, Manas Ranjan Kabat, Ali Ismail Awad, Suvendra Kumar Jayasingh, Deepak K Tosh, 2025-08-19 This Taylor Francis CRC Press volume contains the papers presented at the International Conference on Emerging Trends in Intelligent Computing Techniques ICETICT 2024 held during 27th and 28th December 2024 organized by DRIEMS University Tangi Cuttack Odisha India A lot of challenges at us and no words of appreciation is enough for the organizing committee who could still pull it off successfully The conference draws the excellent technical keynote talk and

many papers The keynote talks by Prof Sanjeevikumar Padmanaban University of South Eastern Norway and Prof Bidyadhar Subudhi Director NIT Warangal are worth mentioning We are grateful to all the speakers for accepting our invitation and sparing their time to deliver the talks Advances in Italian Robotics Giulio Rosati, Giovanni Boschetti, Giuseppe Carbone, 2020-07-03 This book disseminates the latest research achievements findings and ideas in the robotics field with particular attention to the Italian scenario Book coverage includes topics that are related to the theory design practice and applications of robots such as robot design and kinematics dynamics of robots and multi body systems linkages and manipulators control of robotic systems trajectory planning and optimization innovative robots and applications industrial robotics collaborative robotics medical robotics assistive robotics and service robotics Book contributions include but are not limited to revised and substantially extended versions of selected papers that have been presented at the 2nd International Conference of IFToMM Italy IFIT 2018 Intelligent Robotics and Applications Zhiyong Chen, Alexandre Mendes, Yamin Yan, Shifeng Chen, 2018-08-03 The two volume set LNAI 10984 and LNAI 10985 constitutes the refereed proceedings of the 11th International Conference on Intelligent Robotics and Applications ICIRA 2018 held in Newcastle NSW Australia in August 2018 The 81 papers presented in the two volumes were carefully reviewed and selected from 129 submissions The papers in the first volume of the set are organized in topical sections on multi agent systems and distributed control human machine interaction rehabilitation robotics sensors and actuators and industrial robot and robot manufacturing The papers in the second volume of the set are organized in topical sections on robot grasping and control mobile robotics and path planning robotic vision recognition and reconstruction and robot intelligence and learning **Proceedings of the First** International Conference on Advanced Robotics, Control, and Artificial Intelligence Hai Wang, 2025-06-27 This book highlights the latest research developments and outcomes on all aspects of advanced robotics control and artificial intelligence Particularly it not only includes those emerging methodologies and techniques which bridge theoretical studies and applications in all robotics and control systems as well as artificial intelligence but also involves the practical concerns and challenges encountered and potential solutions in those fields **Industrial and Robotic Systems** Eusebio E. Hernandez, Sajjad Keshtkar, S. Ivvan Valdez, 2020-05-13 This volume gathers the latest advances innovations and applications in the field of robotics engineering as presented by leading international researchers and engineers at the Latin American Symposium on Industrial and Robotic Systems LASIRS held in Tampico Mexico on October November 30 01 2019 The contributions cover all major areas of R D and innovation in simulation optimization and control of robotics such as design and optimization of robots using numerical and metaheuristic methods autonomous and control systems industrial compliance solutions numerical simulations for manipulators and robots metaheuristics applied to robotics problems Industry 4 0 control and automation in petrochemical processes simulation and control in aerospace and aeronautics and education in robotics The conference represented a unique platform to share the latest research and developments in simulation control

and optimization of robotic systems and to promote cooperation among specialists in machine and mechanism area

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