Yu Sun
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New Development in Robot Vision

New Development In Robot Vision Cognitive Systems Monographs

Margherita Antona,Constantine Stephanidis

New Development In Robot Vision Cognitive Systems Monographs:

 New Development in Robot Vision Yu Sun,Aman Behal,Chi-Kit Ronald Chung,2014-09-26 The field of robotic vision has advanced dramatically recently with the development of new range sensors Tremendous progress has been made resulting in significant impact on areas such as robotic navigation scene environment understanding and visual learning This edited book provides a solid and diversified reference source for some of the most recent important advancements in the field of robotic vision The book starts with articles that describe new techniques to understand scenes from 2D 3D data such as estimation of planar structures recognition of multiple objects in the scene using different kinds of features as well as their spatial and semantic relationships generation of 3D object models approach to recognize partially occluded objects etc Novel techniques are introduced to improve 3D perception accuracy with other sensors such as a gyroscope positioning accuracy with a visual servoing based alignment strategy for microassembly and increasing object recognition reliability using related manipulation motion models For autonomous robot navigation different vision based localization and tracking strategies and algorithms are discussed New approaches using probabilistic analysis for robot navigation online learning of vision based robot control and 3D motion estimation via intensity differences from a monocular camera are described This collection will be beneficial to graduate students researchers and professionals working in the area of robotic vision   **Cognitive Robotics** Angelo Cangelosi,Minoru Asada,2022-05-17 The current state of the art in cognitive robotics covering the challenges of building AI powered intelligent robots inspired by natural cognitive systems A novel approach to building AI powered intelligent robots takes inspiration from the way natural cognitive systems in humans animals and biological systems develop intelligence by exploiting the full power of interactions between body and brain the physical and social environment in which they live and phylogenetic developmental and learning dynamics This volume reports on the current state of the art in cognitive robotics offering the first comprehensive coverage of building robots inspired by natural cognitive systems Contributors first provide a systematic definition of cognitive robotics and a history of developments in the field They describe in detail five main approaches developmental neuro evolutionary swarm and soft robotics They go on to consider methodologies and concepts treating topics that include commonly used cognitive robotics platforms and robot simulators biomimetic skin as an example of a hardware based approach machine learning methods and cognitive architecture Finally they cover the behavioral and cognitive capabilities of a variety of models experiments and applications looking at issues that range from intrinsic motivation and perception to robot consciousness Cognitive Robotics is aimed at an interdisciplinary audience balancing technical details and examples for the computational reader with theoretical and experimental findings for the empirical scientist   New Trends in Medical and Service Robots Hannes Bleuler,Mohamed Bouri,Francesco Mondada,Doina Pisla,Aleksandar Rodić,Patrick Helmer,2015-11-12 Medical and Service Robotics integrate the most recent achievements in mechanics mechatronics computer science haptic and teleoperation devices together with adaptive control

algorithms The book includes topics such as surgery robotics assist devices rehabilitation technology surgical instrumentation and Brain Machine Interface BMI as examples for medical robotics Autonomous cleaning tending logistics surveying and rescue robots and elderly and healthcare robots are typical examples of topics from service robotics This is the Proceedings of the Third International Workshop on Medical and Service Robots held in Lausanne Switzerland in 2014 It presents an overview of current research directions and fields of interest It is divided into three sections namely 1 assistive and rehabilitation devices 2 surgical robotics and 3 educational and service robotics Most contributions are strongly anchored on collaborations between technical and medical actors engineers surgeons and clinicians Biomedical robotics and the rapidly growing service automation fields have clearly overtaken the classical industrial robotics and automatic control centered activity familiar to the older generation of roboticists **Re-Enacting Sensorimotor Experience for Cognition** Guido Schillaci,Verena V. Hafner,Bruno Lara,2017-03-29 Mastering the sensorimotor capabilities of our body is a skill that we acquire and refine over time starting at the prenatal stages of development This learning process is linked to brain development and is shaped by the rich set of multimodal information experienced while exploring and interacting with the environment Evidence coming from neuroscience suggests the brain forms and mantains body representations as the main strategy to this mastering Although it is still not clear how this knowledge is represented in our brain it is reasonable to think that such internal models of the body undergo a continuous process of adaptation They need to match growing corporal dimensions during development as well as temporary changes in the characteristics of the body such as the transient morphological alterations produced by the usage of tools In the robotics community there is an increasing interest in reproducing similar mechanisms in artificial agents mainly motivated by the aim of producing autonomous adaptive systems that can deal with complexity and uncertainty in human environments Although promising results have been achieved in the context of sensorimotor learning and autonomous generation of body representations it is still not clear how such low level representations can be scaled up to more complex motor skills and how they can enable the development of cognitive capabilities Recent findings from behavioural and brain studies suggests that processes of mental simulations of action perception loops are likely to be executed in our brain and are dependent on internal motor representations The capability to simulate sensorimotor experience might represent a key mechanism behind the implementation of further cognitive skills such as self detection self other distinction and imitation Empirical investigation on the functioning of similar processes in the brain and on their implementation in artificial agents is fragmented This e book comprises a collection of manuscripts published by Frontiers in Robotics and Artificial Intelligence under the section Humanoid Robotics on the research topic re enactment of sensorimotor experience for cognition in artificial agents This compendium aims at condensing the latest theoretical review and experimental studies that address new paradigms for learning and integrating multimodal sensorimotor information in artificial agents re use of the sensorimotor experience for cognitive development and further

construction of more complex strategies and behaviours using these concepts The authors would like to thank M A Dylan Andrade for his art work for the cover **Developmental Robotics** Angelo Cangelosi,Matthew Schlesinger,2015-01-23 A comprehensive overview of an interdisciplinary approach to robotics that takes direct inspiration from the developmental and learning phenomena observed in children s cognitive development Developmental robotics is a collaborative and interdisciplinary approach to robotics that is directly inspired by the developmental principles and mechanisms observed in children s cognitive development It builds on the idea that the robot using a set of intrinsic developmental principles regulating the real time interaction of its body brain and environment can autonomously acquire an increasingly complex set of sensorimotor and mental capabilities This volume drawing on insights from psychology computer science linguistics neuroscience and robotics offers the first comprehensive overview of a rapidly growing field After providing some essential background information on robotics and developmental psychology the book looks in detail at how developmental robotics models and experiments have attempted to realize a range of behavioral and cognitive capabilities The examples in these chapters were chosen because of their direct correspondence with specific issues in child psychology research each chapter begins with a concise and accessible overview of relevant empirical and theoretical findings in developmental psychology The chapters cover intrinsic motivation and curiosity motor development examining both manipulation and locomotion perceptual development including face recognition and perception of space social learning emphasizing such phenomena as joint attention and cooperation language from phonetic babbling to syntactic processing and abstract knowledge including models of number learning and reasoning strategies Boxed text offers technical and methodological details for both psychology and robotics experiments **Visual Perception for Humanoid Robots** David Israel González Aguirre,2018-09-01 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

   Intrinsic motivations and open-ended development in animals, humans, and robots Gianluca Baldassarre,Tom Stafford, Marco Mirolli,Peter Redgrave,Richard Michael Ryan,Andrew Barto,2015-02-10 The aim of this Research Topic for Frontiers in Psychology under the section of Cognitive Science and Frontiers in Neurorobotics is to present state of the art research whether theoretical empirical or computational investigations on open ended development driven by intrinsic motivations The topic will address questions such as How do motivations drive learning How are complex skills built up from a foundation of simpler competencies What are the neural and computational bases for intrinsically motivated learning What is the contribution of intrinsic motivations to wider cognition Autonomous development and lifelong open ended learning are hallmarks of intelligence Higher mammals and especially humans engage in activities that do not appear to directly serve the goals of survival reproduction or material advantage Rather a large part of their activity is intrinsically motivated behavior driven by curiosity play interest in novel stimuli and surprising events autonomous goal setting and the pleasure of acquiring new competencies This allows the cumulative acquisition of knowledge and skills that can later be used to accomplish fitness enhancing goals Intrinsic motivations continue during adulthood and in humans artistic creativity scientific discovery and subjective well being owe much to them The study of intrinsically motivated behavior has a long history in psychological and ethological research which is now being reinvigorated by perspectives from neuroscience artificial intelligence and computer science For example recent neuroscientific research is discovering how neuromodulators like dopamine and noradrenaline relate not only to extrinsic rewards but also to novel and surprising events how brain areas such as the superior colliculus and the hippocampus are involved in the perception and processing of events novel stimuli and novel associations of stimuli and how violations of predictions and expectations influence learning and motivation Computational approaches are characterizing the space of possible reinforcement learning algorithms and their augmentation by intrinsic reinforcements of different kinds Research in robotics and machine learning is yielding systems with increasing autonomy and capacity for self improvement artificial systems with motivations that are similar to those of real organisms and support prolonged autonomous learning Computational research on intrinsic motivation is being complemented by and closely interacting with

research that aims to build hierarchical architectures capable of acquiring storing and exploiting the knowledge and skills acquired through intrinsically motivated learning Now is an important moment in the study of intrinsically motivated open ended development requiring contributions and integration across a large number of fields within the cognitive sciences This Research Topic aims to contribute to this effort by welcoming papers carried out with ethological psychological neuroscientific and computational approaches as well as research that cuts across disciplines and approaches

Mechatronics and Robotics Marina Indri,Roberto Oboe,2020-11-24 The term mechatronics was coined in 1969 merging mecha from mechanism and tronics from electronics to reflect the original idea at the basis of this discipline that is the integration of electrical and mechanical systems into a single device The spread of this term and of mechatronics itself has been growing in the years including new aspects and disciplines like control engineering computer engineering and communication information engineering Nowadays mechatronics has a well defined and fundamental role in strict relation with robotics Drawing a sharp border between mechatronics and robotics is impossible as they share many technologies and objectives Advanced robots could be defined as mechatronic devices equipped with a smart brain but there are also up to date mechatronic devices used in tight interaction with humans that are governed by smart architectures for example for safety purposes Aim of this book is to offer a wide overview of new research trends and challenges for both mechatronics and robotics through the contribution of researchers from different institutions providing their view on specific subjects they consider as hot topics in both fields with attention to new fields of application new challenges to the research communities and new technologies available The reader of this book will enjoy the various contributions as they have been prepared with actual applications in mind along a journey from advanced actuators and sensors to human robot interaction through robot control navigation planning and programming issues The book presents several state of the art solutions like multiple stage actuation to cope with conflicting specification of large motion spans ultra high accuracy model based control for high tech mechatronic systems modern approaches of software systems engineering to robotics aand humanoids for human assistance The reader can also find new techniques in approaching the design of mechatronic systems in some possible industrial and service robotics scenarios with a particular attention for the interaction between humans and mechanisms **Toward Robotic Socially Believable Behaving Systems - Volume I** Anna Esposito,Lakhmi C. Jain,2016-03-21 This volume is a collection of research studies on the modeling of emotions in complex autonomous systems Several experts in the field are reporting their efforts and reviewing the literature in order to shed lights on how the processes of coding and decoding emotional states took place in humans which are the physiological physical and psychological variables involved invent new mathematical models and algorithms to describe them and motivate these investigations in the light of observable societal changes and needs such as the aging population and the cost of health care services The consequences are the implementation of emotionally and socially believable machines acting as helpers into domestic spheres where emotions

drive behaviors and actions The contents of the book are highly multidisciplinary since the modeling of emotions in robotic socially believable systems requires a holistic perspective on topics coming from different research domains such as computer science engineering sociology psychology linguistic and information communication The book is of interest both to experts and students since last research works on a so complex multidisciplinary topic are described in a neat and didactical scientific language **Mechatronics and Machine Vision in Practice 4** John Billingsley,Peter Brett,2020-09-05 The many intriguing examples on the application of mechatronics reinforce the excitement of this creative field of technology As a collection they present a stimulating resource to developers of future mechatronics technology and to educators searching for interesting examples From structured light measurement of the build up of detritus on railway bogies and detection of uncracked spores of Chinese medicine to a practical tractor vision guidance system embedded in a smart phone application the practical applications of mechatronics and machine vision abound Fruits are counted on the tree pasture biomass is measured and a robot collects camel dung as a resource 3D printing is in vogue but papers here discuss the construction and strategy of the printer itself The measurement and analysis of myoelectric muscle signals enable a prosthesis to be controlled and a feeding robot is used for patient care An exoskeleton has both soft and rigid links and an optical sensor analyses the tissue into which a surgical needle is being inserted These are some of the papers in this collection from the 26th annual conference on Mechatronics and Machine Vision in Practice carefully selected to exclude papers that are merely theoretical and to highlight those that show practical verification Papers have been contributed from China New Zealand the Philippines Emirates Germany and of course Australia **Spatial Temporal Patterns for Action-Oriented Perception in Roving Robots II** Paolo Arena,Luca Patanè,2013-12-12 This book presents the result of a joint effort from different European Institutions within the framework of the EU funded project called SPARK II devoted to device an insect brain computational model useful to be embedded into autonomous robotic agents Part I reports the biological background on Drosophila melanogaster with particular attention to the main centers which are used as building blocks for the implementation of the insect brain computational model Part II reports the mathematical approach to model the Central Pattern Generator used for the gait generation in a six legged robot Also the Reaction diffusion principles in non linear lattices are exploited to develop a compact internal representation of a dynamically changing environment for behavioral planning In Part III a software hardware framework developed to integrate the insect brain computational model in a simulated real robotic platform is illustrated The different robots used for the experiments are also described Moreover the problems related to the vision system were addressed proposing robust solutions for object identification and feature extraction Part IV includes the relevant scenarios used in the experiments to test the capabilities of the insect brain inspired architecture taking as comparison the biological case Experimental results are finally reported whose multimedia can be found in the SPARK II web page www spark2 diees unict it **RoboCup 2023: Robot World Cup XXVI** Cédric Buche,Alessandra Rossi,Marco

Simões,Ubbo Visser,2024-03-13 This book constitutes the proceedings of the 26th RoboCup International Symposium which was held in Bordeaux France during July 4 10 2023 The 25 regular papers included in these proceedings were carefully reviewed and selected from 47 submissions the volume also includes 11 RoboCup Champions Papers In addition to presenting the proceedings of the RoboCup 2023 Symposium the book highlights the approaches of champion teams from the competitions Due to the complex research challenges set by the RoboCup initiative the RoboCup International Symposium offers a unique perspective for exploring scientific and engineering principles underlying advanced robotic and AI systems

   The Visual Neuroscience of Robotic Grasping Eris Chinellato,Angel P. del Pobil,2015-06-19 This book presents interdisciplinary research that pursues the mutual enrichment of neuroscience and robotics Building on experimental work and on the wealth of literature regarding the two cortical pathways of visual processing the dorsal and ventral streams we define and implement computationally and on a real robot a functional model of the brain areas involved in vision based grasping actions Grasping in robotics is largely an unsolved problem and we show how the bio inspired approach is successful in dealing with some fundamental issues of the task Our robotic system can safely perform grasping actions on different unmodeled objects denoting especially reliable visual and visuomotor skills The computational model and the robotic experiments help in validating theories on the mechanisms employed by the brain areas more directly involved in grasping actions This book offers new insights and research hypotheses regarding such mechanisms especially for what concerns the interaction between the dorsal and ventral streams Moreover it helps in establishing a common research framework for neuroscientists and roboticists regarding research on brain functions   *How to Grow a Robot* Mark H. Lee,2020-05-26 How to develop robots that will be more like humans and less like computers more social than machine like and more playful and less programmed Most robots are not very friendly They vacuum the rug mow the lawn dispose of bombs even perform surgery but they aren t good conversationalists It s difficult to make eye contact If the future promises more human robot collaboration in both work and play wouldn t it be better if the robots were less mechanical and more social In How to Grow a Robot Mark Lee explores how robots can be more human like friendly and engaging Developments in artificial intelligence notably Deep Learning are widely seen as the foundation on which our robot future will be built These advances have already brought us self driving cars and chess match winning algorithms But Lee writes we need robots that are perceptive animated and responsive more like humans and less like computers more social than machine like and more playful and less programmed The way to achieve this he argues is to grow a robot so that it learns from experience just as infants do After describing what s wrong with artificial intelligence one key shortcoming it s not embodied Lee presents a different approach to building human like robots developmental robotics inspired by developmental psychology and its accounts of early infant behavior He describes his own experiments with the iCub humanoid robot and its development from newborn helplessness to ability levels equal to a nine month old explaining how the iCub learns from its own experiences AI

robots are designed to know humans as objects developmental robots will learn empathy Developmental robots with an internal model of self will be better interactive partners with humans That is the kind of future technology we should work toward   *Universal Access in Human-Computer Interaction. Interaction Techniques and Environments* Margherita Antona,Constantine Stephanidis,2016-07-04 The three volume set LNCS 9737 9739 constitutes the refereed proceedings of the 10th International Conference on Universal Access in Human Computer Interaction UAHCI 2016 held as part of the 10th International Conference on Human Computer Interaction HCII 2016 in Toronto ON Canada in July 2016 jointly with 15 other thematically similar conferences The total of 1287 papers presented at the HCII 2016 conferences were carefully reviewed and selected from 4354 submissions The papers included in the three UAHCI 2016 volumes address the following major topics novel approaches to accessibility design for all and eInclusion best practices universal access in architecture and product design personal and collective informatics in universal access eye tracking in universal access multimodal and natural interaction for universal access universal access to mobile interaction virtual reality 3D and universal access intelligent and assistive environments universal access to education and learning technologies for ASD and cognitive disabilities design for healthy aging and rehabilitation universal access to media and games and universal access to mobility and automotive   **Theoretical and Computational Models of Word Learning: Trends in Psychology and Artificial Intelligence** Gogate, Lakshmi,2013-02-28 The process of learning words and languages may seem like an instinctual trait inherent to nearly all humans from a young age However a vast range of complex research and information exists in detailing the complexities of the process of word learning Theoretical and Computational Models of Word Learning Trends in Psychology and Artificial Intelligence strives to combine cross disciplinary research into one comprehensive volume to help readers gain a fuller understanding of the developmental processes and influences that makeup the progression of word learning Blending together developmental psychology and artificial intelligence this publication is intended for researchers practitioners and educators who are interested in language learning and its development as well as computational models formed from these specific areas of research   Biologically Inspired Approaches for Locomotion, Anomaly Detection and Reconfiguration for Walking Robots Bojan Jakimovski,2011-08-20 The increasing presence of mobile robots in our everyday lives introduces the requirements for their intelligent and autonomous features Therefore the next generation of mobile robots should be more self capable in respect to increasing of their functionality in unforeseen situations decreasing of the human involvement in their everyday operations and their maintenance being robust fault tolerant and reliable in their operation Although mobile robotic systems have been a topic of research for decades and aside the technology improvements nowadays the subject on how to program and making them more autonomous in their operations is still an open field for research Applying bio inspired organic approaches in robotics domain is one of the methodologies that are considered that would help on making the robots more autonomous and self capable i e having properties such as self reconfiguration self

adaptation self optimization etc In this book several novel biologically inspired approaches for walking robots multi legged and humanoid domain are introduced and elaborated They are related to self organized and self stabilized robot walking anomaly detection within robot systems using self adaptation and mitigating the faulty robot conditions by self reconfiguration of a multi legged walking robot The approaches presented have been practically evaluated in various test scenarios the results from the experiments are discussed in details and their practical usefulness is validated

Probabilistic Mapping of Spatial Motion Patterns for Mobile Robots Tomasz Piotr Kucner,Achim J. Lilienthal,Martin Magnusson,Luigi Palmieri,Chittaranjan Srinivas Swaminathan,2020-03-28 This book describes how robots can make sense of motion in their surroundings and use the patterns they observe to blend in better in dynamic environments shared with humans The world around us is constantly changing Nonetheless we can find our way and aren t overwhelmed by all the buzz since motion often follows discernible patterns Just like humans robots need to understand the patterns behind the dynamics in their surroundings to be able to efficiently operate e g in a busy airport Yet robotic mapping has traditionally been based on the static world assumption which disregards motion altogether In this book the authors describe how robots can instead explicitly learn patterns of dynamic change from observations store those patterns in Maps of Dynamics MoDs and use MoDs to plan less intrusive safer and more efficient paths The authors discuss the pros and cons of recently introduced MoDs and approaches to MoD informed motion planning and provide an outlook on future work in this emerging fascinating field

Tactile Sensors for Robotic Applications Salvatore Pirozzi,2021-03-17 The book covers different aspects Innovative technologies for tactile sensors development Tactile data interpretation for control purposes Alternative sensing technologies Multi sensor systems for grasping and manipulation Sensing solutions for impaired people   3D Computer Vision Christian Wöhler,2012-07-23 This indispensable text introduces the foundations of three dimensional computer vision and describes recent contributions to the field Fully revised and updated this much anticipated new edition reviews a range of triangulation based methods including linear and bundle adjustment based approaches to scene reconstruction and camera calibration stereo vision point cloud segmentation and pose estimation of rigid articulated and flexible objects Also covered are intensity based techniques that evaluate the pixel grey values in the image to infer three dimensional scene structure and point spread function based approaches that exploit the effect of the optical system The text shows how methods which integrate these concepts are able to increase reconstruction accuracy and robustness describing applications in industrial quality inspection and metrology human robot interaction and remote sensing

The book delves into New Development In Robot Vision Cognitive Systems Monographs. New Development In Robot Vision Cognitive Systems Monographs is a vital topic that must be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into New Development In Robot Vision Cognitive Systems Monographs, encompassing both the fundamentals and more intricate discussions.

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The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of New Development In Robot Vision Cognitive Systems Monographs.

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