
Robotic Object Recognition Using Vision and Touch

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Advanced Tactile Sensing For Robotics Howard R Nicholls,1992-12-10 Advanced robot systems require sensory information to enable them to make decisions and to carry out actions in a versatile autonomous way Humans make considerable use of information derived through touch and an emerging domain of robot sensing is tactile sensing This book considers various aspects of tactile sensing from hardware design through to the use of tactile data in exploratory situations using a multi fingered robot hand In the first part of the book the current state of progress of tactile sensing is surveyed and it is found that the field is still in an early stage of development Next some fundamental issues in planar elasticity concerning the interaction between tactile sensors and the environment are presented Having established how the basic data can be derived from the sensors the issues of what form tactile sensors should take and how they should be used are considered This is particularly important given the infancy of this field The human tactile system is examined and then biological touch and its implications for robotics is looked at Some experiments in dextrous manipulation using a robot hand are described which apply some of these results The integration of tactile sensors into a complete system is also considered and another novel approach for using touch sensing in a flexible assembly machine is described Both basic material and new research results are provided in this book thus catering to different levels of readers The chapters by world experts in different aspects of the field are integrated well into one volume The editor and authors have produced a thorough and in depth survey of all work in robot tactile sensing making the book essential reading for all researchers in this emergent field **Tactile Sensing, Skill**

Learning, and Robotic Dexterous Manipulation Qiang Li,Shan Luo,Zhaopeng Chen,Chenguang Yang,Jianwei Zhang,2022-04-02 Tactile Sensing Skill Learning and Robotic Dexterous Manipulation focuses on cross disciplinary lines of research and groundbreaking research ideas in three research lines tactile sensing skill learning and dexterous control The book introduces recent work about human dexterous skill representation and learning along with discussions of tactile sensing and its applications on unknown objects property recognition and reconstruction Sections also introduce the adaptive control schema and its learning by imitation and exploration Other chapters describe the fundamental part of relevant research paying attention to the connection among different fields and showing the state of the art in related branches The book summarizes the different approaches and discusses the pros and cons of each Chapters not only describe the research but also include basic knowledge that can help readers understand the proposed work making it an excellent resource for researchers and professionals who work in the robotics industry haptics and in machine learning Provides a review of tactile perception and the latest advances in the use of robotic dexterous manipulation Presents the most detailed work on synthesizing intelligent tactile perception skill learning and adaptive control Introduces recent work on human s dexterous

skill representation and learning and the adaptive control schema and its learning by imitation and exploration Reveals and illustrates how robots can improve dexterity by modern tactile sensing interactive perception learning and adaptive control approaches

Vision and Navigation Charles E. Thorpe, 2012-12-06 Mobile robots are playing an increasingly important role in our world Remotely operated vehicles are in everyday use for hazardous tasks such as charting and cleaning up hazardous waste spills construction work of tunnels and high rise buildings and underwater inspection of oil drilling platforms in the ocean A whole host of further applications however beckons robots capable of autonomous operation without or with very little intervention of human operators Such robots of the future will explore distant planets map the ocean floor study the flow of pollutants and carbon dioxide through our atmosphere and oceans work in underground mines and perform other jobs we cannot even imagine perhaps even drive our cars and walk our dogs The biggest technical obstacles to building mobile robots are vision and navigation enabling a robot to see the world around it to plan and follow a safe path through its environment and to execute its tasks At the Carnegie Mellon Robotics Institute we are studying those problems both in isolation and by building complete systems Since 1980 we have developed a series of small indoor mobile robots some experimental and others for practical applicationr Our outdoor autonomous mobile robot research started in 1984 navigating through the campus sidewalk network using a small outdoor vehicle called the Terregator In 1985 with the advent of DARPA's Autonomous Land Vehicle Project we constructed a computer controlled van with onboard sensors and researchers In the fall of 1987 we began the development of a six legged Planetary Rover

Parallel Architectures and Parallel Algorithms for Integrated Vision Systems Alok N. Choudary, J.H. Patel, 2012-12-06 Computer vision is one of the most complex and computationally intensive problem Like any other computationally intensive problems parallel processing has been suggested as an approach to solving the problems in computer vision Computer vision employs algorithms from a wide range of areas such as image and signal processing advanced mathematics graph theory databases and artificial intelligence Hence not only are the computing requirements for solving vision problems tremendous but they also demand computers that are efficient to solve problems exhibiting vastly different characteristics With recent advances in VLSI design technology Single Instruction Multiple Data SIMD massively parallel computers have been proposed and built However such architectures have been shown to be useful for solving a very limited subset of the problems in vision Specifically algorithms from low level vision that involve computations closely mimicking the architecture and require simple control and computations are suitable for massively parallel SIMD computers An Integrated Vision System IVS involves computations from low to high level vision to be executed in a systematic fashion and repeatedly The interaction between computations and information dependent nature of the computations suggests that architectural requirements for computer vision systems can not be satisfied by massively parallel SIMD computers

Robotic Tactile Perception and Understanding Huaping Liu, Fuchun Sun, 2018-03-20 This book introduces the challenges of robotic tactile perception and task understanding and describes an

advanced approach based on machine learning and sparse coding techniques Further a set of structured sparse coding models is developed to address the issues of dynamic tactile sensing The book then proves that the proposed framework is effective in solving the problems of multi finger tactile object recognition multi label tactile adjective recognition and multi category material analysis which are all challenging practical problems in the fields of robotics and automation The proposed sparse coding model can be used to tackle the challenging visual tactile fusion recognition problem and the book develops a series of efficient optimization algorithms to implement the model It is suitable as a reference book for graduate students with a basic knowledge of machine learning as well as professional researchers interested in robotic tactile perception and understanding and machine learning

Machine Intelligence and Knowledge Engineering for Robotic Applications

Andrew K.C. Wong, Alan Pugh, 2012-12-06 This book is the outcome of the NATO Advanced Research Workshop on Machine Intelligence and Knowledge Engineering for Robotic Applications held at Maratea Italy in May 1986 Attendance of the workshop was by invitation only Most of the participants and speakers are recognized leaders in the field representing industry government and academic community worldwide The focus of the workshop was to review the recent advances of machine intelligence and knowledge engineering for robotic applications It covers five main areas of interest They are grouped into five sections 1 Robot Vision 2 Knowledge Representation and Image Understanding 3 Robot Control and Inference Systems 4 Task Planning and Expert Systems 5 Software Hardware Systems Also included in this book are a paper from the Poster Session and a brief report of the panel discussion on the Future Direction in Knowledge Based Robotics Section I of this book consists of four papers It begins with a review of the basic concepts of computer vision with emphasis on techniques specific for robot vision systems The next paper presents a comprehensive 3 D vision system for robotic application

Bayesian Modeling of Uncertainty in Low-Level Vision Richard Szeliski, 2012-12-06 Vision has to deal with uncertainty The sensors are noisy the prior knowledge is uncertain or inaccurate and the problems of recovering scene information from images are often ill posed or underconstrained This research monograph which is based on Richard Szeliski's Ph D dissertation at Carnegie Mellon University presents a Bayesian model for representing and processing uncertainty in low level vision Recently probabilistic models have been proposed and used in vision Szeliski's method has a few distinguishing features that make this monograph important and attractive First he presents a systematic Bayesian probabilistic estimation framework in which we can define and compute the prior model the sensor model and the posterior model Second his method represents and computes explicitly not only the best estimates but also the level of uncertainty of those estimates using second order statistics i.e. the variance and covariance Third the algorithms developed are computationally tractable for dense fields such as depth maps constructed from stereo or range finder data rather than just sparse data sets Finally Szeliski demonstrates successful applications of the method to several real world problems including the generation of fractal surfaces motion estimation without correspondence using sparse range data and incremental depth

from motion

Reviewing **Robotic Object Recognition Using Vision And Touch**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Robotic Object Recognition Using Vision And Touch**," an enthralling opus penned by a highly acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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Robotic Object Recognition Using Vision And Touch Introduction

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