Autonomous Robots From Biological Inspiration To Implementation And Control Intelligent Robotics And Autonomous Agents Series

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The Path to Autonomous Robots

KLEIN MILLER

Behavior-based Robotics EPFL Press
Explores how to produce an 'artificial conscience' in a new class of robots, humane-oids, which are robots that can potentially perform more ethically than humans in the battlefield. This book presents robot architectural design recommendations for Post facto suppression of unethical behavior.
Towards Autonomous Robotic Systems MIT Press
A comprehensive introduction to new approaches in artificial intelligence and robotics that are inspired by self-organizing biological processes and structures. New approaches to artificial intelligence spring from the idea that intelligence emerges as much from cells, bodies, and societies as it does from evolution, development, and learning. Traditionally, artificial intelligence has been concerned with reproducing the abilities of human brains; newer approaches take inspiration from a wider range of biological structures that that are capable of autonomous self-organization. Examples of these new approaches include evolutionary computation and evolutionary electronics, artificial neural networks, immune systems, biorobotics, and swarm intelligence—to mention only a few. This book offers a comprehensive introduction to the emerging field of biologically inspired artificial intelligence that can be used as an upper-level text or as a reference for researchers. Each chapter presents computational approaches inspired by a different biological system; each begins with background information about the biological system and then proceeds to develop computational models that make use of biological concepts. The chapters cover

evolutionary computation and electronics; cellular systems; neural systems, including neuromorphic engineering; developmental systems; immune systems; behavioral systems—including several approaches to robotics, including behavior-based, bio-mimetic, epigenetic, and evolutionary robots; and collective systems, including swarm robotics as well as cooperative and competitive co-evolving systems. Chapters end with a concluding overview and suggested reading.
Autonomous Robots and Agents Physica
“[An] essential book… it is required reading as we seriously engage one of the most important debates of our time.”—Sherry Turkle, author of Reclaiming Conversation: The Power of Talk in a Digital Age From drones to Mars rovers—an exploration of the most innovative use of robots today and a provocative argument for the crucial role of humans in our increasingly technological future. In Our Robots, Ourselves, David Mindell offers a fascinating behind-the-scenes look at the cutting edge of robotics today, debunking commonly held myths and exploring the rapidly changing relationships between humans and machines. Drawing on firsthand experience, extensive interviews, and the latest research from MIT and elsewhere, Mindell takes us to extreme environments—high atmosphere, deep ocean, and outer space—to reveal where the most advanced robotics already exist. In these environments, scientists use robots to discover new information about ancient civilizations, to map some of the world’s largest geological features, and even to “commute” to Mars to conduct daily experiments. But these tools of air, sea, and space also forecast the dangers, ethical quandaries, and unintended consequences of a future in which robotics and automation suffuse our everyday lives. Mindell argues that the stark lines we’ve drawn between human and not human, manual and automated, aren’t helpful for understanding our relationship with robotics. Brilliantly researched and accessibly written, Our Robots, Ourselves clarifies misconceptions about the autonomous robot, offering instead a hopeful message about what he calls “rich human presence” at the center of the technological landscape we are now creating.
Cognitive Robotics MDPI
This exciting study explores the novel insight, based on well-established ethological principles, that animals, humans, and autonomous robots can all be analyzed as multi-task autonomous control systems.
Governing Lethal Behavior in Autonomous Robots Cambridge University Press
Autonomous robots are robots which can perform desired tasks in unstructured environments without continuous human guidance. Many kinds of robots have some degree of autonomy. Different robots can be autonomous in different ways. A high degree of autonomy is particularly desirable in fields such as space exploration, where communication delays and interruptions are unavoidable. Some modern factory robots are "autonomous" within the strict confines of their direct environment. The exact orientation and position of the next object of work and (in the more advanced factories) even the type of object and the required task must be determined. This can vary unpredictably (at least from the robot's point of view). One important area of robotics research is to enable the robot to cope with its environment whether this be on land, underwater, in the air, underground, or in space. This book presents the latest research from around the globe.
Neuromorphic and Brain-Based Robots Springer Science & Business Media
The International Symposia on Distributed Autonomous Robotic Systems (DARS) started at Riken, Japan in 1992. Since then, the DARS symposia have been held every two years: in 1994 and 1996 in Japan (Riken, Wako), in 1998 in Germany (Karlsruhe), in 2000 in the USA (Knoxville, TN), in 2002 in Japan (Fukuoka), in 2004 in France (Toulouse), and in 2006 in the USA (Minneapolis, MN). The 9th DARS symposium, which was held during November 17–19 in T- kuba, Japan, hosted 84 participants from 13 countries. The 48 papers presented there were selected through rigorous peer review with a 50% acceptance ratio. Along with three invited talks, they addressed the spreading research fields of DARS, which are classifiable along two streams: theoretical and standard studies of DARS, and interdisciplinary studies using DARS concepts. The former stream includes multi-robot cooperation (task assignment methodology among multiple robots, multi-robot localization, etc.), swarm intelligence, and modular robots. The latter includes distributed sensing, mobiligence, ambient intelligence, and mul- agent systems interaction with human beings. This book not only offers readers the latest research results related to DARS from theoretical studies to application-oriented ones; it also describes the present trends of this field. With the diversity and depth revealed herein, we expect that DARS technologies will flourish soon.
Introduction to Autonomous Robots IOS Press
From driving, flying, and swimming, to digging for unknown objects in space exploration, autonomous robots take on varied shapes and sizes. In part, autonomous robots are designed to perform tasks that are too dirty, dull, or dangerous for humans. With nontrivial autonomy and volition, they may soon claim their own place in human society. These robots will be our allies as we strive for understanding our natural and man-made environments and build positive synergies around us. Although we may never perfect replication of biological capabilities in robots, we must harness the inevitable emergence of robots that synchronizes with our own capacities to live, learn, and grow. This book is a snapshot of motivations and methodologies for our collective attempts to transform our lives and enable us to cohabit with robots that work with and for us. It reviews and guides the reader to seminal and continual developments that are the foundations for successful paradigms. It attempts to demystify the abilities and limitations of robots. It is a progress report on the continuing work that will fuel future endeavors. Table of Contents: Part I: Preliminaries/Agency, Motion, and Anatomy/Behaviors / Architectures / Affect/Sensors / Manipulators/Part II: Mobility/Potential Fields/Roadmaps / Reactive Navigation / Multi-Robot Mapping: Brick and Mortar Strategy / Part III: State of the Art / Multi-Robotics Phenomena / Human-Robot Interaction / Fuzzy Control / Decision Theory and Game Theory / Part IV: On the Horizon / Applications: Macro and Micro Robots / References / Author Biography / Discussion
Intelligent Behavior in Animals and Robots One Billion Knowledgeable
Self-organizing approaches inspired from biological systems, such as social insects, genetic, molecular and cellular systems under morphogenesis, and human mental development, has enjoyed great success in advanced robotic systems that need to work in dynamic and changing environments. Compared with classical control methods for robotic systems, the major advantages of bio-inspired self-organizing robotic systems include robustness, self-repair and self-healing in the presence of system failures and/or malfunctions, high adaptability to environmental changes, and autonomous self-organization and self-reconfiguration without a centralized control. “Bio-inspired Self-organizing Robotic Systems” provides a valuable reference for scientists, practitioners and research students working on developing control algorithms for self-organizing engineered collective systems, such as swarm robotic systems, self-reconfigurable modular robots, smart material based robotic devices, unmanned

aerial vehicles, and satellite constellations.

Essential Principles for Autonomous Robotics Penguin

What Is Autonomous Robotics An autonomous robot is a robot that conducts behaviors or performs tasks autonomously (without external influence). Autonomous robotics is commonly regarded as a branch of artificial intelligence, robotics, and information engineering. How You Will Benefit - Answering the public top questions about autonomous robotics. - Real world examples for the usage of robots in many industries and corporations. - 17 appendices to explain, briefly, 266 emerging technology in each industry to have 360-degree full understanding of robotics' technologies. - Insights, and validations about the following topics: Chapter 1: Autonomous Robot Chapter 2: Behavior-Based Robotics Chapter 3: Robot Learning Chapter 4: Cloud Robotics Chapter 5: Ubiquitous Robot Chapter 6: Swarm Robotics Chapter 7: Fog robotics Chapter 8: Robotic Sensing Chapter 9: Robotic sensors Chapter 10: Robot navigation Chapter 11: Simultaneous localization and mapping Chapter 12: Teleoperation Chapter 13: Telerobotics Chapter 14: Bio-inspired robotics Chapter 15: Biorobotics Chapter 16: Cognitive robotics Chapter 17: Developmental robotics Chapter 18: Domestic robot Chapter 19: Evolutionary robotics Chapter 20: Humanoid robot Chapter 21: Microbotics Chapter 22: Robotics Chapter 23: Industrial robot Chapter 24: PatrolBot Chapter 25: Amazon Scout Chapter 26: RoboBee Chapter 27: Robomow Chapter 28: Wake-up robot problem Chapter 29: Kidnapped robot problem Chapter 30: Three Laws of Robotics Who This Book Is For Professionals, undergraduate and graduate students, enthusiasts, hobbyists, and those who want to go beyond basic knowledge or information for any kind of robot.

Bio-Inspired Artificial Intelligence MIT Press

Neuromorphic and brain-based robotics have enormous potential for furthering our understanding of the brain. By embodying models of the brain on robotic platforms, researchers can investigate the roots of biological intelligence and work towards the development of truly intelligent machines. This book provides a broad introduction to this groundbreaking area for researchers from a wide range of fields, from engineering to neuroscience. Case studies explore how robots are being used in current research, including a whisker system that allows a robot to sense its environment and neurally inspired navigation systems that show impressive mapping results. Looking to the future, several chapters consider the development of cognitive, or even conscious robots that display the adaptability and intelligence of biological organisms. Finally, the ethical implications of intelligent robots are explored, from morality and Asimov's three laws to the question of whether robots have rights.

Distributed Autonomous Robotic Systems 2 Springer

This book introduces the theories and methods of Nature-Inspired Robotics in artificial intelligence. Software and hardware technologies, alongside theories and methods, illustrate the application of bio-inspired artificial intelligence. It includes discussions on topics such as Robot Control Manipulators, Geometric Transformation, Robotic Drive Systems and Nature Inspired Robotic Neural System. Elaborating upon recent progress made in five distinct configurations of nature-inspired computing, it explores the potential applications of this technology in two specific areas: neuromorphic computing systems and neuromorphic perceptual systems. · Discusses advances in cutting-edge technology in brain-inspired computing, perception technologies and aspects of neuromorphic electronics · Offers a thorough introduction to two-terminal neuromorphic memristors, including memristive devices and resistive switching mechanisms · Provides comprehensive explorations of spintronic neuromorphic devices and multi-terminal neuromorphic devices with cognitive behaviours · Includes cognitive behaviour of Inspired Robotics and cognitive technologies with applications in Artificial Intelligence · Contains practical discussions of neuromorphic devices based on chalcogenide and organic materials. This text acts as a reference book for students, scholars, and industry professionals.

Interdisciplinary Approaches to Robot Learning MIT Press

This book introduces concepts in mobile, autonomous robotics to third-fourth year students in Computer Science or a related discipline. The book covers principles of robot motion, forward and inverse kinematics of robotic arms and simple wheeled platforms, perception, error propagation, localization and simultaneous localization and mapping. The cover picture shows a wind-up toy that is smart enough to not fall off a table just using intelligent mechanism design and illustrate the importance of the mechanism in designing intelligent, autonomous systems. This book is open source, open to contributions and released under a creative common license.

Nature Inspired Robotics Springer

This book collects the extended versions of the best papers presented at the 3rd International Conference on Autonomous Robots and Agents, ICARA 2006, held at Palmerston North, New Zealand, December, 2006. It covers theoretical and methodological aspects of incorporating intelligence in autonomous robots and agents, detailing the collaborative efforts and methods needed to overcome challenges faced in the real world and accomplish complex tasks.

Autonomous Robotics Springer

This book introduces concepts in mobile, autonomous robotics to 3rd-4th year students in Computer Science or a related discipline. The book covers principles of robot motion, forward and inverse kinematics of robotic arms and simple wheeled platforms, perception, error propagation, localization and simultaneous localization and mapping. The cover picture shows a wind-up toy that is smart enough to not fall off a table just using intelligent mechanism design and illustrate the importance of the mechanism in designing intelligent, autonomous systems. This book is open source, open to contributions, and released under a creative common license.

Biologically Inspired Robot Behavior Engineering Springer

It is man’s ongoing hope that a machine could somehow adapt to its environment by reorganizing itself. This is what the notion of self-organizing robots is based on. The theme of this book is to examine the feasibility of creating such robots within the limitations of current mechanical engineering. The topics comprise the following aspects of such a pursuit: the philosophy of design of self-organizing mechanical systems; self-organization in biological systems; the history of self-organizing mechanical systems; a case study of a self-assembling/self-repairing system as an autonomous distributed system; a self-organizing robot that can create its own shape and robotic motion; implementation and instrumentation of self-organizing robots; and the future of self-organizing robots. All topics are illustrated with many up-to-date examples, including those from the authors’ own work. The book does not require advanced knowledge of mathematics to be understood, and will be of great benefit to students in the robotics discipline, including in the areas of mechanics, control, electronics, and computer science. It is also an important source for researchers who wish to investigate the field of robotics or who have an interest in the application of self-organizing phenomena.

Our Robots, Ourselves MIT Press

A comprehensive introduction to new approaches in artificial intelligence and robotics that are inspired by self-organizing biological processes and structures. New approaches to artificial

intelligence spring from the idea that intelligence emerges as much from cells, bodies, and societies as it does from evolution, development, and learning. Traditionally, artificial intelligence has been concerned with reproducing the abilities of human brains; newer approaches take inspiration from a wider range of biological structures that that are capable of autonomous self-organization. Examples of these new approaches include evolutionary computation and evolutionary electronics, artificial neural networks, immune systems, biorobotics, and swarm intelligence—to mention only a few. This book offers a comprehensive introduction to the emerging field of biologically inspired artificial intelligence that can be used as an upper-level text or as a reference for researchers. Each chapter presents computational approaches inspired by a different biological system; each begins with background information about the biological system and then proceeds to develop computational models that make use of biological concepts. The chapters cover evolutionary computation and electronics; cellular systems; neural systems, including neuromorphic engineering; developmental systems; immune systems; behavioral systems—including several approaches to robotics, including behavior-based, bio-mimetic, epigenetic, and evolutionary robots; and collective systems, including swarm robotics as well as cooperative and competitive co-evolving systems. Chapters end with a concluding overview and suggested reading.

Bio-inspired Emergent Control of Locomotion Systems Springer
The International Conference on Intelligent Autonomous Systems (IAS) conference brings together leading researchers interested in all aspects of autonomy and adaptivity of artificial systems. This book contains the proceedings of the tenth IAS in Baden Baden, Germany.

Biologically Inspired Robotics Springer Science & Business Media
This book constitutes the refereed proceedings of the 8th International Symposium on Evolutionary Robotics, ER 2001, held in Tokyo, Japan, in October 2001. The seven revised full papers by the invited speakers Rodney A. Brooks, Dario Floreano, Robert J. Full, Inman Harvey, Owen Holland, Francesco Mondada, and Jordan B. Pollack were carefully selected and revised for presentation in the book. Among the topics addressed are imitation of life and machine consciousness, autonomous vision-based robots, evolved robots, living machines, artificial evolution, bioinspired artificial life locomotion, and mobile robotic systems engineering.

Autonomous Robots and Agents CRC Press
This book constitutes the refereed proceedings of the 18th Annual Conference on Towards Autonomous Robotics, TAROS 2017, held in Guildford, UK, in July 2017. The 43 revised full papers presented together with 13 short papers were carefully reviewed and selected from 66 submissions. The papers discuss robotics research drawn from a wide and diverse range of topics, such as swarm and multi-robotic systems; human-robot interaction; robotic learning and imitation; robot navigation, planning and safety; humanoid and bio-inspired robots; mobile robots and vehicles; robot testing and design; detection and recognition; learning and adaptive behaviours; interaction; soft and reconfigurable robots; and service and industrial robots.

Bio-Inspired Self-Organizing Robotic Systems World Scientific
The principal chapters of this book form a collection of technical articles sp- ning many areas of research in robotics, these are followed by a set of short r- iniscences and tributes written by former students of Professor George A. Bekey. Professor Bekey, a pioneer in robotics, retired from the University of Southern C-ifornia (USC) in 2002 after serving on its faculty for forty years. He maintains an association with USC as University Professor Emeritus. Professor Bekey turned 80 in June 2008 - this is his Festschrift. As one of Professor Bekey's former students, it has been my privilege to know him for many years. This book represents the collective warm feelings of his former students, who remember their association with him in the fondest terms. Part I of this book is composed of technical chapters representing threads of active robotics research knitted loosely together. In many cases the themes of the chapters have their origins in the work the authors did when they were graduate students with Professor Bekey. These chapters are written for the reader interested in a sampling of modern research in Autonomous Robots. It is my hope that, for the serious reader, these chapters will serve as invitations to explore the ?eld via further reading and research.

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