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

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Catalyzing Inquiry at the Interface of Computing and Biology
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Experimental Robotics
20th Annual Conference, TAROS 2019, London, UK, July 3–5, 2019, Proceedings, Part II
Bio-Inspired Artificial Intelligence
RoboCup 2009: Robot Soccer World Cup XIII
Bio-Inspired Computing and Networking
Social Computing
Second International Conference on Social Robotics, ICSR 2010, Singapore, November 23-24, 2010. Proceedings
Autonomous Weapons Systems
Autonomous Mobile Robots in Unknown Outdoor Environments
Artificial Neural Networks: Biological Inspirations – ICANN 2005
From Babies to Robots

MORA SKINNER

Swarm Robotics Springer Science & Business Media

Autonomous RobotsFrom Biological Inspiration to Implementation and ControlMIT Press
15th International Conference, Warsaw, Poland, September 11-15, 2005, Proceedings, Part I Cambridge University 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.

The Horizons of Evolutionary Robotics Springer

Incorporating papers from the 12th International Symposium on Experimental Robotics (ISER), December 2010, this book examines the latest advances across the various fields of robotics. Offers insights on both theoretical concepts and experimental results.

Evolutionary Robotics Springer Science & Business Media

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.

Adaptive Mobile Robotics MIT Press

Advances in computer science and technology and in biology over the last several years have opened up the possibility for computing to help answer fundamental questions in biology and for biology to help with new approaches to computing. Making the most of the research opportunities at the interface of computing and biology requires the active participation of people from both fields. While past attempts have been

made in this direction, circumstances today appear to be much more favorable for progress. To help take advantage of these opportunities, this study was requested of the NRC by the National Science Foundation, the Department of Defense, the National Institutes of Health, and the Department of Energy. The report provides the basis for establishing cross-disciplinary collaboration between biology and computing including an analysis of potential impediments and strategies for overcoming them. The report also presents a wealth of examples that should encourage students in the biological sciences to look for ways to enable them to be more effective users of computing in their studies.

The Path to Autonomous Robots

Autonomous RobotsFrom Biological Inspiration to Implementation and Control

An overview of the basic concepts and methodologies of evolutionary robotics, which views robots as autonomous artificial organisms that develop their own skills in close interaction with the environment and without human intervention.

The 10th International Symposium

Springer Science & Business Media

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.

Robot Ethics CRC Press

This two volume set (CCIS 623 and 634) constitutes the refereed proceedings of the Second International Conference of Young Computer Scientists, Engineers and Educators, ICYCSEE 2016, held in Harbin, China, in August 2016. The 91 revised full papers presented were carefully reviewed and selected from 338 submissions. The papers are organized in topical sections on Research Track (Part I) and Education Track, Industry Track, and Demo Track (Part II) and cover a wide range of topics

related to social computing, social media, social network analysis, social modeling, social recommendation, machine learning, data mining.

Biomimetic Neural Learning for Intelligent Robots MIT Press

Prominent experts from science and the humanities explore issues in robot ethics that range from sex to war. Robots today serve in many roles, from entertainer to educator to executioner. As robotics technology advances, ethical concerns become more pressing: Should robots be programmed to follow a code of ethics, if this is even possible? Are there risks in forming emotional bonds with robots? How might society—and ethics—change with robotics? This volume is the first book to bring together prominent scholars and experts from both science and the humanities to explore these and other questions in this emerging field. Starting with an overview of the issues and relevant ethical theories, the topics flow naturally from the possibility of programming robot ethics to the ethical use of military robots in war to legal and policy questions, including liability and privacy concerns. The contributors then turn to human-robot emotional relationships, examining the ethical implications of robots as sexual partners, caregivers, and servants. Finally, they explore the possibility that robots, whether biological-computational hybrids or pure machines, should be given rights or moral consideration. Ethics is often slow to catch up with technological developments. This authoritative and accessible volume fills

a gap in both scholarly literature and policy discussion, offering an impressive collection of expert analyses of the most crucial topics in this increasingly important field.

Biologically Inspired Robotics MIT Press This is one of three reports on the study of micro-robots. This document describes the design and construction of a series of small robotic vehicles. The designs incorporate biological inspiration from the cricket. The goal is a micro autonomous legged robot capable of traveling over a variety of terrains. The development of many components needed to build the robot, such as micro-McKibben artificial muscles, micro compressors, and MEMS (micro-electro-mechanical systems) - fabricated valves is also discussed. These components were first used in the design and construction of several prototype sub-systems such as a prototype leg and a simple non-autonomous hybrid vehicle that tests individual components before use in the fully integrated vehicles. From these prototypes two versions of an autonomous vehicle that use a combination of legs and wheels to locomote were developed. Two wheels support the front of the vehicles and two rear legs propel them. The valves distribute air, supplied by the compressor, from the plenum to the actuators on the rear legs. A six-legged non-autonomous vehicle was designed, constructed and tested. It was demonstrated to walk in a tripod gait. A second report (NATICK/TR-05/011) focuses on the investigation of a micro-

joint angle sensor using MEMS Cilia, and a third report (NATICK/TR-05/012) examines micro-robots on abstracted biological principles.

The Robotics Primer Physica

Many aspects of Nature, Biology or even from Society have become part of the techniques and algorithms used in computer science or they have been used to enhance or hybridize several techniques through the inclusion of advanced evolution, cooperation or biologically based additions. The previous NICSO workshops were held in Granada, Spain, 2006, Acireale, Italy, 2007, and in Tenerife, Spain, 2008. As in the previous editions, NICSO 2010, held in Granada, Spain, was conceived as a forum for the latest ideas and the state of the art research related to nature inspired cooperative strategies. The contributions collected in this book cover topics including nature-inspired techniques like Genetic Algorithms, Evolutionary Algorithms, Ant and Bee Colonies, Swarm Intelligence approaches, Neural Networks, several Cooperation Models, Structures and Strategies, Agents Models, Social Interactions, as well as new algorithms based on the behaviour of fireflies or bats.

A Dynamical Systems Approach

Cambridge University Press

The second edition of this handbook provides a state-of-the-art overview on the various aspects in the rapidly developing field of robotics. Reaching for the human frontier, robotics is vigorously engaged in the growing challenges of

new emerging domains. Interacting, exploring, and working with humans, the new generation of robots will increasingly touch people and their lives. The credible prospect of practical robots among humans is the result of the scientific endeavour of a half a century of robotic developments that established robotics as a modern scientific discipline. The ongoing vibrant expansion and strong growth of the field during the last decade has fueled this second edition of the Springer Handbook of Robotics. The first edition of the handbook soon became a landmark in robotics publishing and won the American Association of Publishers PROSE Award for Excellence in Physical Sciences & Mathematics as well as the organization’s Award for Engineering & Technology. The second edition of the handbook, edited by two internationally renowned scientists with the support of an outstanding team of seven part editors and more than 200 authors, continues to be an authoritative reference for robotics researchers, newcomers to the field, and scholars from related disciplines. The contents have been restructured to achieve four main objectives: the enlargement of foundational topics for robotics, the enlightenment of design of various types of robotic systems, the extension of the treatment on robots moving in the environment, and the enrichment of advanced robotics applications. Further to an extensive update, fifteen new chapters have been introduced on emerging topics, and a new generation

of authors have joined the handbook's team. A novel addition to the second edition is a comprehensive collection of multimedia references to more than 700 videos, which bring valuable insight into the contents. The videos can be viewed directly augmented into the text with a smartphone or tablet using a unique and specially designed app. Springer Handbook of Robotics Multimedia Extension Portal: http://handbookofrobotics.org/

Proceedings of the 15th International Conference on Climbing and Walking Robots and the Support Technologies for Mobile Machines, Baltimore, USA, 23-26 July, 2012 MIT Press

Swarm robotics can be defined as the study of how a swarm of relatively simple physically embodied agents can be constructed to collectively accomplish tasks that are beyond the capabilities of a single one. Unlike other studies on multi-robot systems, swarm robotics emphasizes self-organization and emergence, while keeping in mind the issues of scalability and robustness. These emphases promote the use of relatively simple robots, equipped with localized sensing ability, scalable communication mechanisms, and the exploration of decentralized control strategies. This state-of-the-art survey is the first book devoted to swarm robotics. It is based on the First International Workshop on Swarm Robotics held in Santa Monica, CA, USA in July 2004 as part of SAB 2004

Bio-Inspired Robotics Springer

An introduction to the science and

practice of autonomous robots that reviews over 300 current systems and examines the underlying technology.
Towards Autonomous Robotic Systems
BoD – Books on Demand
An authoritative overview of current research in this exciting interdisciplinary field. Evolutionary robotics (ER) aims to apply evolutionary computation techniques to the design of both real and simulated autonomous robots. The Horizons of Evolutionary Robotics offers an authoritative overview of this rapidly developing field, presenting state-of-the-art research by leading scholars. The result is a lively, expansive survey that will be of interest to computer scientists, robotics engineers, neuroscientists, and philosophers. The contributors discuss incorporating principles from neuroscience into ER; dynamical analysis of evolved agents; constructing appropriate evolutionary pathways; spatial cognition; the coevolution of robot brains and bodies; group behavior; the evolution of communication; translating evolved behavior into design principles; the development of an evolutionary robotics–based methodology for shedding light on neural processes; an incremental approach to complex tasks; and the notion of “mindless intelligence”—complex processes from immune systems to social networks—as a way forward for artificial intelligence. Contributors Christos Ampatzis, Randall D. Beer, Josh Bongard, Joachim de Greeff, Ezequiel A. Di Paolo, Marco Dorigo, Dario Floreano, Inman Harvey,

Sabine Hauert, Phil Husbands, Laurent Keller, Michail Maniadakis, Orazio Miglino, Sara Mitri, Renan Moioli, Stefano Nolfi, Michael O'Shea, Rainer W. Paine, Andy Philippides, Jordan B. Pollack, Michela Ponticorvo, Yoon-Sik Shim, Jun Tani, Vito Trianni, Elio Tuci, Patricia A. Vargas, Eric D. Vaughan
Second International Conference of Young Computer Scientists, Engineers and Educators, ICYCSEE 2016, Harbin, China, August 20-22, 2016, Proceedings, Part I MIT Press
This state-of-the-art survey contains selected papers contributed by researchers in intelligent systems, cognitive robotics, and neuroscience including contributions from the MirrorBot project and from the NeuroBotics Workshop 2004. The research work presented demonstrates significant novel developments in biologically inspired neural models for use in intelligent robot environments and biomimetic cognitive behavior.
Autonomous Agents Springer Science & Business Media
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.

Distributed Autonomous Robotic Systems MIT Press

This textbook for advanced undergraduates and graduate students emphasizes algorithms for a range of strategies for locomotion, sensing, and reasoning. It concentrates on wheeled and legged mobile robots but discusses a variety of other propulsion systems. This edition includes advances in robotics and intelligent machines over the ten years prior to publication, including significant coverage of SLAM (simultaneous localization and mapping) and multi-robot systems. It includes additional mathematical background and an extensive list of sample problems. Various mathematical techniques that were assumed in the first edition are now briefly introduced in appendices at the end of the text to make the book more self-contained. Researchers as well as students in the field of mobile robotics will appreciate this comprehensive treatment of state-of-the-art methods and key technologies.

Intelligent Systems, Cognitive Robotics, and Neuroscience SPIE Press

Seeking new methods to satisfy increasing communication demands, researchers continue to find inspiration from the complex systems found in nature. From ant-inspired allocation to a swarm algorithm derived from honeybees, Bio-Inspired Computing and Networking explains how the study of biological systems can significantly improve computing, networki

Essential Principles for Autonomous Robotics Springer

Methods by which robots can learn

control laws that enable real-time reactivity using dynamical systems; with applications and exercises. This book presents a wealth of machine learning techniques to make the control of robots more flexible and safe when interacting with humans. It introduces a set of control laws that enable reactivity using dynamical systems, a widely used method for solving motion-planning problems in robotics. These control approaches can replan in milliseconds to adapt to new environmental constraints and offer safe and compliant control of forces in contact. The techniques offer theoretical advantages, including convergence to a goal, non-penetration of obstacles, and passivity. The coverage of learning begins with low-level control parameters and progresses to higher-level competencies composed of combinations of skills. Learning for Adaptive and Reactive Robot Control is designed for graduate-level courses in robotics, with chapters that proceed from fundamentals to more advanced content. Techniques covered include learning from demonstration, optimization, and reinforcement learning, and using dynamical systems in learning control laws, trajectory planning, and methods for compliant and force control . Features for teaching in each chapter: • applications, which range from arm manipulators to whole-body control of humanoid robots; • pencil-and-paper and programming exercises; • lecture videos, slides, and MATLAB code examples available on the author’s website . • an eTextbook

platform website offering protected material[EPS2] for instructors including solutions.

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