Behavior Based Robotics Intelligent Robotics And Autonomous Agents

This is a comprehensive volume on robot teams that will be the standard reference on multi-robot systems. The volume provides not only the essentials of multi-agent robotics theory but also descriptions of exemplary implemented systems demonstrating the key concepts of multi-robot research. Information is presented in a descriptive manner and augme

Behavior Trees (BTs) provide a way to structure the behavior of an artificial agent such as a robot or a non-player character in a

computer game. Traditional design methods, such as finite state machines, are known to produce brittle behaviors when complexity increases, making it very hard to add features without breaking existing functionality. BTs were created to address this very problem, and enables the creation of systems that are both modular and reactive. Behavior Trees in Robotics and AI: An Introduction provides a broad introduction as well as an in-depth exploration of the topic, and is the first comprehensive book on the use of BTs. This book introduces the subject of BTs from simple topics, such as semantics and design principles, to complex topics, such as learning and task planning. For each topic, the authors provide a set of examples, ranging from simple illustrations to realistic complex behaviors, to enable the reader to successfully combine theory with practice. Starting with an

introduction to BTs, the book then describes how BTs relate to, and in many cases, generalize earlier switching structures, or control architectures. These ideas are then used as a foundation for a set of efficient and easy to use design principles. The book then presents a set of important extensions and provides a set of tools for formally analyzing these extensions using a state space formulation of BTs. With the new analysis tools, the book then formalizes the descriptions of how BTs generalize earlier approaches and shows how BTs can be automatically generated using planning and learning. The final part of the book provides an extended set of tools to capture the behavior of Stochastic BTs, where the outcomes of actions are described by probabilities. These tools enable the computation of both success probabilities and time to completion. This book targets a broad audience,

including both students and professionals interested in modeling complex behaviors for robots, game characters, or other AI agents. Readers can choose at which depth and pace they want to learn the subject, depending on their needs and background. Probablistic robotics is a growing area in the subject, concerned with perception and control in the face of uncertainty and giving robots a level of robustness in real-world situations. This book introduces techniques and algorithms in the field.

Advanced robotics' describes the use of sensor-based robotic devices which exploit powerful computers to achieve the high levels of functionality that begin to mimic intelligent human behaviour. The object of this book is to summarise developments in the base technologies, survey recent applications and highlight new advanced concepts which will influence future progress. I.

Technologies (Recent developments in advanced robotics and intelligent systems; Machine intelligence - architectures, controllers and applications; Advanced control systems for robotic arms; Intelligent gripping systems; Force feedback control in robots applied to decommissioning; Tele-presence control of robots; Sensing and sensor management for planning); II Applications (Robotics in the nuclear industry; Robots in surgery; Intelligent autonomous systems for cars; Walking machine technology; Handling of flexible materials in automation; Robotics in food manufacturing; Robotic milking; Error-free semiconductor wafer handling); III Advanced concepts and procedures (The concept of robot society and its utilisation; Miniature and microrobotics; Characteristics of robot behavior; A behaviour synthesis architecture for co-operant mobile robots; Co-

operant behaviour in multiple manipulators; Neural networks in automation procedures; Parallel processing, neural networks and genetic algorithms for real-time robot control); Index.

Today, autonomous robots are used in a rather limited range of applications such as exploration of inaccessible locations, cleaning floors, mowing lawns etc. However, ongoing hardware improvements (and human fantasy) steadily reveal new robotic applications of significantly higher sophistication. For such applications, the crucial bottleneck in the engineering process tends to shift from physical boundaries to controller generation. As an attempt to automatize this process, Evolutionary Robotics has successfully been used to generate robotic controllers of various types. However, a major challenge of the field remains the evolution of truly complex behavior. Furthermore, automatically

created controllers often lack analyzability which makes them useless for safety-critical applications. In this book, a simple controller model based on Finite State Machines is proposed which allows a straightforward analysis of evolved behaviors. To increase the model's evolvability, a procedure is introduced which, by adapting the genotype-phenotype mapping at runtime, efficiently traverses both the behavioral search space as well as (recursively) the search space of genotype-phenotype mappings. Furthermore, a data-driven mathematical framework is proposed which can be used to calculate the expected success of evolution in complex environments.

An agent is a system capable of perceiving the environment, reasoning with the percepts and then acting upon the world. Agents can be purely software systems, in which case their

percepts and output `actions' are encoded binary strings. However, agents can also be realized in hardware, and then they are robots. The Artificial Intelligence community frequently views robots as embodied intelligent agents. The First International Conference on Autonomous Agents was held in Santa Monica, California, in February 1997. This conference brought together researchers from around the world with interests in agents, whether implemented purely in software or in hardware. The conference featured such topics as intelligent software agents, agents in virtual environments, agents in the entertainment industry, and robotic agents. Papers on robotic agents were selected for this volume. Autonomous Agents will be of interest to researchers and students in the area of artificial intelligence and robotics.

Foreword by Michael Arbib This introduction to the principles, design, and practice of intelligent behavior-based autonomous robotic systems is the first true survey of this robotics field. The author presents the tools and techniques central to the development of this class of systems in a clear and thorough manner. Following a discussion of the relevant biological and psychological models of behavior, he covers the use of knowledge and learning in autonomous robots, behavior-based and hybrid robot architectures, modular perception, robot colonies, and future trends in robot intelligence. The text throughout refers to actual implemented robots and includes many pictures and descriptions of hardware, making it clear that these are not abstract simulations, but real machines capable of perception, cognition, and action.

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.

Robotic Welding, Intelligence and Automation
Behavior-based Robotics
An Experiment in Behavior Engineering
Robot Teams
Introduction to Autonomous Mobile Robots
Developmental Robotics
Multiagent Systems
From AI to Robotics
Intelligent Behavior in Animals and Robots
Intelligent Robotics and Applications
Design, Specification, Analysis, Simulation and Implementation
Robotics Through Science Fiction

Providing a guided tour of the pioneering work and major technical issues, Multiagent Robotic Systems

addresses learning and adaptation in decentralized autonomous robots. Its systematic examination demonstrates the interrelationships between the autonomy of individual robots and the emerged global behavior properties of a group performing a cooperative task. The author also includes descriptions of the essential building blocks of the architecture of autonomous mobile robots with respect to their requirement on local behavioral conditioning and group behavioral evolution. After reading this book you will be able to fully appreciate the strengths and usefulness of various approaches in the development and application of multiagent robotic systems. It

covers: Why and how to develop and experimentally test the computational mechanisms for learning and evolving sensory-motor control behaviors in autonomous robots How to design and develop evolutionary algorithm-based group behavioral learning mechanisms for the optimal emergence of group behaviors How to enable group robots to converge to a finite number of desirable task states through group learning What are the effects of the local learning mechanisms on the emergent global behaviors How to use decentralized, self-organizing autonomous robots to perform cooperative tasks in an unknown environment Earlier works have focused

primarily on how to navigate in a spatially unknown environment, given certain predefined motion behaviors. What is missing, however, is an in-depth look at the important issues on how to effectively obtain such behaviors in group robots and how to enable behavioral learning and adaptation at the group level. Multiagent Robotic Systems examines the key methodological issues and gives you an understanding of the underlying computational models and techniques for multiagent systems.

Robots in groups or colonies can exhibit an enormous variety and richness of behaviors which cannot be observed with singly autonomous systems. Of course,

this is analogous to the amazing variety of group animal behaviors which can be observed in nature. In recent years more and more investigators have started to study these behaviors. The studies range from classifications and taxonomies of behaviors, to development of architectures which cause such group activities as flocking or swarming, and from emphasis on the role of intelligent agents in such groups to studies of learning and obstacle avoidance. There used to be a time when many robotics researchers would question those who were interested in working with teams of robots: `Why are you worried about robotic teams when it's hard enough to just get one to work?'.

This issue responds to that question. Robot Colonies provides a new approach to task problem-solving that is similar in many ways to distributed computing. Multiagent robotic teams offer the possibility of spatially distributed parallel and concurrent perception and action. A paradigm shift results when using multiple robots, providing a different perspective on how to carry out complex tasks. New issues such as interagent communications, spatial task distribution, heterogeneous or homogeneous societies, and interference management are now central to achieving coordinated and productive activity within a colony. Fortunately mobile robot hardware has evolved

sufficiently in terms of both cost and robustness to enable these issues to be studied on actual robots and not merely in simulation. Robot Colonies presents a sampling of the research in this field. While capturing a reasonable representation of the most important work within this area, its objective is not to be a comprehensive survey, but rather to stimulate new research by exposing readers to the principles of robot group behaviors, architectures and theories. Robot Colonies is an edited volume of peer-reviewed original research comprising eight invited contributions by leading researchers. This research work has also been published as a special issue of Autonomous Robots

(Volume 4, Number 1).
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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 International 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 the world.

This book highlights selected papers presented at the 2nd International Symposium on Artificial Intelligence

and Robotics 2017 (ISAIR2017), held in Nakamura Centenary Memorial Hall, Kitakyushu, Japan on November 25–26, 2017. Today, the integration of artificial intelligence and robotic technologies has become a topic of growing interest for both researchers and developers from academic fields and industries worldwide, and artificial intelligence is poised to become the main approach pursued in next-generation robotics research. The rapidly growing number of artificial intelligence algorithms and big data solutions has significantly extended the number of potential applications for robotic technologies. However, it also poses new challenges for the artificial

intelligence community. The aim of this symposium is to provide a platform for young researchers to share the latest scientific achievements in this field, which are discussed in these proceedings.

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.

Gain a gentle introduction to the world of Artificial Intelligence (AI) using the Raspberry Pi as the computing platform. Most of the major AI topics will be explored, including expert systems, machine learning both shallow and deep, fuzzy logic control,

and more! AI in action will be demonstrated using the Python language on the Raspberry Pi. The Prolog language will also be introduced and used to demonstrate fundamental AI concepts. In addition, the Wolfram language will be used as part of the deep machine learning demonstrations. A series of projects will walk you through how to implement AI concepts with the Raspberry Pi. Minimal expense is needed for the projects as only a few sensors and actuators will be required. Beginners and hobbyists can jump right in to creating AI projects with the Raspberry PI using this book. What You'll Learn What AI is and—as importantly—what it is not Inference and expert

systems Machine learning both shallow and deep Fuzzy logic and how to apply to an actual control system When AI might be appropriate to include in a system Constraints and limitations of the Raspberry Pi AI implementation Who This Book Is For Hobbyists, makers, engineers involved in designing autonomous systems and wanting to gain an education in fundamental AI concepts, and non-technical readers who want to understand what AI is and how it might affect their lives.

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.

Robot Behaviour

Robot Programming

A Practical Guide to Behavior-Based Robotics

Artificial Intelligence Explained Through Six Classic Robot Short Stories

Intelligent Planning for Mobile Robotics: Algorithmic Approaches

From Babies to Robots

Algorithmic Approaches

Bio-Inspired Artificial Intelligence

Mobile, Social, and Sentient Robots

Vehicles
Complex Behavior in Evolutionary Robotics
Governing Lethal Behavior in Autonomous Robots

This research report brings together present trends in advanced welding robots, robotic welding, artificial intelligent and automatic welding. It includes important technical subjects on welding robots such as intelligent technologies and systems, and design and analysis. Modeling, identification and control of the welding process are presented, as well as knowledge-based systems for welding and tele-robotic welding. Other topics covered are sensing and data fusion, computer vision and virtual-reality applications of the

welding process. An overview of intelligent and flexible manufacturing systems is given in addition to artificial intelligent technologies for industrial processes.
Robots have evolved impressively since the 3-D manipulator built by C.W. K- ward (1957), the two little electromechanical turtles Elmer and Elsie [Walter, 1950, Walter, 1951], and the ?rst mobile robots controlled by comp- ers, Shakey [Nilsson, 1984], CART [Moravec, 1979, Moravec, 1983], and - lare [Giralt et al., 1979]. Since then, we have seen industrial robot manipu- tors working in car factories, automatic guided vehicles moving heavy loads along pre-de?ned routes, human-remotely-operated robots neutralising bombs, and

even semi-autonomous robots, like Sojourner, going to Mars and moving from one position to another commanded from Earth. Robots will go further and further in our society. However, there is still a kind of robot that has not completely taken off so far: autonomous robots. Autonomy depends upon working without human supervision for a considerable amount of time, taking independent decisions, adapting to new challenges in dynamic environments, interacting with other systems and humans, and so on. Research on autonomy is highly motivated by the expectations of having robots that can work with us and for us in everyday environments, assisting us at home or work,

acting as servants and companions to help us in the execution of different tasks, so that we can have more spare time and a better quality of life.

The refereed proceedings of the 10th International Fuzzy Systems Association World Congress, IFSA 2003, held in June/July 2003 in Istanbul, Turkey. The 84 papers presented together with 5 invited papers were carefully reviewed and selected form 318 submissions. The papers address all current issues in the area and present the state of the art in fuzzy sets, fuzzy systems, and fuzzy logic and their applications in a broad variety of fields. The papers are divided in four parts on mathematical issues, methodological issues,

application areas, and cross-disciplinary issues.
1. What is a robot? 2. Where do robots come from? 3. What's in a robot? 4. Arms, legs, wheels, tracks, and really drives them 5. Move it! 6. Grasping at straws 7. What's going on? 8. Switch on ghe light 9. Sonars, lasers, and cameras 10. Stay in control 11. The building bolcks of control 12. What's in your head? 13. Think hard, act later 14. Don't think, react! 15. Think and act separately, in parallel 16. Think the way you act 17. Making your robot behave 18. When the unexpected happens 19. Going places 20. Go, team! 21. Things keep getting better 22. Where to next?
Six classic science fiction stories and commentary that

illustrate and explain key algorithms or principles of artificial intelligence. This book presents six classic science fiction stories and commentary that illustrate and explain key algorithms or principles of artificial intelligence. Even though all the stories were originally published before 1973, they help readers grapple with two questions that stir debate even today: how are intelligent robots programmed? and what are the limits of autonomous robots? The stories—by Isaac Asimov, Vernor Vinge, Brian Aldiss, and Philip K. Dick—cover telepresence, behavior-based robotics, deliberation, testing, human-robot interaction, the "uncanny valley," natural language understanding, machine

learning, and ethics. Each story is preceded by an introductory note, " As You Read the Story, " and followed by a discussion of its implications, " After You Have Read the Story. " Together with the commentary, the stories offer a nontechnical introduction to robotics. The stories can also be considered as a set of—admittedly fanciful—case studies to be read in conjunction with more serious study. Contents " Stranger in Paradise " by Isaac Asimov, 1973 " Runaround " by Isaac Asimov, 1942 " Long Shot " by Vernor Vinge, 1972 " Catch That Rabbit " by Isaac Asimov, 1944 " Super-Toys Last All Summer Long " by Brian Aldiss, 1969 " Second Variety " by Philip K. Dick,

1953

The "vehicles" described in this light-hearted yet wonderfully skillful exercise in fictional science are the inventions of one of the world's eminent brain researchers.

foreword by Lashon Booker To program an autonomous robot to act reliably in a dynamic environment is a complex task. The dynamics of the environment are unpredictable, and the robots' sensors provide noisy input. A learning autonomous robot, one that can acquire knowledge through interaction with its environment and then adapt its behavior, greatly simplifies the designer's work. A learning robot need

not be given all of the details of its environment, and its sensors and actuators need not be finely tuned. Robot Shaping is about designing and building learning autonomous robots. The term "shaping" comes from experimental psychology, where it describes the incremental training of animals. The authors propose a new engineering discipline, "behavior engineering," to provide the methodologies and tools for creating autonomous robots. Their techniques are based on classifier systems, a reinforcement learning architecture originated by John Holland, to which they have added several new ideas, such as "mutespec," classifier system "energy,"and dynamic population size. In the book they

present Behavior Analysis and Training (BAT) as an example of a behavior engineering methodology. In this book, we have set up a unified analytical framework for various human-robot systems, which involve peer-peer interactions (either space-sharing or time-sharing) or hierarchical interactions. A methodology in designing the robot behavior through control, planning, decision and learning is proposed. In particular, the following topics are discussed in-depth: safety during human-robot interactions, efficiency in real-time robot motion planning, imitation of human behaviors from demonstration, dexterity of robots to adapt to different environments and tasks, cooperation

among robots and humans with conflict resolution. These methods are applied in various scenarios, such as human-robot collaborative assembly, robot skill learning from human demonstration, interaction between autonomous and human-driven vehicles, etc. Key Features: Proposes a unified framework to model and analyze human-robot interactions under different modes of interactions. Systematically discusses the control, decision and learning algorithms to enable robots to interact safely with humans in a variety of applications. Presents numerous experimental studies with both industrial collaborative robot arms and autonomous vehicles.

Robot Colonies
The Ethical and Social Implications of Robotics
Multiagent Robotic Systems
Experiments in Synthetic Psychology
The Biology, Intelligence, and Technology of Self-Organizing Machines
The Robotics Primer
Understanding Intelligence
10th International Fuzzy Systems Association World Congress, Istanbul, Turkey, June 30 - July 2, 2003, Proceedings
Robot Ethics
From Diversity to Polymorphism

An Introduction

Robot Shaping

*** Teaches the concepts of behavior-based programming through text, programming examples, and a unique online simulator robot * Explains how to design new behaviors by manipulating old ones and adjusting programming * Does not assume reader familiarity with robotics or programming languages * Includes a section on designing your own behavior-based system from scratch An introduction to the science and practice of autonomous robots that reviews over 300 current systems and examines the underlying**

technology. Autonomous robots are intelligent machines capable of performing tasks in the world by themselves, without explicit human control. Examples range from autonomous helicopters to Roomba, the robot vacuum cleaner. In this book, George Bekey offers an introduction to the science and practice of autonomous robots that can be used both in the classroom and as a reference for industry professionals. He surveys the hardware implementations of more than 300 current systems, reviews some of their application areas, and examines the underlying technology, including control, architectures,

learning, manipulation, grasping, navigation, and mapping. Living systems can be considered the prototypes of autonomous systems, and Bekey explores the biological inspiration that forms the basis of many recent developments in robotics. He also discusses robot control issues and the design of control architectures. After an overview of the field that introduces some of its fundamental concepts, the book presents background material on hardware, control (from both biological and engineering perspectives), software architecture, and robot intelligence. It then examines a broad

range of implementations and applications, including locomotion (wheeled, legged, flying, swimming, and crawling robots), manipulation (both arms and hands), localization, navigation, and mapping. The many case studies and specific applications include robots built for research, industry, and the military, among them underwater robotic vehicles, walking machines with four, six, and eight legs, and the famous humanoid robots Cog, Kismet, ASIMO, and QRIO. The book concludes with reflections on the future of robotics—the potential benefits as well as the possible dangers that may arise from

large numbers of increasingly intelligent and autonomous robots.

From AI to Robotics: Mobile, Social, and Sentient Robots is a journey into the world of agent-based robotics and it covers a number of interesting topics, both in the theory and practice of the discipline. The book traces the earliest ideas for autonomous machines to the mythical lore of ancient Greece and ends the last chapter with a debate on a prophecy set in the apparent future, where human beings and robots/technology may merge to create superior beings – the era of transhumanism.

Throughout the text, the work of leading researchers is presented in depth, which helps to paint the socio-economic picture of how robots are transforming our world and will continue to do so. This work is presented along with the influences and ideas from futurists, such as Asimov, Moravec, Lem, Vinge, and of course Kurzweil. The book furthers the discussion with concepts of Artificial Intelligence and how it manifests in robotic agents. Discussions across various topics are presented in the book, including control paradigm, navigation, software, multi-robot systems, swarm robotics, robots in

social roles, and artificial consciousness in robots. These discussions help to provide an overall picture of current day agent- based robotics and its prospects for the future. Examples of software and implementation in hardware are covered in Chapter 5 to encourage the imagination and creativity of budding robot enthusiasts. The book addresses several broad themes, such as AI in theory versus applied AI for robots, concepts of anthropomorphism, embodiment and situatedness, extending theory of psychology and animal behavior to robots, and the proposal that in the future, AI may be the

new definition of science. Behavior-based robotics is covered in Chapter 2 and retells the debate between deliberative and reactive approaches. The text reiterates that the effort of modern day robotics is to replicate human-like intelligence and behavior, and the tools that a roboticist has at his or her disposal are open source software, which is often powered by crowd-sourcing. Open source meta-projects, such as Robot Operating System (ROS), etc. are briefly discussed in Chapter 5. The ideas and themes presented in the book are supplemented with cartoons, images, schematics and a number of special sections

to make the material engaging for the reader. Designed for robot enthusiasts – researchers, students, or the hobbyist, this comprehensive book will entertain and inspire anyone interested in the exciting world of robots. Expounding on the results of the author's work with the US Army Research Office, DARPA, the Office of Naval Research, and various defense industry contractors, Governing Lethal Behavior in Autonomous Robots 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. The

author examines the philosophical basis, motivation, theory, and design recommendations for the implementation of an ethical control and reasoning system in autonomous robot systems, taking into account the Laws of War and Rules of Engagement. The book presents robot architectural design recommendations for Post facto suppression of unethical behavior, Behavioral design that incorporates ethical constraints from the onset, The use of affective functions as an adaptive component in the event of unethical action, and A mechanism that identifies and advises operators regarding their ultimate

responsibility for the deployment of autonomous systems. It also examines why soldiers fail in battle regarding ethical decisions; discusses the opinions of the public, researchers, policymakers, and military personnel on the use of lethality by autonomous systems; provides examples that illustrate autonomous systems' ethical use of force; and includes relevant Laws of War. Helping ensure that warfare is conducted justly with the advent of autonomous robots, this book shows that the first steps toward creating robots that not only conform to international law but outperform human

soldiers in their ethical capacity are within reach in the future. It supplies the motivation, philosophy, formalisms, representational requirements, architectural design criteria, recommendations, and test scenarios to design and construct an autonomous robotic system capable of ethically using lethal force. Ron Arkin was quoted in a November 2010 New York Times article about robots in the military.

In recent years, robots have been built based on cognitive architecture which has been developed to model human cognitive ability. The cognitive architecture can be a basis for

intelligence technology to generate robot intelligence. In this edited book the robot intelligence is classified into six categories: cognitive intelligence, social intelligence, behavioral intelligence, ambient intelligence, collective intelligence and genetic intelligence. This classification categorizes the intelligence of robots based on the different aspects of awareness and the ability to act deliberately as a result of such awareness. This book aims at serving researchers and practitioners with a timely dissemination of the recent progress on robot intelligence technology and its applications,

based on a collection of papers presented at the 1st International Conference on Robot Intelligence Technology and Applications (RiTA), held in Gwangju, Korea, December 16-18, 2012. For a better readability, this edition has the total 101 papers grouped into 3 chapters: Chapter I: Cognitive Intelligence, Social Intelligence and Behavioral Intelligence, Chapter II: Ambient Intelligence, Collective Intelligence and Genetic Intelligence, Chapter III: Intelligent Robot Technologies and Applications.

Artificial Intelligence in Behavioral and

Mental Health Care summarizes recent advances in artificial intelligence as it applies to mental health clinical practice. Each chapter provides a technical description of the advance, review of application in clinical practice, and empirical data on clinical efficacy. In addition, each chapter includes a discussion of practical issues in clinical settings, ethical considerations, and limitations of use. The book encompasses AI based advances in decision-making, in assessment and treatment, in providing education to clients, robot assisted task completion, and the use of AI for research

and data gathering. This book will be of use to mental health practitioners interested in learning about, or incorporating AI advances into their practice and for researchers interested in a comprehensive review of these advances in one source. Summarizes AI advances for use in mental health practice Includes advances in AI based decision-making and consultation Describes AI applications for assessment and treatment Details AI advances in robots for clinical settings Provides empirical data on clinical efficacy Explores practical issues of use in clinical settings

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.

Robotics is an ever-expanding field and intelligent planning continues to play a major role. Given that the intention of mobile robots is to carry out tasks independent from human aid, robot intelligence is needed to make and plan out

decisions based on various sensors. Planning is the fundamental activity that implements this intelligence into the mobile robots to complete such tasks. Understanding problems, challenges, and solutions to path planning and how it fits in is important to the realm of robotics. Intelligent Planning for Mobile Robotics: Algorithmic Approaches presents content coverage on the basics of artificial intelligence, search problems, and soft computing approaches. This collection of research provides insight on both robotics and basic algorithms and could serve as a reference book for courses related to

robotics, special topics in AI, planning, applied soft computing, applied AI, and applied evolutionary computing. It is an ideal choice for research students, scholars, and professors alike.

An Edition of the Presented Papers from the 1st International Conference on Robot Intelligence Technology and Applications

Advanced Robotics & Intelligent Machines

Designing Robot Behavior in Human-Robot Interactions

Introduction to AI Robotics

Theories, Methods, and Technologies

Second International Conference, ICIRA 2009,

Singapore, December 16-18, 2009, Proceedings
Autonomous Agents
Design, Description, Analysis and Modelling
Probabilistic Robotics
Essential Principles for Autonomous Robotics
Artificial Intelligence in Behavioral and Mental Health Care
Autonomous Robots

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 Intelligence takes many forms. This exciting study explores the novel insight, basedon well-established ethological principles, that

animals, humans, and autonomous robots can all beanalyzed as multi-task autonomous control systems. Biological adaptive systems, the authors argue,can in fact provide a better understanding of intelligence and rationality than that provided bytraditional AI.In this technically sophisticated, clearly written investigation of robot-animalanalogies, McFarland and Bösser show that a bee's accuracy in navigating on a cloudy day and amoth's simple but effective hearing mechanisms have as much to teach us about

intelligent behavioras human models. In defining intelligent behavior, what matters is the behavioral outcome, not thenature of the mechanism by which the outcome is achieved. Similarly, in designing robots capable ofintelligent behavior, what matters is the behavioral outcome.McFarland and Bösser address theproblem of how to assess the consequences of robot behavior in a way that is meaningful in terms ofthe robot's intended role, comparing animal and robot in relation to rational behavior, goalseeking, task

accomplishment, learning, and other important theoretical issues.David McFarland isReader in Animal Behaviour at the University of Oxford. Thomas Bösser is Head of the Man MachineResearch Group at Westfälische Wilhelms Universität, in Münster, and a partner in the consultingfirm Advanced Concepts.

This book takes the vocal and visual modalities and human-robot interaction applications into account by considering three main aspects, namely, social and

affective robotics, robot navigation, and risk event recognition. This book can be a very good starting point for the scientists who are about to start their research work in the field of human-robot interaction.

The book includes all the background material required to understand the principles underlying intelligence, as well as enough detailed information on intelligent robotics and simulated agents so readers can begin experiments and projects on their own. By the mid-1980s researchers from artificial

intelligence, computer science, brain and cognitive science, and psychology realized that the idea of computers as intelligent machines was inappropriate. The brain does not run "programs"; it does something entirely different. But what? Evolutionary theory says that the brain has evolved not to do mathematical proofs but to control our behavior, to ensure our survival. Researchers now agree that intelligence always manifests itself in behavior—thus it is behavior that we must understand. An exciting new field has

grown around the study of behavior-based intelligence, also known as embodied cognitive science, "new AI," and "behavior-based AI." This book provides a systematic introduction to this new way of thinking. After discussing concepts and approaches such as subsumption architecture, Braitenberg vehicles, evolutionary robotics, artificial life, self-organization, and learning, the authors derive a set of principles and a coherent framework for the study of naturally and artificially intelligent systems, or

autonomous agents. This framework is based on a synthetic methodology whose goal is understanding by designing and building. The book includes all the background material required to understand the principles underlying intelligence, as well as enough detailed information on intelligent robotics and simulated agents so readers can begin experiments and projects on their own. The reader is guided through a series of case studies that illustrate the design principles of embodied cognitive science.

This is the first comprehensive introduction to multiagent systems and contemporary distributed artificial intelligence that is suitable as a textbook.

A comprehensive survey of artificial intelligence algorithms and programming organization for robot systems, combining theoretical rigor and practical applications.

This textbook offers a comprehensive survey of artificial intelligence (AI) algorithms and programming organization for robot systems. Readers who master the topics covered will be

able to design and evaluate an artificially intelligent robot for applications involving sensing, acting, planning, and learning. A background in AI is not required; the book introduces key AI topics from all AI subdisciplines throughout the book and explains how they contribute to autonomous capabilities. This second edition is a major expansion and reorganization of the first edition, reflecting the dramatic advances made in AI over the past fifteen years. An introductory overview provides a framework

for thinking about AI for robotics, distinguishing between the fundamentally different design paradigms of automation and autonomy. The book then discusses the reactive functionality of sensing and acting in AI robotics; introduces the deliberative functions most often associated with intelligence and the capability of autonomous initiative; surveys multi-robot systems and (in a new chapter) human-robot interaction; and offers a "metaview" of how to design and evaluate autonomous systems and the ethical

considerations in doing so. New material covers locomotion, simultaneous localization and mapping, human-robot interaction, machine learning, and ethics. Each chapter includes exercises, and many chapters provide case studies. Endnotes point to additional reading, highlight advanced topics, and offer robot trivia.

Human-Robot Interaction

Fuzzy Sets and Systems - IFSA 2003

Evolutionary Robotics

From Biological Inspiration to

Implementation and Control
Theory and Application
Dynamic Approach to Behavior Based Robotics
Behavior Trees in Robotics and AI
Robot Intelligence Technology and Applications 2012
Artificial Intelligence and Robotics
Beginning Artificial Intelligence with the Raspberry Pi