OMB No. 6402079336278

Autonomous Mobile Robots

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Autonomous Mobile Robots ***OMB No. 6402079336278 edited by***

SANTOS CERVANTES

Autonomous Mobile Robots: Perception, mapping, and navigation

Springer Science & Business Media
The 33rd Annual German Conference on Arti?cial Intelligence (KI 2010) took place at the Karlsruhe Institute of Technology KIT, September 21–24, 2010, under the motto “Anthropomatic Systems.” In this volume you will ?nd the keynote paper and 49 papers of oral and poster presentations. The papers were selected from 73 submissions, resulting in an acceptance rate of 67%. As usual at the KI conferences, two entire days were allocated for targeted workshops—seventhis year—andone tutorial. The workshopand tutorialma- rials are not contained in this volume, but the conference website, www.ki2010.kit.edu,will provide information and references to their contents. Recent trends in AI research have been focusing on anthropomatic systems, which address synergies between humans and intelligent machines. This trend is emphasized through the topics of the overall conference program. They include learning systems, cognition, robotics, perception and action, knowledge rep- sentation and reasoning, and planning and decision making. Many topics deal with uncertainty in various scenarios and incompleteness of knowledge. Summarizing, KI 2010 provides a cross section of recent research in modern AI methods and anthropomatic system applications. We are very grateful that Jos´ edel Mill´ an, Hans-Hellmut Nagel, Carl Edward Rasmussen, and David Vernon accepted our invitation to give a talk.
Build Autonomous Mobile Robot from Scratch using ROS Springer Science & Business Media
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.

Mobile Robotics

Introduction to Autonomous Mobile Robots, second edition
How do we accomplish our long range Autonomous Mobile Robots goals? How do we manage Autonomous Mobile Robots Knowledge Management (KM)? Who is the Autonomous Mobile Robots process owner? How do you manage and improve your Autonomous Mobile Robots work systems to deliver customer value and achieve organizational success and sustainability? Does Autonomous Mobile Robots analysis show the relationships among important Autonomous Mobile Robots factors? Defining, designing, creating, and implementing a process to solve a challenge or meet an objective is the most valuable role... In EVERY group, company, organization and department. Unless you are talking a one-time, single-use project, there should be a process. Whether that process is managed and implemented by humans, AI, or a combination of the two, it needs to be designed by someone with a complex enough perspective to ask the right questions. Someone capable of asking the right questions and step back and say, 'What are we really trying to accomplish here? And is there a different way to look at it?' This Self-Assessment empowers people to do just that - whether their title is entrepreneur, manager, consultant, (Vice-)President, CxO etc... - they are the people who rule the future. They are the person who asks the right questions to make Autonomous Mobile Robots investments work better. This Autonomous Mobile Robots All-Inclusive Self-Assessment enables You to be that person. All the tools you need to an in-depth Autonomous Mobile Robots Self-Assessment. Featuring 677 new and updated case-based questions, organized into seven core areas of process design, this Self-Assessment will help you identify areas in which Autonomous Mobile Robots improvements can be made. In using the questions you will be better able to: - diagnose Autonomous Mobile Robots projects, initiatives, organizations, businesses and processes using accepted diagnostic standards and practices - implement evidence-based best practice strategies aligned with overall goals - integrate recent advances in Autonomous Mobile Robots and process design strategies into practice according to best practice guidelines Using a Self-Assessment tool known as the Autonomous Mobile Robots Scorecard, you will develop a clear picture of which Autonomous Mobile Robots areas need attention. Your purchase includes access details to the Autonomous Mobile Robots self-assessment dashboard download which gives you your dynamically prioritized projects-ready tool and shows your organization exactly what to do next. You will receive the following contents with New and Updated specific criteria: - The latest quick edition of the book in PDF - The latest complete edition of the book in PDF, which criteria correspond to the criteria in... - The Self-Assessment Excel Dashboard, and... - Example pre-filled Self-Assessment Excel Dashboard to get familiar with results generation ...plus an extra, special, resource that helps you with project managing. INCLUDES LIFETIME SELF ASSESSMENT UPDATES Every self assessment comes with Lifetime Updates and Lifetime Free Updated Books. Lifetime Updates is an industry-first feature which allows you to receive verified self assessment updates, ensuring you always have the most accurate information at your fingertips.
Mobile Robots Springer Science & Business Media
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.

Springer Science & Business Media
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.

Mobile Robots

5starcooks
This book presents a unique examination of mobile robots and embedded systems, from introductory to intermediate level. It is structured in three parts, dealing with Embedded Systems (hardware and software design, actuators, sensors, PID control, multitasking), Mobile Robot Design (driving, balancing, walking, and flying robots), and Mobile Robot Applications (mapping, robot soccer, genetic algorithms, neural networks, behavior-based systems, and simulation). The book is written as a text for courses in computer science, computer engineering, IT, electronic engineering, and mechatronics, as well as a guide for robot hobbyists and researchers.
Autonomous mobile robots. 2. Control, planning, and architecture IEEE Computer Society
It has long been the goal of engineers to develop tools that enhance our ability to do work, increase our quality of life, or perform tasks that are either beyond our ability, too hazardous, or too tedious to be left to human efforts. Autonomous mobile robots are the culmination of decades of research and development, and their potential is seemingly unlimited. Roadmap to the Future Serving as the first comprehensive reference on this interdisciplinary technology, Autonomous Mobile Robots: Sensing, Control, Decision Making, and Applications authoritatively addresses the theoretical, technical, and practical aspects of the field. The book examines in detail the key components that form an autonomous mobile robot, from sensors and sensor fusion to modeling and control, map building and path planning, and decision making and autonomy, and to the final integration of these components for diversified applications. Trusted Guidance A duo of accomplished experts leads a team of renowned international researchers and professionals who provide detailed technical reviews and the latest solutions to a variety of important problems. They share hard-won insight into the practical implementation and integration issues involved in developing autonomous and open

robotic systems, along with in-depth examples, current and future applications, and extensive illustrations. For anyone involved in researching, designing, or deploying autonomous robotic systems, Autonomous Mobile Robots is the perfect resource.

Embedded Robotics CRC Press

The study of what can be computed by a team of autonomous mobile robots, originally started in robotics and AI, has become increasingly popular in theoretical computer science (especially in distributed computing), where it is now an integral part of the investigations on computability by mobile entities. The robots are identical computational entities located and able to move in a spatial universe; they operate without explicit communication and are usually unable to remember the past; they are extremely simple, with limited resources, and individually quite weak. However, collectively the robots are capable of performing complex tasks, and form a system with desirable fault-tolerant and self-stabilizing properties. The research has been concerned with the computational aspects of such systems. In particular, the focus has been on the minimal capabilities that the robots should have in order to solve a problem. This book focuses on the recent algorithmic results in the field of distributed computing by oblivious mobile robots (unable to remember the past). After introducing the computational model with its nuances, we focus on basic coordination problems: pattern formation, gathering, scattering, leader election, as well as on dynamic tasks such as flocking. For each of these problems, we provide a snapshot of the state of the art, reviewing the existing algorithmic results. In doing so, we outline solution techniques, and we analyze the impact of the different assumptions on the robots' computability power. Table of Contents: Introduction / Computational Models / Gathering and Convergence / Pattern Formation / Scatterings and Coverings / Flocking / Other Directions

Robot Vision CRC Press

Designing Autonomous Mobile Robots introduces the reader to the fundamental concepts of this complex field. The author addresses all the pertinent topics of the electronic hardware and software of mobile robot design, with particular emphasis on the more difficult problems of control, navigation, and sensor interfacing. Covering topics such as advanced sensor fusion, control systems for a wide array of application sensors and instrumentation, and fuzzy logic applications, this volume is essential reading for engineers undertaking robotics projects as well as undergraduate and graduate students studying robotic engineering, artificial intelligence, and cognitive science. Its state-of-the-art treatment of core concepts in mobile robotics helps and challenges readers in exploring new avenues in an exciting field. Authored by a well-known pioneer of mobile robotics Learn how to approach the design of and complex control system with confidence

Computational Principles of Mobile Robotics Springer

In recent years, autonomous robots, including Xavier, Martha [1], Rhino [2,3], Minerva,and Remote Agent, have shown impressive performance in long-term demonstrations. In NASA’s Deep Space program, for example, an - tonomous spacecraft controller, called the Remote Agent [5], has autonomously performed a scienti?c experiment in space. At Carnegie Mellon University, Xavier [6], another autonomous mobile robot, navigated through an o?ce - vironment for more than a year, allowing people to issue navigation commands and monitor their execution via the Internet. In 1998, Minerva [7] acted for 13 days as a museum tourguide in the Smithsonian Museum, and led several thousand people through an exhibition. These autonomous robots have in common that they rely on plan-based c- trol in order to achieve better problem-solving competence. In the plan-based approach, robots generate control actions by maintaining and executing a plan that is e?ective and has a high expected utility with respect to the robots’ c- rent goals and beliefs. Plans are robot control programs that a robot can not only execute but also reason about and manipulate [4]. Thus, a plan-based c- troller is able to manage and adapt the robot’s intended course of action — the plan — while executing it and can thereby better achieve complex and changing tasks.

KI 2010: Advances in Artificial Intelligence

CRC Press

As research progresses, it enables multi-robot systems to be used in more and more complex and dynamic scenarios. Hence, the question arises how different modelling and reasoning paradigms can be utilised to describe the intended behaviour of a team and execute it in a robust and adaptive manner. Hendrik Skubch presents a solution, ALICA (A Language for Interactive Cooperative Agents) which combines modelling techniques drawn from different paradigms in an integrative fashion. Hierarchies of finite state machines are used to structure the behaviour of the team such that temporal and causal relationships can be expressed. Utility functions weigh different options against each other and assign agents to different tasks. Finally, non-linear constraint satisfaction and optimisation problems are integrated, allowing for complex cooperative behaviour to be specified in a concise, theoretically well-founded manner.

Autonomous Mobile Robots in Unknown Outdoor Environments CRC Press

It is at least two decades since the conventional robotic manipulators have become a common manufacturing tool for different industries, from automotive to pharmaceutical. The proven benefits of utilizing robotic manipulators for manufacturing in different industries motivated scientists and researchers to try to extend the applications of robots to many other areas by inventing several new types of robots other than conventional manipulators. The new types of robots can be categorized in two groups; redundant (and hyper-redundant) manipulators, and mobile (ground, marine, and aerial) robots. These groups of robots, known as advanced robots, have more freedom for their mobility, which allows them to do tasks that the conventional manipulators cannot do. Engineers have taken advantage of the extra mobility of the advanced robots to make them work in constrained environments, ranging from limited joint motions for redundant (or hyper-redundant) manipulators to obstacles in the way of mobile (ground, marine, and aerial) robots. Since these constraints usually depend on the work environment, they are variable. Engineers have had to invent methods to allow the robots to deal with a variety of constraints automatically. A robot that is equipped with those methods is called an Autonomous Robot. Autonomous Robots: Kinematics, Path Planning, and Control covers the kinematics and dynamic modeling/analysis of Autonomous Robots, as well as the methods suitable for their control. The text is suitable for mechanical and electrical engineers who want to familiarize themselves with methods of modeling/analysis/control that have been proven efficient through research.

Feature-Based Localization in Sonar-Equipped Autonomous Mobile Robots Through Hough Transform and Unsupervised Learning Network Institute of Electrical & Electronics Engineers(IEEE)

This monograph is devoted to the theory and development of autonomous navigation of mobile robots using computer vision based sensing mechanism. The conventional robot navigation systems, utilizing traditional sensors like ultrasonic, IR, GPS, laser sensors etc., suffer several drawbacks related to either the physical limitations of the sensor or incur high cost. Vision sensing has emerged as a popular alternative where cameras can be used to reduce the overall cost, maintaining high degree of intelligence, flexibility and robustness. This book includes a detailed description of several new approaches for real life vision based autonomous navigation algorithms and SLAM. It presents the concept of how subgoal based goal-driven navigation can be carried out using vision sensing. The development concept of vision based robots for path/line tracking using fuzzy logic is presented, as well as how a low-cost robot can be indigenously developed in the laboratory with microcontroller based sensor systems. The book describes successful implementation of integration of low-cost, external peripherals, with off-the-shelf procured robots. An important highlight of the book is that it presents a detailed, step-by-step sample demonstration of how vision-based navigation modules can be actually implemented in real life, under 32-bit Windows environment. The book also discusses the concept of implementing vision based SLAM employing a two camera based system.

Autonomous Mobile Robots the Ultimate Step-By-Step Guide John Wiley & Sons

This book consists of 18 chapters divided in four sections: Robots for Educational Purposes, Health-Care and Medical Robots, Hardware - State of the Art, and Localization and Navigation. In the first section, there are four chapters covering autonomous mobile robot Emmy III, KCLBOT - mobile nonholonomic robot, and general overview of educational mobile robots. In the second section, the following themes are covered: walking support robots, control system for wheelchairs, leg-wheel mechanism as a mobile platform, micro mobile robot for abdominal use, and the influence of the robot size in the psychological treatment. In the third section, there are chapters about I2C bus system, vertical displacement service robots, quadruped robots - kinematics and dynamics model and Epi.q (hybrid) robots. Finally, in the last section, the following topics are covered: skid-steered vehicles, robotic exploration (new place recognition), omnidirectional mobile robots, ball-wheel mobile robots, and planetary wheeled mobile robots.

Introduction to Autonomous Mobile Robots, second edition MIT Press

This volume is a collection of 22 papers presented at the International Workshop on Information Processing in Autonomous Mobile Robots, held in Munich (Germany) in March 1991. Autonomous mobile robot technologies are generating significant interest because of their potential capabilities for future applications on the plant floor as weil as in the service industry. Autonomous robots may navigate around factories and laboratories, hospitals, office-buildings, airports or sirnilar public and sernipublic places. They may deliver equipment, coilect garbage and perform other such tasks. One of the major challenges for the field of autonomous mobile robot research is to develop robust and real-time systerns for perception and understanding of complicated real environments as weil as for intelligent decision-making with respect to proper actions. This Workshop was set up to stimulate discussion and the exchangement of new ideas on various aspects of autonomous mobile robot methodologies and applications. The main focal points of the Workshop program were sensing and perception, navigation and control, knowledge bases and computer architechtures as weil as various applications. The papers are prepared by leading experts in theses areas from Europe, Japan, the United States and by researchers involved in the interdisciplinary research project on "Information Processing in Autonomous Mobile Robots (Sonderforschungsbereich 331)" at the Technische Universität München.

Autonomous Mobile Robots Cambridge University Press

Mobile robots have been increasingly applied in many different scenarios, such as space exploration and search and rescue, where the robots are required to travel over uneven terrain while outdoors. This book provides a new framework and the related algorithms for designing autonomous mobile robotic systems in such unknown outdoor environments.

Introduction to Autonomous Robots Elsevier

The economic potential of autonomous mobile robots will increase tremendously during the next years. Service robots such as cleaning machines and inspection or assistance robots will bring us great support in our daily lives. This textbook provides an introduction to the methods of controlling these robotic systems. Starting from mobile robot kinematics, the reader receives a systematic overview of the basic problems as well as methods and algorithms used for solving them. Localisation, object recognition, map building, navigation and control architectures for autonomous vehicles will be discussed in detail. In conclusion, a survey of specific service robot applications is included as well. This book is a very useful introduction to mobile robotics for beginners as well as advanced students and engineers.

Distributed Computing by Oblivious Mobile Robots

Springer

Wheeled Mobile Robotics: From Fundamentals Towards Autonomous Systemscovers the main topics from the wide area of mobile robotics, explaining all applied theory and application. The book gives the reader a good foundation, enabling them to continue to more advanced topics. Several examples are included for better understanding, many of them accompanied by short MATLAB® script code making it easy to reuse in practical work. The book includes several examples of discussed methods and projects for wheeled mobile robots and some advanced methods for their control and localization. It is an ideal resource for those seeking an understanding of robotics, mechanics, and control, and for engineers and researchers in industrial and other specialized research institutions in the field of wheeled mobile robotics. Beginners with basic math knowledge will benefit from the examples, and engineers with an understanding of basic system theory and control will find it easy to follow the more demanding fundamental parts and advanced methods explained. Offers comprehensive coverage of the essentials of the field that are suitable for both academics and practitioners Includes several examples of the application of algorithms in simulations and real laboratory projects Presents foundation in mobile robotics theory before continuing with more advanced topics Self-sufficient to beginner readers, covering all important topics in the mobile robotics field Contains specific topics on modeling, control, sensing, path planning, localization, design architectures, and multi-agent systems

Autonomous Robots Springer Science & Business Media

The author compiles everything a student or experienced developmental engineer needs to know about the supporting technologies associated with the rapidly evolving field of robotics. From the table of contents: Design Considerations * Dead Reckoning * Odometry Sensors * Doppler and Inertial Navigation * Typical Mobility Configurations * Tactile and Proximity Sensing * Triangulation Ranging * Stereo Disparity * Active Triangulation * Active Stereoscopic * Hermies * Structured Light * Known Target Size * Time of Flight * Phase-Shift Measurement * Frequency Modulation * Interferometry * Range from Focus * Return Signal Intensity * Acoustical Energy * Electromagnetic Energy * Optical Energy * Microwave Radar * Collision Avoidance * Guidepath Following * Position-Location Systems * Ultrasonic and Optical Position-Location Systems * Wall, Doorway, andCeiling Referencing * Application-Specific Mission Sensors

Autonomous Robots Butterworth-Heinemann

Autonomous Mobile Robots: Planning, Navigation, and Simulation presents detailed coverage of the domain of robotics in motion planning and associated topics in navigation. This book covers numerous base planning methods from diverse schools of learning, including deliberative planning methods, reactive planning methods, task planning methods, fusion of different methods, and cognitive architectures. It is a good resource for doing initial project work in robotics, providing an overview, methods and simulation software in one resource. For more advanced readers, it presents a variety of planning algorithms to choose from, presenting the tradeoffs between the algorithms to ascertain a good choice. Finally, the book presents fusion mechanisms to design hybrid algorithms. Presents intuitive and practical coverage of all sub-problems of mobile robotics to enable easy comprehension of sophisticated modern-day robots Covers a wide variety of motion planning algorithms, giving a near-exhaustive treatment of the domain with thought provoking comparisons

between algorithms Dives into detailed discussions on robot operating systems and other simulators to get hands-on knowledge without the need of in-house robots

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