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, robots are playing an increasingly important role in the growing market of exploring, the new emerging challenges are being created and the robot is increasingly touching people and their lives. The credible prospect of practical robots among humans is the result of the scientific advancement as a result of a century of robotics development. This new handbook, therefore, provides a broad and strong link between robotics and diverse disciplines.

The 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 part editors and more than 200 authors, continues to be an authoritative reference for robotics researchers, newcomers to the field, and to those 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 novella addition to the second edition is a comprehensive collection of multimedia references to more than 700 videos, which brings valuable insight 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/
be required to map and avoid obstacles such as sunken ships. This thesis examines obstacle avoidance behavior using a forward-looking sonar for the autonomous underwater vehicle REMUS. Three-dimensional obstacle avoidance behaviors and control algorithms are compared. A general framework of the control of REMUS is accomplished using line of sight and state feedback controllers. A two-dimensional forward-looking sonar model with a 1200 horizontal scan and a 110 meter radial range is used. Obstacle detection algorithms are developed from geometric mapping of bearing and range weighting functions form the gain factor for a dynamic obstacle avoidance behavior. The overall vehicle heading error incorporates this obstacle avoidance term to develop a path around detected objects. REMUS is a highly responsive vehicle in the model and is capable of avoiding multiple objects in proximity along its track path.

This book describes different methods that are relevant to the development and testing of control algorithms for advanced driver assistance systems (ADAS) and automated driving functions (ADF). These control algorithms need to respond safely, reliably and optimally in varying operating conditions. Also, vehicles have to comply with safety and emission regulations. This book describes the various challenges that are typically addressed in this field when developing control algorithms for the interaction of vehicles with the environment and different traffic participants, an almost infinite number of possible scenarios and situations that need to be considered may exist. This book focuses on the development and testing of advanced driver assistance systems and, with regards to extensive simulation examples and case studies, to practically-oriented examples and contributions, to ensure effective development and testing of ADAS and ADF. Control Strategies for Advanced Driver Assistance Systems and Autonomous Driving Functions is a collection of articles by international experts in the field representing theoretical and application-based points of view. As such, the methods and examples demonstrated in the book will be a valuable source of information for academic and industrial researchers, as well as for automotive companies and suppliers.

Recently, research in robot kinematics has attracted researchers with different theoretical profiles and backgrounds, such as mechanical and electrical engineering, computer science, physics, and mathematics. This book includes studies and results that are typically found in the robotics field. It has been developed concentrating its interest in a broad class of problems in this area and representing a conglomeration of disciplines including, mechanics, theory of systems, algebra, and applied mathematics. The book is divided into different parts without regard to the technical background of the reader. It is, in robotics, kinematics studies the motion of robots for programming, control and design purposes. It deals with the spatial positions, orientations, velocities and accelerations of the robot manipulator which has to be manipulated in its workspace. This book is intended for robotics researchers, engineers, academics and students, and serves as a reference for the applications and experiments, illustrating how the programming of robots is not restricted to symbolic computing languages such as LISP. Researchers interested in getting started in robot programming will find information on how to begin, on what public-domain code is available, and on how to come to be of the active in the study of robotics via email contact. This book presents the current state of robotics research: the advances and challenges in its theoretical foundation and technology basis, and the developments in its traditional and new areas of applications. This book offers in its 11-part volume a collection of a broad range of topics in robotics. The content of these contributions provides a wide basis of their significance and quality. It is our hope that the greater dissemination of research developments will stimulate more exchanges and collaborations among the research community.

At the dawn of the new millennium, robotics is undergoing a major transformation in scope and dimension. From a largely dominant industrial focus, robotics is rapidly expanding into the challenges of unstructured environments. Interacting with, assisting, serving, and exploring with humans, the emerging robots will increasingly touch people and their environment. This book presents the current state of robotics research: the advances and challenges in its theoretical foundation and technology basis, and the developments in its traditional and new areas of applications. This book offers in its 11-part volume a collection of a broad range of topics in robotics. The content of these contributions provides a wide basis of their significance and quality. It is our hope that the greater dissemination of research developments will stimulate more exchanges and collaborations among the research community.

The concept of concurrent engineering (CE) was first developed in the 1980s. Now often referred to as transdisciplinary engineering, it is based on the idea that different phases of a product life cycle should be conducted concurrently and initiated as early as possible within the Product Creation Process (PCP). The main goal of CE is to increase the efficiency of the PCP and reduce errors in later phases of the PCP and reduce errors in later phases of the PCP in the present thesis, artificial intelligence, humans-robots, intelligent robots, and robots will play increasingly important roles in future manufacturing, and management, and actuator models and the integration of sensor information into the system controller. In the present thesis, an artificial impedance approach is used for developing the product, and control of robot manipulators. This book is ideally designed for engineers, professionals, practitioners, upper-level students, and academicians seeking current information on emerging communication networking trends.

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This journal-like book series includes edited volumes to rapidly report and spread the latest technological results, new scientific discovery and valuable applied researches in the fields concerning offshore robotics as well as promote international academic exchange. We aim to make it one of the premier comprehensive academic publications of world offshore vehicle and robotics community. The audience of the series will include the scholars, researchers, engineers and students who are interested in fields of autonomous marine vehicles and robotics, including autonomous surface vehicles, autonomous underwater vehicles, remote operation vehicles, marine bionics, marine vehicle modelling, guidance, navigation, control and cooperation and so on.

One of the ultimate goals in robotics is the creation of autonomous robots. Such robots will accept high-level descriptions of tasks and will execute them without further human intervention. The input descriptions will specify what the user wants done rather than how to do it. This book discusses a central problem in the development of autonomous robots. Motion planning, the central theme of this book, can be loosely defined as follows: how can a robot decide what motions to perform in order to achieve as a goal the arrangement of physical objects? This capability is eminently necessary since, by definition, a robot accomplishes tasks by moving in the real world. The minimum one would expect from an autonomous robot is the ability to plan its own motions.

FSR, the International Conference on Field and Service Robotics, is the leading single track conference of robotics for field and service applications. This book presents the results of FSR2012, the eighth conference of Field and Service Robotics, which was originally planned for 2011 with the venue of Matsuohima in Tohoku region of Japan. However, on March 11, 2011, a magnitude M9.0 earthquake occurred off the Pacific coast of Tohoku, and a large-scale disaster was caused by the Tsunami which resulted, therefore the conference was postponed by one year to July, 2012. In fact, this earthquake raised issues concerning the contribution of field and service robotics technology to emergency scenarios. A number of precious lessons were learned from operation of robots in the resulting, very real and challenging, disaster environments. Up-to-date study on disaster response, relief and recovery was then featured in the conference. This book offers 43 papers on a broad range of topics including: Disaster Response, Service/Entertainment Robots, Inspection/Maintenance Robots, Mobile Robot Navigation, Agricultural Robots, Robots for Excavation, Planetary Exploration, Large Area Mapping, SLAM for Outdoor Robots, and Elemental Technology for Mobile Robots.

This book focuses on the finite-time control of attitude stabilization, attitude tracking for individual spacecraft, and finite-time control of attitude synchronization. It discusses formation reconfiguration for multiple spacecraft in complex networks, and provides a new fast nonsingular terminal sliding mode surface (FNTSMS). Furthermore, it contains newly designed controllers and several control laws to enhance the performance of spacecraft systems and meet related demands, such as strong disturbance rejection and high-precision control. As such, the book establishes a fundamental framework for these topics, while also highlighting the importance of integrated analysis. It is a useful resource for all researchers and students who are interested in this field, as well as engineers whose work involves designing flight vehicles.

RoboCup 2002, the 6th Robot World Cup Soccer and Rescue Competitions and Conference, took place during June 18-25, 2002, at the Fukuoka Dome (main venue) in Fukuoka, Japan. It was, by far, the RoboCup event with the largest number of registered participants (1004 persons, distributed in 188 teams from 29 countries) and visitors (around 120,000 persons). As was done in its previous editions since 1997, the event included several robotic competitions and an international symposium. The papers and posters presented at the symposium constitute the main part of this book. In addition to the technical papers, a section describes significant advances in each league and the results. The symposium organizers received 76 submissions, among which 17 papers (22%) were accepted for oral presentation at the symposium (7th section of the book), and 21 papers (29%) were accepted as posters (second section of the book). Most papers were evaluated by three reviewers each, chosen from the members of the International Program Committee (IPC). The IPC consisted of a balanced combination of regular RoboCup participants and researchers from outside this community. The reviewers worked hard to guarantee a fair review process - the result of their work was a high-quality symposium with very interesting presentations.

Soft computing is a branch of computing which, unlike hard computing, can deal with uncertain, imprecise and incomplete data. The three constituents of soft computing are fuzzy, logic-based computing, neurocomputing, and genetic algorithms. Fuzzy logic contributes the capability of approximate reasoning, neurocomputing offers function approximation and learning capabilities, and genetic algorithms provide a methodology for systematic random search and optimization. These three capabilities are combined in a complementary and synergistic fashion. This book presents a cohesive set of contributions dealing with important issues and applications of soft computing in systems and control technology. The contributions include state-of-the-art material, mathematical developments, fresh results, and how-to-do issues. Among the problems studied via neural, fuzzy, neurofuzzy and genetic methodologies are: data fusion, reinforcement learning, approximation properties, multichannel imaging, signal processing, system optimization, gaming, and several forms of control. The book can serve as a reference for researchers and practitioners in the field. Readers can find in it a large amount of useful and timely information, and thus save considerable effort in searching for other scattered literature.

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