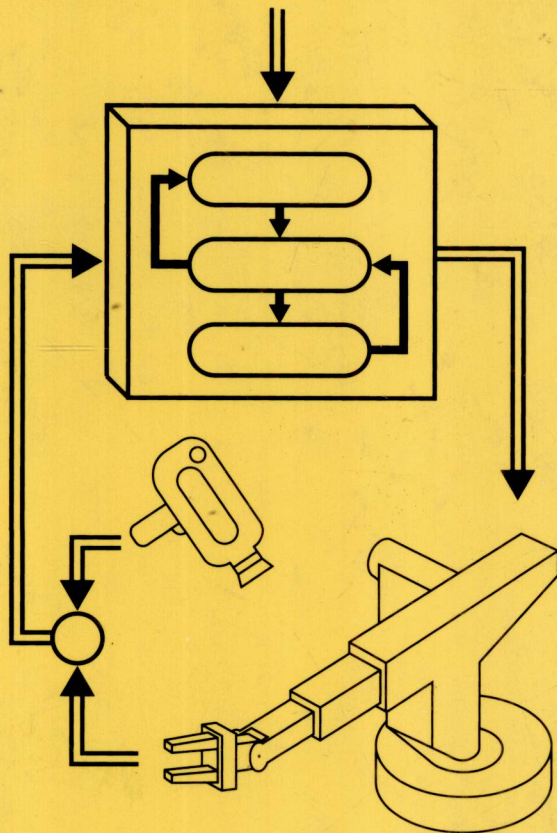


Intelligent Robotic Systems



edited by
Spyros G. Tzafestas

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INTELLIGENT ROBOTIC SYSTEMS

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E9560818

MARCEL DEKKER, INC.

New York • Basel • Hong Kong

8180888

Library of Congress Cataloging-in-Publication Data

Intelligent robotic systems / edited by Spyros G. Tzafestas.

p. cm. -- (Electrical engineering and electronics)

Includes bibliographical references and index.

ISBN 0-8247-8135-X

1. Robotics. I. Tzafestas, S. G.
TJ211.I4825 1991
629.8'92--dc20

II. Series.

91-14102
CIP



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MARCEL DEKKER, INC.

270 Madison Avenue, New York, New York 10016

Current printing (last digit):

10 9 8 7 6 5 4 3 2 1

PRINTED IN THE UNITED STATES OF AMERICA

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Preface

This book presents a collection of contributions on a range of topics that fall within the domain of intelligent robotic systems in the broad sense. Robotics is an aspect of flexible automation and is a technology with a future and for the future. First-generation robots had no computing or sensing capabilities, whereas second-generation robots have restricted computational power, textual high-level languages, and sensory feedback. Third-generation robotic systems are "intelligent" in the sense that they possess decision-making and problem-solving capabilities, achieved through a combination of sensory feedback processing and artificial intelligence techniques. Intelligent robots can see, hear, and sense pressure, force and torque, and temperature.

Most present-day robots are far from humanlike in their appearance and behavior. They are actually one-armed machines positioned at fixed locations on the shop floor. Modern applications, such as deep-sea mining and salvage operations, teleoperations in space, intensive manipulation in nuclear, radioactive, and other toxic environments, and precise operations in unstructured industrial environments, require further enhancement of the mechanical, electronic, and intelligence capabilities of today's robots. Future intelligent robots will be fully autonomous multiarm mobile machines, able to respond to human voice command and to receive, translate, and execute general instructions. They will have integrated into them new developments in metafunctional sensing, perception, decision making, machine learning, on-line knowledge acquisition, reasoning under uncertainty, and adaptive and knowledge-based control.

The aim of this book is to provide wide coverage of the intelligent robotics field, focusing primarily on the latest developments. The contributions were

written by well-known experts working in a variety of academic and research environments. The volume is divided into five parts, which cover introductory issues, system structures and robot programming, modeling and control, sensors and sensing, and applications. Unavoidably, a single volume cannot be exhaustive, but an effort was made to produce a well-balanced volume dealing with a representative set of topics. As a result of the multi-authored nature of the book, a multiplicity of techniques and angles of attack are included. This is of particular value to those seeking alternative solutions and designs.

We hope this book will be valuable to all scientists and engineers interested or working in the area of intelligent robotics and control. Both the sensor postgraduate student and the professional will find here material useful in their work. By nature the book is not intended to cover elementary topics, but each chapter is self-contained and readers can study chapters of special interest without difficulty.

I am indebted to all contributors for their efforts to offer high-quality up-to-date material and for their patience throughout the lengthy production and publication process. It is hoped that the future will show that their work has produced a significant addition to the current research-oriented literature on robotic systems.

Spyros G. Tzafestas

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PART I

INTRODUCTORY ISSUES

