Robotic Control

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Robotic Control

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Macmillan New Electronics
Introductions to Advanced Topics

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Series Editor's Foreword

The rapid development of electronics and its engineering applications ensures that new topics are always competing for a place in university and polytechnic courses. But it is often difficult for lecturers to find suitable books for recommendation to students, particularly when a topic is covered by a short lecture module, or as an 'option'.

Macmillan New Electronics offers introductions to advanced topics. The level is generally that of second and subsequent years of undergraduate courses in electronic and electrical engineering, computer science and physics. Some of the authors will paint with a broad brush; others will concentrate on a narrower topic, and cover it in greater detail. But in all cases the titles in the Series will provide a sound basis for further reading of the specialist literature, and an up-to-date appreciation of practical applications and likely trends.

The level, scope and approach of the Series should also appeal to practising engineers and scientists encountering an area of electronics for the first time, or needing a rapid and authoritative update.

Preface

Robots have already become standard tools for use in industrial automation systems, mainly where a variety of simple repetitive tasks is carried out. Their key feature, programmability, also allows their operation to be modified according to sensory information about their environment. Their surroundings may now be less well-defined, opening up new application areas and reducing the need for specially made jigs and fixtures. However, there is a long way to go before they can do useful tasks in completely unconstrained environments and before they have intelligence, instead of operating on explicit pre-programmed instructions. Once this has been achieved, the potential of robots will become enormous.

An initial study of robots would comprise an investigation into their mechanical construction, a survey of the types of sensors and actuators which might be used, and how control might be achieved so that the robot can perform the desired movements with the required speed and accuracy.

But practical robotics is much more than this. The robot must interface with its environment, in which there could be objects to be handled, feeding devices, other robots and people. A robot will usually be part of a larger system which can be programmed to perform a multitude of tasks. All of these items are considered here as being part of *Robotic Control*. The aim of this book is to present the concepts and technologies used in state-of-the-art robots, with an emphasis on fixed-base robots for industrial applications.

The early chapters describe the structure of a robot and its hardware components, followed by a study of how good dynamic control can be achieved. The programming aspects are considered in chapter 5.

The second part of the book develops the theme of adding external sensors and other equipment to the simple robot, making possible more advanced applications. Chapter 6 starts with an overview of typical external sensors and sensory data processing, and then looks at how this information may be used to enhance the capability of a robot. Workcell mechanisms such as feeders are described in chapter 7 which culminates in an illustrative example of the design of a sensory robotic workcell. Finally, chapter 8 attempts some crystal-ball gazing at future trends, based on reports of work being carried out at research institutes around the world.

The book is intended as a text for undergraduate courses or as an introduction for graduates new in the area. A basic working knowledge of computers and programming is assumed throughout, and of Laplace transforms in parts of chapters 3 and 4.

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Figure 6.14 courtesy of the Department of Computer Science, University College of Wales, Aberystwyth.

Figure 7.7 courtesy of SATRA Footwear Technology Centre.