

Book Reviews

Applications in Artificial Intelligence—S. J. Andriole (Petrocelli Books, Inc., 1985, 528 pp.). *Reviewed by A. P. Sage, George Mason University, Fairfax, VA 22030, USA.*

The intended purpose of this book is to introduce non-AI specialists to the reality and potential of applied artificial intelligence. Generally, it succeeds very well in this.

Part one, which is an introduction to artificial intelligence, contains two papers. The first, by Steve Andriole, is a short historical overview and future prognosis; the second, by Daniel Schutzer, is a similarly brief discussion of artificial intelligence tools.

The second part of the book contains four tutorial papers on expert systems. Each approaches expert system design and operation from somewhat different perspectives. Richard Duda and John Gaschnig provide an overview, emphasize production rule systems, and conclude with a simple basic language program for backward chaining. Moshe Ben-Bassat discusses expert systems, especially the MEDAS system, for clinical diagnosis. In an especially interesting paper, Paul Lehner and Stephen Barth present a strong case supporting the development of expert systems on microcomputers. William Gevarter presents a survey and taxonomy of existing expert systems.

Four papers concerning natural language processing are presented in Part III. There are many potential uses for well designed natural language interfaces. The first three papers by Gary Hendrix and Earl Sacerdoti, Roger Schank, Steven Schwartz, and Jaime Carbonell each present interesting and different perspectives on several aspects of natural language processing. The final paper by three authors from Carnegie Mellon and one from Digital Equipment Corporation (DEC) provide an overview of XCALIBUR. This is DEC's interface to XSEL and R1, the expert system that configures VAX computers.

Part IV is devoted to information management. Daniel Schutzer presents a case study of how artificial intelligence could be used to solve a very large database management problem. An adaptive information selector is discussed by Azad Madni, Michael Samet, and Dennis Purcell. The final paper by Gerald Hice and Steven Andriole discuss the introduction of artificial intelligence type approaches into videotex systems.

Three papers on various topics in robotics comprise part V. These discuss general topics in intelligent motion control, computer vision, and autonomous mobile devices.

Up to this point in the book, most of the discussions are introductory and tutorial. These are interspersed with presentations of contemporary and projected future developments that make the book ideally suited for the manager and non-AI specialist who wishes a (more or less advocacy) presentation of where AI has been and where it is likely to go. This trend is continued in the remainder of the book. Part VI is devoted to what the editor calls "problem solving," which is used to imply "miscellaneous applications." The first chapter in this part contains an overview of intelligent instructional systems for training. This chapter, by Dexter Fletcher, is followed by a discussion of a decision-tree-structuring aid written by Jonathan Weiss. The final three chapters of this part, and the book, discuss primarily philosophical overview issues related to AI and command, control, communications, and intelligence systems. Each presents a useful discussion of the impact that AI is having, or could have, on national defense.

A cogent discussion of the future of applied artificial intelligence concludes the book. While this article itself is well written, much of the commentary seems to be unduly repetitive of earlier statements in the book. The multi-authored and edited nature of the presentation makes this sort of repetition very difficult to avoid. All in all, this is an important work from which the non-specialist in AI can obtain a view of what experts in the field believe to be potential contributions to applications and practice. The editor has done an excellent job in presenting a very broad picture of developments in AI (expert systems, natural language processing information management, robotics) in a very readable format.

Robotics for Engineers—Y. Koren (New York: McGraw-Hill, 1985, 347 pp.). *Reviewed by S. Tzafestas, Electrical Engineering Department, National Technical University, Zografou, Athens 15773, Greece.*

This introductory book on robotics is appropriate for students and practicing engineers who have to install or maintain industrial robots.

The first two chapters provide the basic concepts of robot structure, robot operation, robot features, etc. Chapters 3, 4, and 5 deal with the design of control loops and kinematics (coordinate transformation, kinematic equations, interpolator design, etc.). The principal method presented in chapter 4 is the Denavit-Hartenberg (DH) method for defining link's coordinate systems and joint parameters and writing the corresponding DH displacement matrices. In addition to the DH method, the book involves the quaternion and rotation vector representations. Regarding the inverse kinematics solution the authors present the resolved motion control method of Whitney (1972), which is appropriate mainly for direct-drive chain manipulators with six axes of motion. The Jacobian matrix for positioning and orienting six-axis robots is obtained by a general cross-products technique, and the inverse kinematics is derived using the rotation vector approach.

Chapter 6 provides a guide to the main applications of industrial robots; namely, loading and unloading machine tools, handling in manufacturing processes, welding, spray painting, assembly, machining, and inspection. Chapter 7 gives the fundamentals of robot programming; and Chapter 8 discusses the class of intelligent robots: i.e., robots equipped with sensors and some degree of artificial intelligence capabilities. Chapter 9 examines the issues that must be considered when selecting and installing a robot for a given plant, and specified safety and long-range company policy. These issues are then applied to a case study. Finally, chapter 10 deals with the links between robotics and related fields, such as computer-aided design (CAD), computer-aided manufacturing (CAM), and integration of robots into flexible manufacturing systems. The future trends in this area are also discussed.

The book provides a well-balanced blend of mathematical aspects of robots (kinematics, control algorithms) and nonmathematical aspects (programming, applications, robot installation, robot-based CAM systems, etc). Each chapter is self-contained and can be used almost independently of the others.

The book is well written and well organized. It can be read very easily, and it is suitable both for University courses on robotics and for the everyday work of practicing engineers.