

Concise Book Reviews (By an Editorial Panel)

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PRINCIPLES OF ROBOT MOTION, Theory, Algorithms and Implementations, by Howie Choset et al., MIT Press, 2005. xix + 603 pp., index, ISBN 0-262-03327-5, 433 references (Hb. £38.95).

This is a comprehensive reference text in motion planning, covering not only the early work but also recent theoretical and practical progress. The seven co-authors have applied their expertise to a broad range of robot motion applications.

The book contains twelve chapters, preceded by a valuable Foreword by Prof. Jean-Claude Latombe of Stanford University in California, and an explanatory Preface by the authors. The chapter titles are: Introduction; Bug Algorithms; Configuration Space; Potential Functions; Roadmaps; Cell Decompositions, Sampling-based Algorithms; Kalman Filtering; Bayesian Methods; Robot Dynamics; Trajectory Planning, Nonholonomic and Underactuated Systems. The chapters are followed by a series of appendices dealing with a number of topics of relevance to the main theme. The spectrum of topics and clear treatment of various items are important features of this outstanding book that would make the mathematical background of robot motion accessible to engineering and computer science students and research workers.

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AUTONOMOUS ROBOTS, From Biological Inspiration to Implementation and Control, by G.A. Bekey, MIT Press, 2005, xv + 577 pp., index, ISBN 0-262-02578-7, 25 pages of references (Hb. £35.95).

This work is an extensive review of the topic, covering the relevant theory and procedures, ranging from design and control to up-to-date applications. In fact, the book is a complete review of the topic, thus being a reference source for research workers and robot technologists. The valuable Preface by the author is followed by 15 chapters, dealing with diverse and relevant matters, e.g. biological systems, robot control, locomotion, manipulation, grasping, multiple robot control, navigation, humanoid robots and future projections. An important appendix dealing with linear feedback control systems, is of considerable interest. In all, the book provides 'a guided tour' in the field of autonomous robots by reviewing the hardware implementation of many current systems and by discussing the technologies of use to such robots. In this rapidly growing field the book is of considerable interest, both for research workers and students of this field of robotics.

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BOOTSTRAP TECHNIQUES FOR SIGNAL PROCESSING, by A.M. Zoubir and D.R. Iskander, Cambridge University Press, 2004, xiv + 217 pp., index, ISBN 0 521 83127 X, 14 pages of references (Hb. £45 or US\$75).

This book is concerned with the foundations of the bootstrap, its properties, its strengths and limitations. A number of useful examples of practical importance is cited in support of the theory; the examples are written in MATLAB. The aim of the compilation is to provide electrical engineers with adequate knowledge of computational techniques for analysing and understanding complicated data sets. In particular, the book is aimed at signal processing practitioners, especially research workers and students working in areas of radar, sonar, telecommunications and biomedical engineering.

The book consists of 5 chapters, including an introduction, and summaries of each chapter. An appendix is dealing with MATLAB codes for the given examples and the bootstrap MATLAB toolbox, items of particular value to practitioners. This area of research and practice is of a fairly recent origin, started by Bradley Efron in the late 1970s. The book marks an important milestone in the development of this fascinating engineering discipline.

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LIGHT VISION COLOR, by A. Valberg, J. Wiley, 2005, viii + 462 pp., index, ISBN 0470849037, Glossary, 20 pages of references (HB £34.95).

This interesting and well-written book deals with an interdisciplinary overview of fundamentals behind the visual sciences; it also covers recent developments in neurosciences, biophysics, psychophysics and sensory psychology. The author examines in detail photometry, contrast sensitivity and the relationship between light, colour and colorimetry. The various topics are discussed in 8 chapters, plus an appendix dealing with a physiologically based systems for colour measurements.

This work will be of interest and help to students in medicine, cognitive science, neurophysiology, etc, but of marginal value to robotics experts.

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WHO NEEDS EMOTIONS? The Brain Meets the Robot, edited by J.-M. Fellous and M.A. Arbib, Oxford University Press, 2005, xvi + 399 pp., index, ISBN 0-19-516619-1, references at the end of each chapter (Hb. £36.50).

This compilation consists of contributions by a panel of experts in neuroscience and artificial intelligence, the aim being to discuss from a scientific perspective the topic whether robots can have emotions. The subject of the relationship between robotics and *A.I.* is examined in some detail and procedures proposed how to implement emotions in robots. Current work on building robots that can express emotions is reviewed, especially in regard to interactions with humans. However, some doubts exist about the nature of emotions in future generations of robots.

The book consists of four parts. Part one deals with perspectives (2 chapter) part 2 addresses the work of the brain in 4 chapters, part 3 deals with emotions and robots 5 (chapters), while part 4, draws conclusions in a chapter by M.A. Arbib.

This interesting work would appeal to researchers and graduate students in neuroscience, robotics, *A.I.*, psychology and cognitive science . . . a timely and fascinating book.

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GEOMETRIC FUNDAMENTALS OF ROBOTICS, by J.M. Selig, second edition, Springer, 2005, xv + 398 pp., index, ISBN 0-387-20874-7, 131 references (Hb. Euro 59.95).

The aim of this book is to introduce mathematical tools, especially geometric ones, e.g. Lie groups and allied concepts, for solving problems in robotics. In fact, the work connects robotics back to mathematical fundamentals in group theory and geometry. In all, the second edition is an extended and corrected version published by Springer about 9 years ago.

Fifteen chapters of the book are dealing in considerable detail with various aspects of the topic, e.g. Clifford Algebra, Lie Algebra, Screw Systems and various aspects of dynamics and statics. The author presents in a clear and detailed fashion solutions to problems in robot control and design, especially for robot manipulators. Hence, the compilation would be of interest and help to graduate

students and research workers in robotics, mechanical engineering, computer science and applied mathematics . . . a very sound and comprehensive treatise.

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QUANTITATIVE MEASURE FOR DISCRETE EVENT SUPERVISORY CONTROL, edited by A. Ray, V.V. Phoha and S. Phoga, Springer, 2005, xvii + 264 pp., index, ISBN 0-387-02108-6, references at end of each chapter (Hb. Euro 69.50).

This book presents a novel method for discrete event decision and control of complex systems, e.g. electric power generation, aircraft problems and multi-agent human and robotic systems. The authors use Supervisory Control Theory (SCT) to model and control complex systems in engineering, and outline the practical implications for materials in Command Control, Communication, Intelligence, Surveillance and Reconnaissance systems. As a matter of interest, the methods have been successfully tested at two universities.

The nine chapters of the book are grouped into two parts; Theory of Language Measure and Supervisory Control (4 chapters); Engineering and Software Applications of Language Measure and Supervisory Control (5 chapter) (part 2 contains 2 chapters of relevance to robotics). The book would be of interest to research workers and graduate students in engineering, robotics, computer science and applied mathematics . . . a rather original and mind-provoking book.