

NEW BOOKS

PARALLEL COMPUTER VISION

Uhr, Leonard (ed.)

ISBN 0-12-706958-5, 1987, 320 pages, \$29.95

ACADEMIC PRESS

Harcourt Brace Jovanovich, Publishers

6277 Sea Harbor Drive

Orlando, FL 32821-9989

Perceptual recognition is among the most important, and the most difficult, of all the problems that computer scientists and engineers are trying to solve. The subject of parallel computing and computer vision is of great interest. Parallelism allows for rapid recognition and description of complex real-world scenes of objects. This book is written by some of the key research scientists involved in the development of massively parallel, but hierarchically structured, algorithms, architectures, and programs for image processing, pattern recognition, and computer vision. The book gives an integrated picture of the programs and algorithms that are being developed, and also of the multi-computer hardware architectures for which these systems are designed.

CURRENT ISSUES IN EXPERT SYSTEMS

Van Lamsweerde, A. and Dufour, P.

ISBN 0-12-714030-1, October 1987,

208 pages, \$34.00

ACADEMIC PRESS

Early work in AI was mainly concerned with general problem solving procedures. The application of these procedures to large "real world" problems was at first unsuccessful, due mainly to the vast area of the search space of alternatives to be considered. Major progress was later made by allowing the problem-solving process to make use of separate, explicit sources of knowledge, concerning highly specific problem domains. This gave rise to a first generation of expert knowledge-based systems. The next step was to improve the power and flexibility of the various knowledge-processing techniques and to develop effective software and hardware architectures to implement them efficiently. This major challenge remains at the core of many of the "fifth-generation" computer projects. This collection of papers from the 1985 International Professorship in Computer Science aims to provide a representative account of some of the major issues in AI worthy of further investigation if future expert systems are to exhibit any form of "intelligent" reasoning.

Methodologies for Intelligent Systems

Proceedings of the Second International

Symposium on Methodologies for Intelligent Systems

Zbigniew W. Ras and Maria Zemankova

ISBN 0-444-01295-8, October 1987, 528 pages,

Cloth \$85.00

ELSEVIER SCIENCE PUBLISHING CO., INC.

P.O. Box 1663, Grand Central Station

New York, NY 10163-1663

This new volume contains 60 research papers selected for presentation at ISMIS '87. Methodologies for Intelligent Systems provides readers with state-of-the-art information on a wide range of topics in central areas of AI, from expert systems, knowledge representation, logic for AI, and learning and adaptive systems to intelligent databases, approximate reasoning, man-machine interaction, and machine vision. Each of the papers contains

suggestions for the application of the presented methodologies, and is refereed to provide a good balance of both theoretical and practical work in AI research.

The papers in Methodologies for Intelligent Systems are self-contained, providing researchers in both academia and industry with an important new source for the latest information in AI research.

VISUAL RECONSTRUCTION

Andrew Blake and Andrew Zisserman

ISBN 02271-0, October 1987, 188 pages,

50 illus., \$25.00

THE MIT PRESS

55 Hayward Street

Cambridge, MA 02142

Visual Reconstruction presents a unified and highly original approach to the treatment of continuity in vision, and introduces two new concepts. The first, the weak continuity constraint, is a concise, computational formalization of piecewise continuity, and a mechanism for expressing the expectation that visual quantities vary continuously, but with occasional abrupt changes. The second concept, the graduated nonconvexity algorithm, is an efficient, deterministic (non-random) algorithm for fitting piecewise continuous functions to visual data.

TRACKING AND TRAILING

Adaptation in Movement Strategies)

Oliver Selfridge

ISBN 19259-4, October 1988, 176 pages,

illus., \$17.50

THE MIT PRESS

In this study, Selfridge shows how simple simulation models can illuminate a host of tracking and trailing behaviors that are responsible for much of the creativity we see in the world of interacting organisms.

REASONING ABOUT CHANGE

**Time and Causation from the Standpoint
of Artificial Intelligence**

Yoav Shoham

ISBN 19269-1, October 1987, \$25.00

THE MIT PRESS

Reasoning About Change presents a comprehensive approach to temporal reasoning in AI. Using techniques from temporal, nonmonotonic and epistemic logics, the author investigates issues that arise when one adopts a rigorous and intuitive approach to temporal reasoning in AI.

PERCEPTRONS

Marvin L. Minsky and Seymour A. Papert

ISBN 63111-3, December 1987, 275 pages,

\$12.50 paper

THE MIT PRESS

Perceptrons, the first book to discuss the concept of parallelism in computation, has remained a seminal work on threshold automata networks for nearly two decades. It marked a historical turn in AI, and is required reading for anyone who wants to understand the connectionist counter-revolution that is going on today.

This new edition includes a review of developments since the appearance of the 1972 edition, and identities

new research directions related to connectionism. The authors note a central theoretical challenge facing connectionism: the challenge to reach a deeper understanding of how "objects" or "agents" with individually can emerge in a network.

KNOWLEDGE-BASED TUTORING **The Guidon System**

William Clancey

ISBN 03123-X, 1987, 380 pages, \$30.00

THE MIT PRESS

Clancey's program has significant applications in cognitive science and education. He outlines AI techniques for explanation and student modeling, and provides a foundation for computer-aided instruction programs. The book contains enough technical details for the work to be replicated, but as been generalized so the methods and lessons can be applied to other knowledge representations.

Modularity in Knowledge Representations **and Natural-Language Understanding**

Edited by Jay L. Garfield

ISBN 07105-3, October 1987, 400 pages, \$35.00

THE MIT PRESS

The notion of modularity, introduced by Chomsky and developed with special emphasis on perceptual and linguistic processes by Fodor has provided a significant stimulus to research in cognitive science. This book presents new essays in which a diverse group of philosophers, linguists, psycholinguists, psychologists, and neuroscientists address general questions and controversies related to modularity.

Chapters are grouped in four parts: Modularity and Psychological Method, Semantics, Syntax and Learnability, On-Line Processing, and The Visual Module.

COMPUTATIONAL COMPLEXITY AND **NATURAL LANGUAGE**

G. Edward Barton, Robert C. Berwick,
and Eric Ristad

ISBN 02266-4, 1987, 352 pages, \$24.95

THE MIT PRESS

The authors use complexity theory to probe the information-processing structure of grammars, discovering why a grammar is easy or difficult to process and suggesting where to look for additional grammatical constraints.

DISTRIBUTED ARTIFICIAL INTELLIGENCE

Edited by Michael Huhns

ISBN 0-934-613-38-9, July 1987, 400 pages,
paperbound \$26.95

MORGAN KAUFMANN PUBLISHERS, INC.

P.O. BOX 50490

PALO ALTO, CA 94303-9953

Presenting papers originally given at a 1985 workshop, this collection describes the current state of research in DAI. DAI is concerned with the cooperative solution of problems by a decentralized group of agents.

The papers in this volume describe architectures and languages for achieving cooperative problem solving in a distributed environment, including several successful applications of distributed AI in manufacturing, information retrieval, and distributed sensing.

PARALLELISM IN EXPERT SYSTEMS

Anoop Gupta

ISBN 0-934613-55-9, 1988, 232 pages,
paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

Of interest to AI system designers and researchers in expert systems, this monograph explores the role of parallelism in the high speed execution of production systems exploiting different sources of parallelism.

The thesis points out the features of existing programs that limit the speed-up obtainable from parallelism and suggests solutions for some of the bottlenecks. The simulation results show that using the suggested multiprocessor architecture (with individual processors performing at 2 MIPS), it is possible to obtain execution speeds of about 12000 working-memory element changes per second, performance significantly higher than that obtained by other proposed parallel implementations of production systems.

Design Problem Solving: Knowledge **Structures and Control Strategies**

David Brown and B. Chandrasekaran

ISBN 0-934613-07-9, Spring 1988,
200 pages, paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

This work provides a unique perspective on design problem solving in the context of expert systems and outlines a general theory of knowledge-based reasoning. An expert system for design built according to these ideas is described.

RULE-BASED PROGRAMMING WITH OPS5

Nancy Wogrin and Thomas A. Cooper

ISBN 0-934613-51-6, Spring 1988,
approx. 350 pages, Price TBA

MORGAN KAUFMANN PUBLISHERS, INC.

This practical guide to learning OPS5 programming is ideal for industrial users of OPS5 and for higher level undergraduates and graduates. The authors have based the book on their experience teaching OPS5 programming and on using OPS5 for building complex, real-world systems. The book focuses on practice issues and includes exercises and programming examples.

LEXICAL AMBIGUITY RESOLUTION

Edited by: Steven Small, Garrison Cottrell,
Michael Tanenhaus

ISBN 0-934613-50-8, Fall 1987, 500 pages,
hardbound, Price TBA

MORGAN KAUFMANN PUBLISHERS, INC.

This book collects much of the best research currently available on the problem of lexical ambiguity resolution in the processing of human language. When taken out of context, sentences are usually ambiguous. When actually uttered in a dialogue or written in text, these same sentences often have unique interpretations. The inherent ambiguity of isolated sentences, easily overlooked in context, becomes obvious in the attempt to write a computer program to understand them.

Different views have emerged on the nature of context and the mechanisms by which it directs our unambiguous understanding of words and sentences. These perspectives are represented and discussed in LEXICAL AMBIGUITY RESOLUTION. Eighteen original papers form a source book for cognitive scientists in AI, psycholinguis-

tics, neuropsychology, or theoretical linguistics. The contributors, respected researchers in psychology and computer science, describe their research goals and results so that cognitive scientists, and others interested in this problem, can comprehend and utilize the findings.

The Frame Problem in AI: Proceedings of the 1987 Workshop

Frank M. Brown

ISBN 0-934613-32-X, 1987, 359 pages,
paperbound, \$24.95

MORGAN KAUFMANN PUBLISHERS, INC.

These original papers, presented at a workshop in April 1987, focus on one of the most fundamental problems in AI: the problem of describing, computationally, what properties persist and what properties change as actions are performed. Proponents of various logical systems, non-monotonic logics, default logics, circumscription logics, modal reflexive logics, and persistence logics, discuss their approaches to the frame problem and possible solutions.

Readings in Nonmonotonic Reasoning

Edited by Matthew L. Ginsburg

ISBN 0-934613-45-1, Fall 1987, approx. 550 pages,
paperbound, \$26.95

MORGAN KAUFMANN PUBLISHERS, INC.

READINGS IN NONMONOTONIC REASONING presents the best of previously published and selected original papers in this challenging area of AI. The volume reflects the spectrum of viewpoints on nonmonotonic reasoning, from background and the formal approaches (default theories, modal theories, circumscriptive theories, and unifications) to truth maintenance and applications. Original material by the editor introduces each chapter.

ANALOGICA: Proceedings of the First Workshop on Analogical Reasoning

Edited by Armand Prieditis, Rutgers University

ISBN 0-934613-37-0, October 1987, 160 pages,
paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

Analogy is perhaps at the very heart of human problem solving, metaphor comprehension, and teaching excellence. Despite increased interest in analogy, the multidisciplinary nature of analogical reasoning has been largely ignored. This collection represents the state of the art in analogical reasoning by drawing together a series of original papers presented at the first workshop on analogical reasoning held at Rutgers in December, 1985. Such a multidisciplinary approach ties together the fields of machine learning, cognitive psychology, philosophy of science, and linguistics.

Semantic Networks: An Evidential Formalization and Its Connectionist Realization

Lokendra Shastri, University of Pennsylvania

ISBN 0-934613-39-7, Fall 1987, 250 pages,
paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

This monograph focuses on two important issues relating to the problem of representing and utilizing a large body of knowledge: that an agent can maintain complete knowledge about only the most trivial environment and must, therefore, be capable of reasoning with incomplete and uncertain information; and that an agent must act in real time, performing similar tasks to human agents in comparable time.

Shastri argues that in order to satisfy the real-time constraint, the kinds of inference that need to be performed very fast must be identified and computational account provided of how this limited class of inference may be performed in an acceptable time frame. Inheritance and categorization within a conceptual hierarchy are identified as two operations that humans perform very fast, and it is suggested that these operations are important because they seem to lie at the core of intelligent behavior and are precursors to more complex reasoning.

A MANY-SORTED CALCULUS BASED ON RESOLUTION AND PARAMODULATION

Christoph Walther, Karlsruhe, West Germany

ISBN 0-934613-49-4, September 1987, 160 pages,
paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

This research note is concerned with mechanizing the utilization of the advantages and concepts of many-sorted logic for automated theorem proving. The author proposes a many-sorted version of a resolution- and paramodulation-based calculus. The advantages of such a calculus and the problems related to its definition are illustrated with several examples. The book describes all the modifications and algorithms necessary to extend a resolution- and paramodulation-based system, yielding a many-sorted automated theorem prover. Experimental results are presented, along with a brief account of the historical development of many-sorted logic and a discussion of related work. This monograph will be of interest to academic and professional specialists in automated deduction, theorem proving, and logic proving.

Genetic Algorithms and Simulated Annealing

Edited by Lawrence Davis, Bolt Beranek and Newman

ISBN 0-934613-44-3, September 1987, 216 pages,
paperbound, \$22.95

MORGAN KAUFMANN PUBLISHERS, INC.

This research note is a collection of papers on two types of stochastic search techniques—genetic algorithms and simulated annealing. These two techniques have been applied to problems that are both difficult and important, such as designing semiconductor layouts, controlling factories, and making communication networks cheaper. Both techniques are modeled on processes found in nature—natural evolution and thermodynamics—and both are being used in AI systems that model aspects of human cognition, such as signal analysis, language processing, and induction.

The authors of these papers convey the challenging ways in which these technologies are developing, and illustrate the wide variety of problems to which they are being applied. This book will be of particular interest to researchers in the fields of search, learning and algorithm design, and industrial designers and AI researchers investigating optimization.

READINGS IN ARTIFICIAL INTELLIGENCE AND DATABASES

John Mylopoulos and Michael Brodie

ISBN 0-934613-53-2, February 1988,
approx. 650 pages, paperbound, \$28.95

MORGAN KAUFMANN PUBLISHERS, INC.

This book presents primary articles on the interactions, actual and potential, between AI and database technologies. A comprehensive introduction discusses topics relevant to the interaction between AI and database

technology, introducing basic motivations, an historical overview, concepts and terminology, major results and contributions, open issues and future directions for research. Chapter introductions discuss particular topics and issues and the specific papers in the chapter.

Advances in Robotics, Volume 1 Algorithmic and Geometric Aspects of Robotics

Edited by: Jacob T. Schwartz and Chee-Keng Yap

ISBN 0-89859-554-1, 1987, 320 pages, \$36.00
LAWRENCE ERLBAUM ASSOCIATES, INC.
365 BROADWAY
HILLSDALE, NJ 07642

As a reference for both academic and industrial researchers, this new series reports the latest contributions of engineering, applied physics, and computer science to robotics. Each volume will focus one key topic in robotics research. The initial volume fully explores the applications of algorithm design and computational geometry to automatic planning and control functions.

ADVANCES IN COMPUTER VISION VOLUMES 1 & 2

Edited By: Christopher Brown

ISBN 0-89859-648-3, Vol. 1, Fall 1987,
192 pages (Tent.), \$27.50
ISBN 0-8058-0092-1, Vol. 2, Fall 1987,
160 pages (Tent.), \$24.95
LAWRENCE ERLBAUM ASSOCIATES, INC.

Contributions from major figures in the field of computer vision make the first two volumes of this new series the most timely and comprehensive resource available on different approaches to machine visual perception. The topics include parallel biological and computer vision segmentation, intrinsic image calculation and object recognition. The volumes cover the theoretical aspects of computer vision (low-level image representations to high level image understanding), as well as offering them in a practical application.

ARTIFICIAL INTELLIGENCE PROGRAMMING, SECOND EDITION

**Eugene Charniak, Christopher K. Riesbeck,
Drew V. McDermott, James R. Meehan**

ISBN 0-89859-609-2, 1987, 552 Pages, \$34.50
LAWRENCE ERLBAUM ASSOCIATES, INC.

AI research has thrived in the years since this best-selling AI classic was first published. Artificial Intelligence Programming, Second Edition encompasses these advances by adapting its coding to Common Lisp, the well-documented language standard, and by bringing together even more useful programming tools.

ARTICLES

SOCRATES

A System to Extract Rules and Knowledge from Existing Databases

Fabrizio Massimo Ferrara

GESI Gestione Sistemi per l'Informatica s.r.l.
Via Rodi, 32 - Rome - Italy

1. INTRODUCTION

Most operations concerning processing by computer have always been centered on gathering, handling and spreading of data and information. These processes, however, are always based on preestablished criteria and they often aim, therefore, only at verifying assumptions already set, or, at most, at identifying situations which are regarded as abnormal with respect to "normal" parameters. We give a few examples to illustrate.

A business corporation works out statistics on sales: they may deal with the number of a certain type of customers who purchase a given product, with the assessment of the average order according to the kind of product sold and the location of the customer etc. In more complex cases, sales will be assessed as a function of a number of items regarding customers' and sellers' characteristics (e.g. type of customer, seller's psychological features, period of time considered, etc.).

A health care facility will carry out analyses to identify the occurrence of a disease, e.g. which factors contribute to the patient's clinical picture (lung cancer rate among smokers), or to associate the causes of death to the case history (e.g. diseases contracted, working environment, habits, etc.).

Finally, a financial corporation might examine the profits of different firms to find out the most lucrative sectors for investment. For this reason, it will look for high profit firms working in a certain industry, or will gather statistical data to verify the impact of competition on profits, etc.

All these cases share a common feature: the criterion of reckoning or analysis is set a priori since the user already knows the problem. Indeed, in the business corporation users themselves will establish a link between the type of customer and the product sold; in the health care facility the doctor himself will assume a link between lung cancer and smoking; while in the financial corporation the user, again, will decide that competition can be one of the reasons for drop in profits.