

INTERNATIONAL JOURNAL OF PATTERN RECOGNITION AND ARTIFICIAL INTELLIGENCE

Editors-in-Charge

H Bunke

Institut für Informatik und
Angewandte Mathematik
Universität Bern
Langgassstrasse 51
CH-3012, Bern, SWITZERLAND
Fax: (031) 653965
Tel: (031) 658681
E-mail: bunke @ iam.unibe.ch

P S P Wang

College of Computer Science
Northeastern University
360 Huntington Avenue
Boston, MA 02115
USA
Tel: (617) 437-3711
Fax: (617) 437-5121
E-mail: pwang @ corwin.ccs.northeastern.edu



AIMS AND SCOPE

This journal publishes both applications- and theory-oriented articles on new developments in the fields of pattern recognition and artificial intelligence, and is of interest to both researchers in industry and academia.

From the beginning, there has always been a close relationship between the disciplines of pattern recognition and artificial intelligence. The recognition and understanding of sensory data like speech or images, which are major concerns in pattern recognition, have always been considered as important subfields of artificial intelligence. On the other hand, topics like knowledge representation, inference, search or learning that belong to the center of artificial intelligence, have constantly attracted the attention of researchers working in pattern recognition. IJPRAI is the first to cover both fields in one periodical, and particular emphasis is put on papers which are in the intersection of both fields. However, it is open to articles from "pure" pattern recognition and "pure" artificial intelligence as well.

– IJPRAI contains current material on applications and theory research in:

- Image Processing • Natural Language Processing • Computer Vision • Speech Understanding • Pattern Recognition
- Robotics and Related Fields • Expert Systems • Artificial Intelligence • Knowledge Engineering • Neural Networks
- It has special issues devoted to relevant and key areas in the field.

SPECIAL ISSUES

- Parallel Image Processing
(Eds. *A Saoudi, M Nivat & P S P Wang*)
- Neural Networks in Vision and Pattern Recognition
(Eds. *J Skrzypek & W Karplus*)
- Blackboard Systems (Eds. *M K Saxena & P C P Bhatt*)
- Neural Networks in Pattern Recognition and Their Applications
(Ed. *C H Chen*)
- Character and Handwriting Recognition – Expanding Frontiers
(Ed. *P S P Wang*)
- Advances in Artificial Intelligence – Applications and Theory
(Ed. *J Bezdek*)
- Learning, Planning Schemes, and Their Applications
(Eds. *N Bourbakis, M Papazoglou & C V Ramamoorthy*)

SOME PAPERS

- DKRL – An Object-Oriented Language to Support Problem Solving in Distributed Blackboard Systems (*M K Saxena, K K Biswas & P C P Bhatt*)
- Control Heuristics for Scheduling in a Parallel Blackboard System (*K Decker, A Garvey, M Humphrey & V Lesser*)
- Parallel Recognition of High Dimensional Images (*M Nivat & A Saoudi*)
- The Depth and Motion Analysis Machine (*O D Faugeras, R Deriche, H Mathieu, N Ayache & G Randall*)
- Image Analysis on Massively Parallel Computers: An Architectural Point of View (*A Méricot & B Zavidovique*)
- Recent Advances in Machine Learning (*Y Kodratoff*)
- Pattern-Based Tactical Planning (*S Walczak*)

PRICE INFORMATION: ISSN 0218-0014

(Vol. 6/1992 5 issues) Institutions/Libraries US\$340 (airmail inclusive)

SPECIAL RATES: Individuals, Institutions/Libraries from developing countries US\$138 (airmail add US\$34).

(Vol. 7/1993 6 issues) Institutions/Libraries US\$340 (airmail inclusive)

SPECIAL RATES: Individuals, Institutions/Libraries from developing countries US\$138 (airmail add US\$34).

For free sample copies or further information on World Scientific Journals, please contact:



World Scientific Publishing

- USA: World Scientific Publishing Co. Inc. 1060 Main Street, River Edge NJ 07661, USA Fax: 1-201-487-9656 Toll-free: 1-800-227-7562
- UK: World Scientific Publishing Co. 73, Lynton Mead, Totteridge, London, N20 8DH ENGLAND Fax: 44-81-4463356 Tel: 44-81-4462461
- SINGAPORE: World Scientific Publishing Co. Pte. Ltd. Farrer Road, P O Box 128 SINGAPORE 9128 Fax: (65) 3825919 Tel: (65) 3825663

PATTERN RECOGNITION LETTERS

An official publication of the International
Association for Pattern Recognition

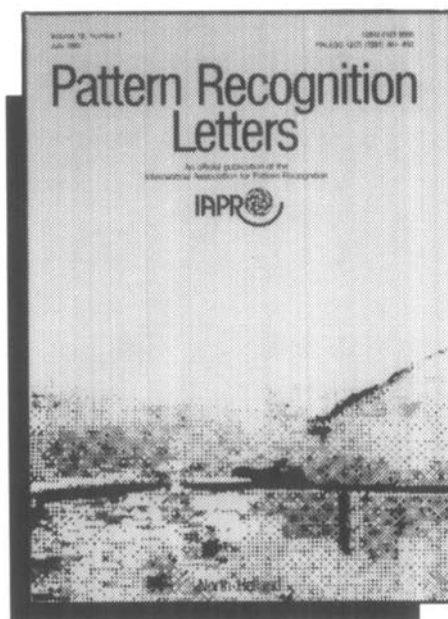
Managing Editors: E. Backer, Department of Electrical Engineering, Delft University of Technology, Mekelweg 4, 2628 CD, Delft, The Netherlands, E.S. Gelsema, Department of Medical Informatics, Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands (Editorial Office)

Advisory Editors: R. De Mori, Montréal, Canada J. Kittler, (UK), University of Surrey, A. Rosenfeld, (USA), J.C. Simon, (France), H. Niemann, (FRG), (UK), A.K. Jain, Michigan State University, (USA), E. Diday, INRIA, (France), P.A. Devijver, ENSTBr, (France)

Associate Editors: R. Bajscy, (USA), M. Nagao, (Japan), M. Onoe, (Japan), W. Pedrycz, (Poland), C.Y. Suen, (Canada), I.T. Young, (The Netherlands), S.W. Zucker, (Canada), J.R. Ullmann, (UK), D. Rutovitz, (UK), T. Pavlidis, (USA), H.H. Nagel, (FRG), H. Marko, (FRG), G.H. Granlund, (Sweden), L.N. Kanal, (USA), T. Kohonen, (Finland), M. Kunt, (Switzerland), R. López de Màntaras, (Spain), S. Levisaldi, (Italy), A. Guzmán, (USA), D. Dutta Majumder, (India), O.D. Faugeras, (France) and M.J.B. Duff, (UK)

AIMS AND SCOPE

Pattern Recognition Letters takes a novel approach to the publication of research work in the field of pattern recognition. Its main features are: concise articles, rapid publication and a broad coverage.



Subscription Information:

1992: Volume 13 (12 issues)

Subscription price:

Dfl. 933.00 / US \$ 462.00

(including postage and handling)

ISSN 0167-8655

The Dutch Guilder (Dfl.) price is definitive.

US \$ price is subject to exchange rate fluctuations



Elsevier Science Publishers

Imprint North - Holland

COUPON FOR A FREE INSPECTION COPY OF PATTERN RECOGNITION LETTERS

Send this form, or a photocopy to:

Elsevier Science Publishers

Imprint North - Holland

Attn: Petra van der Meer

P.O. Box 103,

1000 AC Amsterdam, The Netherlands

For customers in the USA and Canada:

Elsevier Science Publishers

Attn: Journal Information Center

P.O. Box 882

Madison Square Station

New York, N.Y. 10159 U.S.A.

Name: _____

Professional Address: _____

407/JCGF

ARTIFICIAL INTELLIGENCE

An International Journal

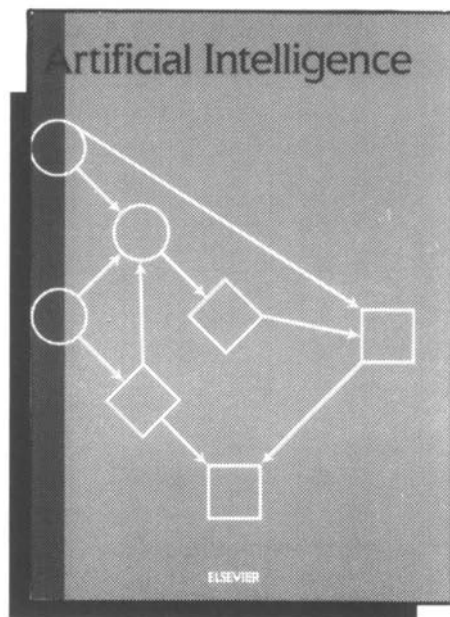
Editor-in-Chief: Daniel G. Bobrow, Xerox Corporation, Palo Alto Research Center, 3333 Coyote Hill Road, Palo Alto, CA 94304, USA

Associate Editor: Michael Brady, Department of Engineering Science, Oxford University, Parks Road, Oxford OX1 3PJ, UK

Review Editor: Mark J. Stefik, (USA)

Associate Review Editor: Stephen W. Smoliar, (Singapore)

Research Notes Editor: Wolfgang Bibel, (FRG)



AIMS AND SCOPE

The Journal, which commenced publication in 1970, is now the generally accepted international forum for the publication of results of current research in this field. A glance at the contents of back numbers indicates the wide variety of topics studied and reported on: for example, the learning of heuristics, scene analysis, induction, heuristic search, theorem-proving, reasoning by analogy, protocol analysis, sentence comprehension, robot planning, question answering, interpretation of imperfect line data, chess programs.

ABSTRACTED/INDEXED IN:

ACM Computing Reviews, Cambridge Scientific Abstracts, DATA NYTT, EIC Intelligence, Engineering Index, INSPEC Abstracts, ISI Current Contents, Mathematical Reviews, Ref. Zhurnal Matematika, Sociological Abstracts.

Subscription Information:

1992: Volumes 53-58 (18 issues)

Subscription price:

Dfl. 1806.00 / US \$ 894.00

(including postage and handling)

ISSN 0004-3702

The Dutch Guilder (Dfl.) price is definitive.

US \$ price is subject to exchange rate fluctuations



Elsevier Science Publishers

Imprint North - Holland

COUPON FOR A FREE INSPECTION COPY OF ARTIFICIAL INTELLIGENCE

Send this form, or a photocopy to:

Elsevier Science Publishers

Imprint North - Holland

Attn: Petra van der Meer

P.O. Box 103,

1000 AC Amsterdam, The Netherlands

For customers in the USA and Canada:

Elsevier Science Publishers

Attn: Journal Information Center

P.O. Box 882

Madison Square Station

New York, N.Y. 10159 U.S.A.

Name: _____

Professional Address: _____

407/J/CGF

A major forum for research in decision making...

JOURNAL OF BEHAVIORAL DECISION MAKING

EDITOR

GEORGE WRIGHT
University of
Strathclyde
UK

ASSOCIATE EDITOR

J. FRANK YATES
University of Michigan,
USA

The Journal of Behavioral Decision Making is a multidisciplinary journal with a broad base of content and style. The objective of the Journal is to present and stimulate behavioral research on decision making and to provide a forum for the evaluation of complementary, contrasting and conflicting perspectives. These perspectives include: psychology, management science, sociology, political science and economics.

Papers published in the Journal will encompass, but not be limited to, the following areas:

- ▶ Individual decision making
- ▶ Management science and decision aids
- ▶ Interpersonal and small group decision making
- ▶ Organizational decision making
- ▶ Strategic decision making
- ▶ Social and political structuring of decision making
- ▶ Behavioral economics
- ▶ Expert systems
- ▶ Consumer decision making
- ▶ Behavioral accounting
- ▶ Medical and clinical decision making

SUBSCRIPTION DETAILS

Volume 5 (1992) 4 Issues

Institutional Rate: Worldwide: US\$155.00

Personal Rate: UK: £42.00 Elsewhere: US\$77.50

FREE SAMPLE COPY

To receive your FREE sample copy please contact:
Jo Underwood, John Wiley & Sons Ltd, Baffins Lane,
Chichester, West Sussex, PO19 1UD, UK
Telephone: (0243) 770257 Fax: (0243) 775878

Subscribe Now...

Telephone your credit
card order on

UK/Europe:
(0)243 770400
USA:
(212) 850 6645



**Taylor
&
Francis
Group**

APPLIED ARTIFICIAL INTELLIGENCE

EDITOR

Robert Trappl

Austrian Research Institute for Artificial Intelligence,
Schottengasse 3, A-1010 Vienna, Austria

SCOPE

One of the few publications covering *applied* artificial intelligence, this quarterly makes sense of the information explosion in the field by covering applied research as well as actual applications. Coverage spans various uses of expert systems, evaluations of existing AI systems and tools, user experiences, theoretical research that will have bearing on applications, and the economic, social, as well as cultural impacts of AI.

RECENT CONTENTS

Knowledge acquisition techniques and second-generation expert systems, M.-O. Cordier and C. Reynaud / Knowledge-based system for assessment of potential entrepreneurs, W. T. Jones, W. S. Martin, M. E. McWilliams and V. Nabors / Integrated knowledge acquisitions from text, previously solved cases, and expert memories, F. Schmalhofer, O. Kuhn and G. Schmidt / Intelligent monitoring and diagnosis systems: A survey, A. Bykat / Design for high autonomy: An overview, J. W. Rozenblit / Achieving flexible autonomy in multiagent systems using constraints, M. Evans, J. Anderson and G. Crysdales.

READERSHIP

Researchers involved with artificial intelligence, robotics, and computers; R & D personnel, consultants; AI hardware/software vendors; and academics in the field of artificial intelligence, computer science, CAD, CAM, and management engineering.

SUBSCRIPTION INFORMATION

Vol 7 (1993), Quarterly, ISSN 0883-9514
Institutional: US\$190 / £111, Personal: US\$91 / £56

JOURNALS OF RELATED INTEREST

Cybernetics and Systems, International Journal of Computer Integrated Manufacturing, Journal of Experimental and Theoretical Artificial Intelligence.

Send for a FREE sample copy to:

**TAYLOR & FRANCIS LTD
Rankine Road, Basingstoke
Hampshire, RG24 0PR, UK**

Tel: (0256) 840366 Fax: (0256) 479438

Knowledge-Based SYSTEMS

Quarterly

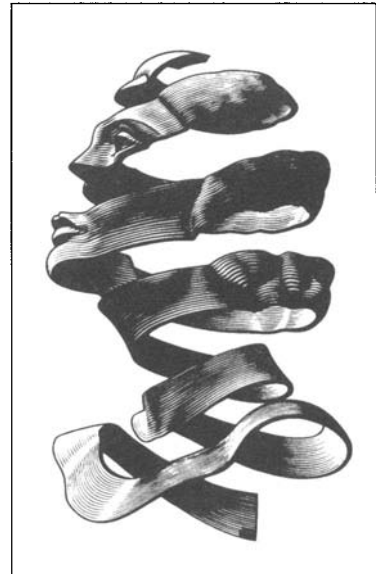
ISSN 0950-7051

Knowledge-Based Systems is the international interdisciplinary and applications-oriented journal on knowledge-based systems.

FOCUS: systems that use knowledge-based techniques to support human decision-making, learning and action

ISSUES: the quality of support given and the manner of its presentation

EMPHASIS: the practical significance of such systems in modern computer development and usage



SUBJECTS COVERED:

- the implementation of knowledge-based systems
- the design process
- the matching of needs to delivered systems
- organizational implications of the introduction of such technology
- expert systems
- application of knowledge based methods
- integration with conventional technologies
- software tools for KBS construction
- decision-support mechanisms
- user interactions
- knowledge acquisition
- knowledge representation
- languages and programming environments
- knowledge based implementation techniques
- system architectures

General Editor: **Professor E A Edmonds**
LUTCHI Research Centre
University of Technology
Loughborough Leics LE11 3TU

Subscription Prices for 1993: UK & Europe: £150 ROW: £165

For a FREE sample copy and further information on subscriptions contact Turpin Distribution Services Ltd, Blackhorse Road, Letchworth, Herts SG6 1HN, UK
Tel: (0462) 672555 Fax: (0462) 480947 Telex: 825372 TURPIN G



Please send me a free sample copy and further information on subscription to **KNOWLEDGE-BASED SYSTEMS**

Name: _____

Address: _____

Postcode: _____

BUTTERWORTH
HEINEMANN

The knowledge engineering review

Notes for Contributors

Contributions for publication should be addressed to Dr John Fox, Editor, The Knowledge Engineering Review, Biomedical Computing Unit, PO Box 123, Lincoln's Inn Fields, London WC2A 3PX, England, Dr Peter Jackson, North American Editor, Department of Electrical and Computer Engineering, Clarkson University, Potsdam, NY 13699-5720, USA; or may be submitted through a member of the Editorial Advisory Board (address inside front cover). Submission implies that the manuscript has not been published previously nor currently submitted for publication elsewhere.

All contributions, whether articles, correspondence or reviews, must be sent in triplicate and typed on one side of the paper, with wide margins and double-line spacing throughout. Any minor corrections should be made neatly in the typescript, leaving the margins clear. The author is invited to nominate up to five possible referees, who will not necessarily be used.

Articles must be accompanied by a brief, informative rather than indicative, abstract. Headings should be set out clearly but not underlined. Primary headings should be in lower case, at margin, with arabic numeral; subheadings should be numbered 2.a., 2.b., etc., and tertiary headings, 2.a.1., 2.a.2. No cross-references should be given by page number, but 'above' and 'below' should be used with the section specified, e.g. Section 2.a.2. The SI system of units should be used. The author should mark in the margin of the manuscript where figures and tables may be inserted. References to points in larger works should, where possible, quote the page reference, e.g. Ager, 1981, p. 102.

Tables should be typed with double-line spacing on sheets separate from the running text. Each table must have a caption that will make the data in the table intelligible without reference to the text.

Illustrations should be drafted for reproduction as full page (148 mm) width. Originals should normally be drawn at twice final area and must be sent in a flat package; larger drawings may delay publication. Lettering should be of a size so that when reduced the smallest lower-case letters will not be less than about 1 mm. Avoid gross disparities in lettering size on a drawing. Duplicates of illustrations should be sent, and may be prints or, preferably, photocopies reduced to final size. Illustrations in the text, both line drawings and photographs for halftone reproductions, will be referred to as figures (Fig. 2, 2a, etc.). Folding plates will not be accepted. Figures composed of photographs should be glossy prints presented at publication scale. Figure captions must be typed with double-line spacing on sheets separate from the running text.

The accuracy of references is the responsibility of authors. References must be double-spaced and spelt out in full, e.g.

Gale, W A, ed 1986. *Artificial Intelligence and statistics*, Reading, Massachusetts: Addison-Wesley

Pearl, J 1984. *Heuristics. Intelligent search strategies for problem solving*, Reading, Massachusetts: Addison-Wesley

Tie-Cheng Wang and Bledsoe, W W, 1987. "Hierarchical deduction" *Journal of Automated Reasoning* 3 (1) pp1-34.

Pau, L F, 1986. "Survey of expert systems for fault detection, test generation and maintenance" *Expert Systems*, 3 (2) pp 100-111.

Twenty Five offprints of each paper will be provided free of charge. Additional offprints may be purchased according to a set scale of charges if ordered when the proofs are returned.

The knowledge engineering review

VOLUME 7 NUMBER 4 DECEMBER 1992

Contents

Editorial – Grey Pages: Rapid publication of conference reports JOHN FOX	287
An overview of on-line assistance: from on-line documentation to intelligent help and training BARBARA WASSON and SIGMUND AKSELSEN	289
Model-based reasoning in financial domains WALTER HAMSCHER	323
Innovative design systems: where are we, and where do we go from here? Part II: Design by exploration D. NAVIN CHANDRA	345
Grey Pages	
Design Rationale Management Research JINTAE LEE	363
Knowledge-Based Software Engineering W. LEWIS JOHNSON	367
Book reviews	371
From the journals	375
List of referees	385

ISSN 0269-8889

CAMBRIDGE UNIVERSITY PRESS

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

Typeset by Paston Press Ltd, Loddon
Printed in Great Britain by Henry Ling Ltd, Dorchester