KYBERNETES

International Journal of Cybernetics and Systems (a quarterly)

EDITOR: B. H. Rudall ASSISTANT EDITORS:

Professors

W. H. von Alven (USA), F. H. George (UK), T. C. Helvey (USA), E. Nicolau (Romania) and Wu Xuemou (China)

ADVISORY BOARD:

Professors

A. Bensoussan (France), Chen Hanfu (China), S. Dillon Ripley (USA) and M. Manescu (Romania)

Founder Editor: Professor J. Rose (UK)

There are also 15 section editors from 8 countries and 21 members of the Editorial Board from 11 countries

This journal is concerned with the interdisciplinary study of cybernetics and systems in the widest sense. Among the extensive range of topics covered are the following: Artificial Intelligence, Automation, Cybernetic Modelling, Computer Simulation, Biocybernetics, Economic and Social Systems, Nature and Validation of General Systems, Ecosystems, Adaptive Systems, Philosophy of Cybernetics, the Interrelation between Cybernetics and other Sciences.

Kybernetes, now in its eighteenth year of publication, aims to endow cybernetics and general systems with an authoritative voice of its own and to establish a competent forum for the exchange of knowledge and information in relevant fields. One of the primary objectives of this publication is to weed out pseudo-cybernetics claims and to base cybernetics on a sound foundation; hence, highly speculative papers that lie on the fringe of cybernetics and systems sciences will not be published. The journal contains only *original papers*; it is the official publication of the World Organisation of General Systems and Cybernetics.

Enquiries and orders to:

MCB UNIVERSITY PRESS
62 Toller Lane
Bradford
BD8 9BY
England
Tel. 0274 499821
Telex. 51317 MCBUNI G
Fax. 547143

For Subscription Rates, Advertising Rates and Back Issues enquire at MCB University Press, as above.

A PRESTIGE PUBLICATION, INDISPENSABLE TO YOUR ORGANISATION AND TO YOU NOW IN ITS EIGHTEENTH YEAR

TO ADVERTISE IN THIS PUBLICATION

Please contact:

Anita Hebblethwaite Journals Advertising Promoter Cambridge University Press The Edinburgh Building Shaftesbury Road Cambridge CB2 2RU

Telephone (0223) 325757 Fax (0223) 315052 Telex 817256



In the USA and Canada please contact:

Journals Department Cambridge University Press 40 West 20th Street New York, NY 10011 USA

Telephone (914) 937 9600 Fax (212) 691 3239



The essential survey and analysis journal for applied Artificial Intelligence...

The Knowledge Engineering Review

Of interest to...

- Designers
- Technical Managers
- · Students
- Teachers
- Al Researchers
- and all interested in theory and applications of knowledge based systems

What is KER?

The Knowledge Engineering Review (KER) is a new periodical published quarterly by Cambridge University Press. Originally established in 1984 by the Expert Systems Group of the British Computer Society as a service to the knowledge engineering community it has developed into a high quality international journal providing a variety of information services. It concentrates on balanced surveys and tutorials within knowlege engineering and the many areas which are relevant or likely to become relevant to those in the field.

What does it publish?

KER maintains a commitment to breadth and depth but occasionally examines important, emerging topics in greater depth by publishing special issues.

KER publishes:

Analyses — Technical Tutorials — Application and country surveys — Commentaries, critiques and debates — Book reviews and Software reviews — Current contents

Why should I buy KER?

- · **KER** is the only broad spectrum journal catering for a wide audience
- Through its authoritative technical surveys **KER** provides efficient access to the primary literature and high quality tutorial material in areas which are important to the knowledge engineer
- · KER's critical reviews of new books and new expert



Cambridge University Press

The Edinburgh Building, Cambridge CB2 2RU, England 40 West 20th St, New York, NY 10011, USA

systems tools and applications products will keep you informed

- The popular 'From the Journals...' section tells you who is publishing what where. It surveys the current journals in expert systems, AI, HCI, cognitive science, KE applications...
- •KER helps teachers and practitioners track emerging new developments
- · KER is committed to help develop knowledge engineering into a high quality and professional engineering discipline

Recent articles

Capturing expertise by rule induction BRIAN P BLOOMFIELD

First generation expert systems: a review of knowledge acquisition methodologies

IAN M NEALE

An AI view of the treatment of uncertainty ALESSANDRO SAFFIOTTI

Dialogue management for co-operative knowledge based systems

S P STENTON

Commentary on the commercialization of knowledge engineering enterprise and product development

BERNARD P WESS JR

Subscription Information: **Knowledge Engineering Review**, £18 for SGES members, £27 for BCS members, £33 for other individuals, £55 for institutions in UK, £58 elsewhere

☐ Please send me further information about Knowledge Engineering Review
☐ Please send me a sample copy
Name
Address
Send to Journals Marketing Department, Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU OR FAX 0223 315052.



PAUL HOROWITZ WINFIELD HILL

Authoritative

Widely accepted as *the* single, authoritative text and reference on electronic circuit design, both analog and digital, the original edition sold over 125,000 copies worldwide and was translated into eight languages.

Revolutionary

The book revolutionized the teaching of electronics by emphasizing the methods actually used by circuit designers — a combination of some basic laws, rules of thumb, and a large bag of tricks. The result was, and is, a largely non-mathematical treatment that encourages circuit intuition, brainstorming, and simplified calculation of circuit values and performance.

Up-to-date

This completely new edition responds to the breakneck pace of change in electronics, but retains the feeling of informality and easy access that helped make the first edition so successful and popular.

• Simply indispensable

For only £29.95 The Art of Electronics consists of over 1140 pages packed with essential information for all scientists and engineers who build electronic circuits. Whatever your background, no matter how complex or simple the circuits you build, The Art of Electronics is a must!

£29.95 net Hardcovers 0 521 37095 7 1148 pp. 1989

Reviews of the first edition:

'Far and away the finest book on the subject of electronics . . . I cannot recommend this book highly enough to anyone whose research or experiments require some electronics.'

Optical Electronics

'A delightful book . . . an excellent teaching text as well as a lab reference. The circuits actually work, the schematics are all readable.'

Review of Scientific Instruments

Changes in the new edition

- totally rewritten chapters on microcomputers and microprocessors
- substantially revised chapters on digital electronics, op-amps and precision design
- every table has been revised and many new ones added
- rewritten chapters on FETs and micropower design
- many completely new sections on numerous topics, from optoelectronics to modems.

Student Manual for The Art of Electronics

T. HAYES and P. HOROWITZ

This companion volume is carefully organized to follow the main text, providing extra explanatory notes, worked examples, solutions, laboratory exercises and useful learning aids, such as glossaries, reading assignments, objectives, data sheets and summaries.

£15.00 net Paperback 0 521 37709 9 624 pp. 1989

For further information please write to Jacqueline Cox at the address below.



The Edinburgh Building, Cambridge CB2 2RU, UK.

Notes for Contributors

- 1. Manuscripts should preferably be written in English, but papers in French and German will also be accepted. All manuscripts will be referred to acknowledged experts in the subject. Only those receiving favourable recommendations from the referees will be accepted for publication. Manuscripts may be sent to any Board member, any Deputy Editor or the Editor.
- 2. Typescripts should be double spaced, on one side of good grade paper, allowing a reasonable left-hand margin. An original and two copies should be submitted with the author's full postal address, position and affiliations.
- 3. A short abstract of about 80 words should precede the main text. List of symbols: A typewritten list of any special symbols should be submitted with the manuscript. The list should not define the symbols mathematically, but should serve to identify them typographically. The list will not appear in print, but is essential to help the typesetter and to avoid costly correction in proof.
- 4. One copy of photographs, prints or transparencies of good quality and unmarked should be submitted. Where lines or lettering are to appear on the photograph, an additional print should be supplied appropriately marked. Each should have, lightly written on the back, the author's name, the figure number and an indication of which is the top of the picture.
- 5. One copy of each line diagram should be submitted at approximately twice final size and unlettered. Diagrams must be drawn in indian ink on plain white or transparent paper. A second copy should be supplied with lettering included. The author's name and the figure number should be written on this copy. Figures should be numbered consecutively, with arabic numerals, have descriptive captions, and be mentioned in the text. The correct position for each figure should be indicated in the margin of the manuscript.
- 6. Tables should be typewritten on separate sheets. Avoid, where possible, very wide tables. Number tables

- consecutively with roman numerals. Each should have a brief heading. Exceptionally lengthy tables may be summarized for publication with a note that copies of details can be obtained from the authors.
- 7. Equations: Wherever possible, mathematical equations should be typewritten, with subscripts and superscripts clearly indicated. The printer will set all mathematical symbols in italics unless otherwise indicated; symbols or letters to be set in roman (upright) type should be encircled in pencil, while bold letters should be shown by a wavy underline.
- 8. References: In the text, references are indicated by superior arabic numbers (without brackets), and should be confined to publish work that is directly pertinent. References should be listed at the end of the paper in numerical order. Authors' initials should precede their names; cited article titles should be quoted in full, enclosed in quotation marks; and abbreviations of journal names should follow the style of Chemical Abstracts or Physical Abstracts, and be underlined for italics: P.W. Anderson, "More is different" Science 177, 393 (1972) C.V. Negoita, Fuzzy Systems (Abacus Press, Tunbridge Wells, UK, 1980)

Citations such as 'personal communication', 'unpublished work', etc., are not acceptable as numbered references but can be included in parenthesis in the text. Do not use summaries as references.

- 9. Proofs: Page proofs will be sent to authors for correction, for return within 48 hours by airmail. Correction to proofs should be restricted to printers' errors only. Authors are entitled to 25 offprints of their article free of charge. Additional offprints may be purchased if they are ordered on the form sent with the proofs.
- 10. Manuscripts, whether accepted or rejected, will not be returned to the authors.
- 11. Submission of an article will be taken to imply that it has not been previously published and that it is not on offer to any other publisher.

BOBOTICA

Volume 8 Part 3

July-September 1990

CONTENTS

Reports and Surveys (Applying Fuzzy Logic in Industry, Automation Causes Conflict, Automated Design of Parts Feeders, Developments in	
Automation, Developments in Computers, Fibre Optic Technology Heralds The Future, Innovative Products and Projects, Robots Worldwide, Safety-Critical Systems). B. H. Rudall	179
Collision-free trajectory control for multiple robots based on neural optimization network, Jihong Lee and Zeungnam Bien (Korea)	185
3D Navigational Path Planning, T. M. Rao and Ronald C. Arkin (U.S.A.)	195
Cascade control of hydraulically actuated manipulators, N. Sepehri, G. A. M. Dumont, P. D. Lawrence and F. Sassani (Canada)	207
Improvement of dynamic capabilities of heavy robots, V. Potkonjak and A. Krstulović (Yugoslavia)	217
Optimum design of gripper jaws for tapered components, D. T. Pham (UK) and M. J. Nategh (Iran)	223
A closed-loop inverse kinematic scheme for on-line joint based robot control, Bruno Siciliano (Italy)	231
Towards a theory of sensory robotics, Jan Pinkava (UK)	245
Conference News	257
Book Reviews	259
Announcements	265

© CAMBRIDGE UNIVERSITY PRESS 1990

Cambridge University Press
The Pitt Building, Trumpington Street, Cambridge CB2 1RP, UK
40 West 20th Street, New York, NY 10011, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia
Printed in Northern Ireland by The Universities Press (Belfast) Ltd.