

# The knowledge engineering review

---

VOLUME 11 NUMBER 1 MARCH 1996

---

---

Cambridge University Press

# The knowledge engineering review

## EDITORS

Prof. John Fox, Imperial Cancer Research Fund, London  
Prof. Adele E. Howe, Colorado State University, USA

## ASSOCIATE EDITOR

Dr Paul Krause, Imperial Cancer Research Fund, UK

## EDITORIAL BOARD

|                    |  |
|--------------------|--|
| Bruce d'Ambrosio   | <i>Oregon State University, USA</i>                          |
| D. Navin Chandra   | <i>Carnegie Mellon University, USA</i>                       |
| Enrico Coiera      | <i>Hewlett-Packard Ltd, UK</i>                               |
| Peter Friedland    | <i>NASA Ames Research Center, USA</i>                        |
| Dov Gabbay         | <i>Imperial College, UK</i>                                  |
| Sture Hägglund     | <i>Linköping University, Sweden</i>                          |
| Peter Hammond      | <i>Brunel University, UK</i>                                 |
| Frank van Harmelen | <i>University of Amsterdam, The Netherlands</i>              |
| Nick Jennings      | <i>Queen Mary and Westfield College, UK</i>                  |
| Benjamin Kuipers   | <i>University of Texas at Austin, USA</i>                    |
| Kiyoshi Niwa       | <i>University of Tokyo, Japan</i>                            |
| Rainer Manthey     | <i>University of Bonn, Germany</i>                           |
| Rob Martil         | <i>Lloyds Register of Shipping, UK</i>                       |
| Nigel Shadbolt     | <i>University of Nottingham, UK</i>                          |
| Glenn Shafer       | <i>Princeton University, USA</i>                             |
| Barry Silverman    | <i>The George Washington University, USA</i>                 |
| Austin Tate        | <i>University of Edinburgh AI Applications Institute, UK</i> |
| Mario Tokoro       | <i>Keio University, Japan</i>                                |
| Jan Treur          | <i>Free University of Amsterdam, The Netherlands</i>         |
| Michael Wellman    | <i>University of Michigan, USA</i>                           |

## The Knowledge Engineering Review: Publication Policy

The Knowledge Engineering Review has been established to provide a general source of information and analysis in all areas relevant to research and development in knowledge based systems and applied artificial intelligence. The editors wish to encourage careful preparation of original papers analysing developments in the field. In particular we wish to see tutorial and survey articles, and commentary, criticism and debate. Primary research papers on specialised technical topics are unlikely to be appropriate but research papers on broad topics, such as development methodology or general evaluations of tools and techniques, are of interest. Descriptions of specific projects or particular computer systems will be considered if their presentation draws out general issues in the design, implementation or impact of knowledge based systems.

## Subscriptions

THE KNOWLEDGE ENGINEERING REVIEW (ISSN 0269-8889) is published quarterly in March, June, September and December. Four parts form a volume. Orders, which must be accompanied by payment, should be sent to any bookseller or subscription agent, or direct to Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU. Subscriptions in the USA or Canada should be sent to Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211. The subscription price (excluding VAT) of volume 11, 1996 is £100.00 (US\$180.00 in the USA and Canada) for institutions; £60.00 (US\$98.00 in the USA and Canada) for individuals; including postage; separate parts cost £27.00 (US\$48.00 in the USA and Canada) plus postage. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number.

Japanese prices for institutions (including ASP delivery) are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan. Second class postage pending at New York, NY, and at additional mailing offices. POSTMASTER: send address changes in USA and Canada to The Knowledge Engineering Review, Cambridge University Press, 110 Midland Avenue, Port Chester, New York, NY 10573-4930.

## Copying

This journal is registered with the Copyright Center, 222 Rosewood Drive, Danvers MA 01923. Organisations in the USA are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of \$05.00. This consent does not extend to multiple copy for promotional or commercial purposes. Code 0269-8889/92 \$11.00+0.10.

FOR ALL OTHER USE, permission should be sought from the Cambridge or New York offices of the Cambridge University Press.

CLAIMS for missing issues can only be considered if made immediately after receipt of the subsequent issue.

BACK VOLUMES: Volumes 1-5 are available from Swets and Zeitlinger at P.O. Box 810, 2160 SZ Lisse, The Netherlands. Volumes 6-11 are available from Cambridge University Press.

ADVERTISING: Details of advertising in The Knowledge Engineering Review may be obtained from the publisher.

Information on *The Knowledge Engineering Review* and all other Cambridge journals is available on

<http://www.cup.com> or <http://www.cup.org/>