

CAMBRIDGE

JOURNALS

Journal of Functional Programming

Editors-in-Chief

Matthias Felleisen, *Northeastern University, USA*

Jeremy Gibbons, *University of Oxford, UK*

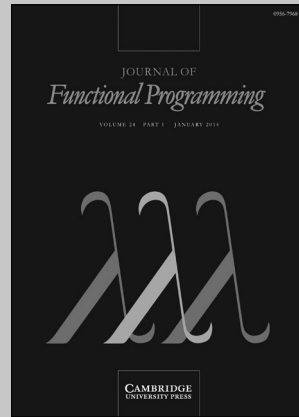
The *Journal of Functional Programming* is the only journal devoted solely to the design, implementation, and application of functional programming languages, spanning the range from mathematical theory to industrial practice. Topics covered include functional languages and extensions, implementation techniques, reasoning and proof, program transformation and synthesis, type systems, type theory, language-based security, memory management, parallelism and applications. The journal is of interest to computer scientists, software engineers, programming language researchers and mathematicians interested in the logical foundations of programming.

Price information

is available at: <http://journals.cambridge.org/jfp>

Free email alerts

Keep up-to-date with new material – sign up at
<http://journals.cambridge.org/jfp-alerts>



Journal of Functional Programming

is available online at:
<http://journals.cambridge.org/jfp>

To subscribe contact Customer Services

in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email journals@cambridge.org

in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

subscriptions_newyork@cambridge.org

For free online content visit:
<http://journals.cambridge.org/jfp>



CAMBRIDGE
UNIVERSITY PRESS

The Knowledge Engineering Review

Editors-in-Chief

Peter McBurney, *King's College, London, UK*

Simon Parsons, *Brooklyn College, City University of New York, USA*

The Knowledge Engineering Review is committed to the development of the field of artificial intelligence and the clarification and dissemination of its methods and concepts. *KER* publishes analyses – high quality surveys providing balanced but critical presentations of the primary concepts in an area; technical tutorials – detailed introductions to an area; application and country surveys commentaries and debates; book reviews; and a popular ‘from the journals’ section, providing the contents of current journals in theoretical and applied artificial intelligence.

Price information

is available at: <http://journals.cambridge.org/ker>

Free email alerts

Keep up-to-date with new material – sign up at
<http://journals.cambridge.org/ker-alerts>



The Knowledge Engineering Review

is available online at:
<http://journals.cambridge.org/ker>

To subscribe contact Customer Services

in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email journals@cambridge.org

in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

subscriptions_newyork@cambridge.org

For free online content visit:
<http://journals.cambridge.org/ker>



CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

Robotica

An Official Journal of the International Federation of Robotics

Editor-in-Chief

G. S. Chirikjian, *Johns Hopkins University, USA*

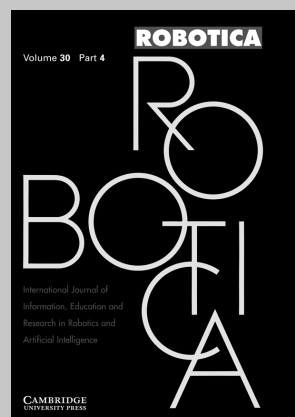
Robotica provides an international forum for the multidisciplinary subject of robotics and encourages developments in this important field of automation with regard to industry, education and research. It covers the many aspects of robotics, including sensory perception, software, kinematics and dynamics involved in robot design, robot task planning and description, intelligibility of skilled motion, applications of robots in the service industries, world model representation, artificial intelligence, development of relevant educational courses, training methods, economic and cost problems and other items of theoretical and practical interest.

Price information

is available at: <http://journals.cambridge.org/rob>

Free email alerts

Keep up-to-date with new material – sign up at
<http://journals.cambridge.org/rob-alerts>



Robotica

is available online at:

<http://journals.cambridge.org/rob>

To subscribe contact Customer Services

in Cambridge:

Phone +44 (0)1223 326070

Fax +44 (0)1223 325150

Email journals@cambridge.org

in New York:

Phone +1 (845) 353 7500

Fax +1 (845) 353 4141

Email

subscriptions_newyork@cambridge.org

For free online content visit:
<http://journals.cambridge.org/rob>



CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE

JOURNALS

Theory and Practice of Logic Programming

Published for the Association for Logic programming

Editor-in-Chief

I Niemelä, *Aalto University School of Science, Finland*

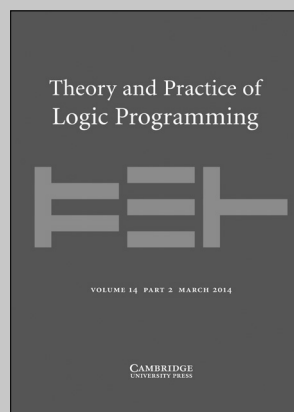
Theory and Practice of Logic Programming emphasises both the theory and practice of logic programming. Logic programming applies to all areas of artificial intelligence and computer science and is fundamental to them. Among the topics covered are AI applications that use logic programming, logic programming methodologies, specification, analysis and verification of systems, inductive logic programming, multi-relational data mining, natural language processing, knowledge representation, non-monotonic reasoning, semantic web reasoning, databases, implementations and architectures and constraint logic programming.

Price information

is available at: <http://journals.cambridge.org/tlp>

Free email alerts

Keep up-to-date with new material – sign up at <http://journals.cambridge.org/tlp-alerts>



Theory and Practice of Logic Programming

is available online at:
<http://journals.cambridge.org/tlp>

To subscribe contact Customer Services

Americas:

Phone +1 (845) 353 7500
Fax +1 (845) 353 4141
Email
subscriptions_newyork@cambridge.org

Rest of world:

Phone +44 (0)1223 326070
Fax +44 (0)1223 325150
Email journals@cambridge.org

For free online content visit:
<http://journals.cambridge.org/tlp>



CAMBRIDGE
UNIVERSITY PRESS

Instructions for Contributors

Aims and Scope

Natural Language Engineering encourages original papers reporting research with a clear potential for practical application. The journal also invites surveys presenting the state of the art in important areas of Natural Language Engineering and Natural Language Processing as well as squibs discussing specific problems. Book reviews and reports on industrial applications are welcomed, as are conference reports, comparative discussions of Natural Language Engineering products and policy-orientated papers examining, for example, funding programmes or market opportunities. All contributions are peer reviewed.

The journal is part of the Thomson Reuters Citation Index and is indexed in many of their products, but most importantly in both the Science and the Social Sciences editions of the Journal Citation Reports (JCR).

General

Submission of a paper to *Natural Language Engineering* is held to imply that the contribution has not been previously published and is not being considered elsewhere. Authors of articles published in the journal assign copyright to Cambridge University Press (with certain rights reserved) and will receive a copyright assignment form for signature on acceptance of their papers.

Contributors are responsible for obtaining permission to reproduce any material in which they do not own copyright, to be used in both print and electronic media, and for ensuring that the appropriate acknowledgements are included in their manuscript.

Up to five keywords should also be supplied to help with assignment of reviewers. Papers should be preceded by an abstract of approximately 300 words.

All manuscripts must be submitted online via the website: <http://mc.manuscriptcentral.com/nle>

For detailed instructions on submitting files see: journals.cambridge.org/nle

If you have further questions, you can write to JNLE@wlv.ac.uk

Manuscript requirements

1. Manuscripts should be **double spaced throughout**, with wide margins. Sheets should be numbered consecutively.
2. The first page of the manuscript should give the title, the name(s) and full mailing address(es) of the author(s), together with email address(es).

Conventions

Authors must consult the full list of conventions for *Natural Language Engineering* available in the Instructions for Contributors at journals.cambridge.org/NLE

First View publishing and DOIs

In order to make articles which have been accepted for publication in *Natural Language Engineering* available as quickly as possible, they are now published as First View online (at Cambridge Journals Online: journals.cambridge.org) The online version is available as soon as author corrections have been completed and before the article appears in a printed issue. A reference is added to the first page of the article in the journal catchline. This is the DOI - Digital Object Identifier. This is a global publishers' standard. A unique DOI number is created for each published item. It can be used for citation purposes instead of volume, issue and page numbers. It therefore suits the early citation of articles which are published as First View on the web before they have appeared in a printed issue. See journals.cambridge.org/nle

Proofreading

Proofs will be supplied as pdfs to your nominated email address. These may be read and corrected by contributors provided that they can guarantee to return the corrected proofs within four days of receipt. Contributors should correct printers' errors but not introduce new or different material at this stage. The publisher reserves the right to charge authors for correction of non-typographical errors.

Offprints

No paper offprints are provided, but a pdf of the published article will be sent to the corresponding author.

Printed in the UK by Bell & Bain Ltd, Glasgow

Cambridge University Press

Journals Fulfillment Department, UPH, Shaftesbury Road, Cambridge CB2 8BS, UK.

32 Avenue of the Americas, New York, NY 10013-2473, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

Ruiz de Alarcón 13, 28014 Madrid, Spain

Dock House, The Waterfront, Cape Town 8001, South Africa

NATURAL LANGUAGE ENGINEERING

Volume 21 Part 3 May 2015

CONTENTS

ARTICLES

- The Kestrel TTS text normalization system 333
Peter Ebden and Richard Sproat
- Relational paraphrase acquisition from Wikipedia: The WRPA method
and corpus 355
M. Vila, H. Rodríguez and M. A. Martí
- Hierarchical reinforcement learning for situated natural language generation 391
Nina Dethlefs And Heriberto Cuayáhuatl
- Experiments with three approaches to recognizing lexical entailment 437
P. D. Turney and S. M. Mohammad
- A survey of automatic Arabic diacritization techniques 477
Aqil M. Azmi and Reham S. Almajed

The cover illustration is computer generated from an engraving of the Tower of Babel in an eighteenth-century bible

Cambridge Journals Online

For further information about this journal
please go to the journal website at:
journals.cambridge.org/nle



MIX
Paper from
responsible sources
FSC® C007785

CAMBRIDGE
UNIVERSITY PRESS