

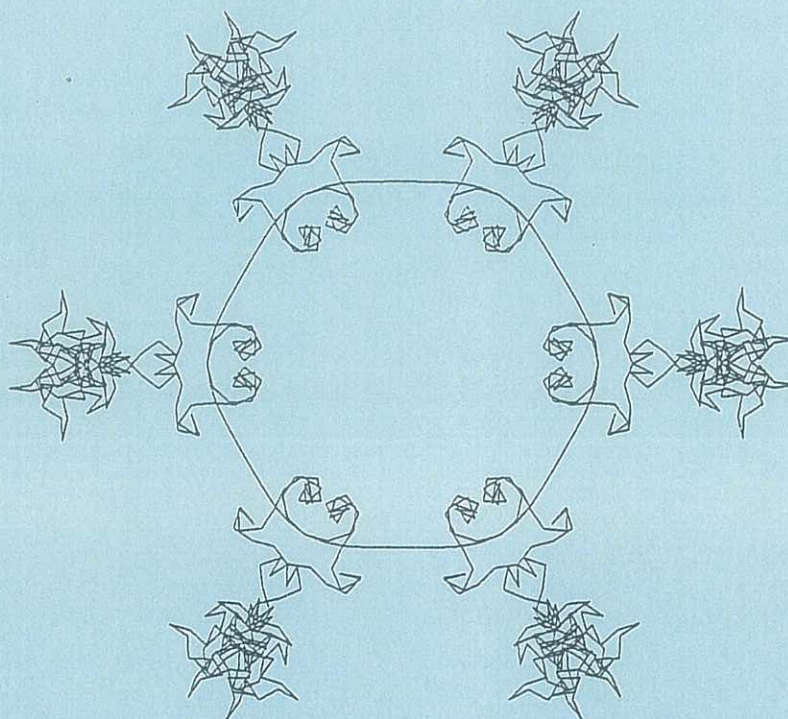
# MACQUARIE COMPUTING REPORTS

## PROCEEDINGS OF THE EIGHTH INTERNATIONAL SYMPOSIUM ON LANGUAGES FOR INTENSIONAL PROGRAMMING

Edited by

Mehmet A. Orgun

Edward A. Ashcroft (Tempe, AZ)



---

Proceedings of ISLIP'95  
The Eighth International Symposium on  
Languages for Intensional Programming

May 3–5, 1995, Macquarie University, Sydney, Australia

Editors

Mehmet A. Orgun

Department of Computing

Macquarie University

Sydney, New South Wales, Australia

Edward A. Ashcroft

Department of Computer Science and Engineering

Arizona State University

Tempe, Arizona, U.S.A.



## Preface

These are the pre-proceedings of ISLIP'95, the Eighth International Symposium on Languages for Intensional Programming, which is being held at Macquarie University, Sydney, Australia. It reproduces the successful submissions to the Symposium.

At ISLIP'95, Ed Ashcroft had confessed that he did not expect ISLIPs to be as persistent as they had proved to be. We have another proof of their persistence: ISLIP'95 is not only the 8th in its series, but also the first ISLIP ever to be held outside Canada and U.S.A. We are delighted that this year it is being held in Sydney, Australia. Macquarie University partly sponsors ISLIP'95, and there is a strong Australian presence at the Symposium. So, the choice for the venue was timely!

ISLIP'95 is also the first in its series with a new reading of the acronym "ISLIP", which originally stood for International Symposium on Lucid and Intensional Programming. There are now many examples of other intensional languages and systems, and their applications, which go beyond Lucid research; for example, spreadsheets, dataflow computation, attribute grammars, version control, temporal databases, executable temporal/modal logics, realtime languages, to name a few. In other words, the headlong development of intensional programming has many heads, and this fact is now reflected in the new reading of the acronym "ISLIP" (and in the selection of papers in front of you).

On behalf of the Program Committee, we would like to express our sincere gratitude to the authors, session chairpersons, and the reviewers who provided us with timely and helpful evaluations. Your task, as authors at ISLIP'95, is not finished yet though—ISLIP'95 will be the first ISLIP whose proceedings will be published as a book by a major publishing company, namely, World-Scientific. We even have a deadline of mid-July 1995 for the submission of the final polished papers. The proceedings will complement the new Lucid book published by Oxford University Press in January 1995. Let's get to work!

Sydney, Australia  
May 1995

M. A. Orgun and E. A. Ashcroft  
Program Committee Co-Chairs  
ISLIP'95

---

### **General Chair:**

Edward A. Ashcroft

Arizona State University (U.S.A.)

### **Program Committee:**

Seiki Akama

Teikyo Heisei University (Japan)

Edward A. Ashcroft (co-chair)

Arizona State University (U.S.A.)

Weichang Du

University of New Brunswick (Canada)

Tony A. Faustini

Arizona State University (U.S.A.)

Jan Hext

Macquarie University (Australia)

Tom Hintz

University of Technology, Sydney (Australia)

R. Jagannathan

SRI International (U.S.A.)

Michael Johnson

Macquarie University (Australia)

Steve Matthews

University of Warwick (U.K.)

Mehmet A. Orgun (co-chair)

Macquarie University (Australia)

John Potter

Microsoft Institute (Australia)

John Plaice

Laval University (Canada)

William W. Wadge

University of Victoria (Canada)

Andrew L. Wendelborn

University of Adelaide (Australia)

Kang Zhang

Macquarie University (Australia)

# Contents

<b>Preface</b>	ii
<b>Invited Talks</b>	
A Functional Extension to Lustre	1
<i>Paul Caspi &amp; Marc Pouzet, Laboratoire VERIMAG, France</i>	
Multidimensional Program Verification	12
<i>Edward Ashcroft, Arizona State university, USA</i>	
Relative Debugging using Multiple Program Versions	14
<i>David Abramson &amp; R. Sosič, Griffith University, Australia</i>	
Possible WOOrlds	16
<i>William Wadge, University of Victoria, Canada</i>	
<b>GLUing</b>	
Portfolio - A Graphical System for GLU Programming	20
<i>R. Jagannathan, SRI International, USA</i>	
Rank Analysis in the GLU Compiler	27
<i>Chris Dodd, SRI International, USA</i>	
GLU for Multidimensional Signal Processing	32
<i>Iskender Agi, SRI International, USA</i>	
<b>Programming Paradigms</b>	
Distributed Programming based on Graphs	41
<i>Jiannong Cao &amp; Lichucha Fernando, University of Adelaide, Australia</i>	
<i>Kang Zhang, Macquarie University, Australia</i>	
Building Logic Constructs into Procedural Programming Languages	50
<i>Yaowei Liu, Nanyang Technological University, Singapore</i>	
<i>John Staples, University of Queensland, Australia</i>	
<b>Dataflow Architecture</b>	
ALFA Fine Grain Dataflow Machine	60
<i>Lorenzo Verdoscia, IRSIP/CNR - Napoli, Italy and ICSI - Berkeley, USA</i>	
<b>Applications</b>	
A New Stream Processing Language	72
<i>John Plaice, Laval University, Canada</i>	
<i>Yannis Haralambous, France</i>	
Particle Simulation with Lucid	86
<i>John Plaice &amp; Joey Paquet, Laval University, Canada</i>	

## **Specification & Verification**

- Real-Time Object-Oriented Specification and Verification 97  
*Satoshi Yamane, Shimane University, Japan*
- Verifying MULTRAN Programs with Temporal Logic 120  
*Wanli Ma, Australian National University, Australia*  
*Mehmet A. Orgun, Macquarie University, Australia*

## **Intensional Concepts**

- The Possible-World Wide Web 135  
*Alan Yoder, University of Notre Dame, USA*  
*William Wadge, University of Victoria, Canada*
- The Intensional Relation 142  
*John Plaice & Joey Paquet, Laval University, Canada*
- Extending the Intensionalization Algorithm to a Broader Class of Higher-Order Programs 144  
*P. Rondogiannis & William Wadge, University of Victoria, Canada*

## **Concurrency**

- A Calculus based on Absence of Actions 149  
*Padmanabhan Krishnan, University of Canterbury, New Zealand*
- Choice is Not Just Non-Determinism 157  
*Richard Buckland, Macquarie University, Australia*

## **Logic Programming**

- A Meta-Level Approach to Modal Logic Programming 161  
*Seiki Akama, Teikyo Heisei University, Japan*
- Fuzzy Temporal Prolog 169  
*Tu Van Le, University of Canberra, Australia*
- Knowledge-based Simulation with Chronolog 175  
*Chuchang Liu & Mehmet A. Orgun, Macquarie University, Australia*

- Author Index** 185



## Author Index

Abramson, David .....	14
Agi, Iskender .....	32
Akama, Seiki .....	161
Ashcroft, Edward A. ....	12
Buckland, Richard .....	157
Cao, Jiannong .....	41
Caspi, Paul .....	1
Dodd, Chris .....	27
Fernando, Lichucha .....	41
Haralambous, Yannis .....	72
Jagannathan, R. ....	20
Krishnan, Padmanabhan .....	149
Liu, Chuchang .....	175
Liu, Yaowei .....	50
Ma, Wanli .....	120
Orgun, Mehmet A. ....	120, 175
Paquet, Joey .....	86, 142
Plaice, John .....	72, 86, 142
Pouzet, Marc .....	1
Rondogiannis, P. ....	144
Sosič, R. ....	14
Staples, John .....	50
Van Le, Tu .....	169
Verdoscia, Lorenzo .....	60
Wadge, William W. ....	16, 135, 144
Yamane, Satoshi .....	97
Yoder, Alan .....	135
Zhang, Kang .....	41