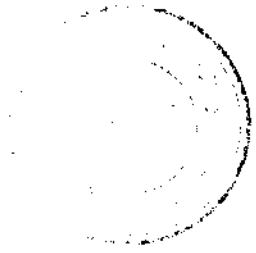
Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis



221

Logic Programming '85

Proceedings of the 4th Conference
Tokyo, Japan, July 1–3, 1985

Edited by Eiiti Wada

Springer-Verlag
Berlin Heidelberg New York Tokyo

Editor

Eiiti Wada
Department of Mathematical Engineering and Instrumentation Physics
Faculty of Engineering, University of Tokyo
3-1, Hongo 7-chome, Bunkyo-ku
Tokyo 113, Japan

CR Subject Classifications (1985): C.1.2, D.1.3, D.3.4, I.2.4, I.2.5, I.2.8

ISBN 3-540-16479-0 Springer-Verlag Berlin Heidelberg New York Tokyo
ISBN 0-387-16479-0 Springer-Verlag New York Heidelberg Berlin Tokyo

Printing and binding: Beltz Offsetdruck, Hemsbach/Bergstr.
2145/3140-543210

Foreword

This volume of the Springer Lecture Notes in Computer Science contains most of the papers submitted, accepted for, and presented at the fourth Logic Programming Conference which took place on July 1 to 3, 1985 in Tokyo.

The first conference was held in March, 1982 in Tsukuba Science City, one month prior to the foundation of the Institute for New Generation Computer Technology (ICOT) which sponsored the later conferences. It was felt at that time that since the interests in Prolog were apparently so prevalent and research work had already been widely conducted in various institutions throughout Japan, time had come to organize the Prolog Conference.

For the subsequent years, the name of the conference was changed to "The Logic Programming Conference '8x", its site was moved to Tokyo, and the annual conferences themselves attracted many high quality papers and active audiences.

The conferences were announced and papers were called for only in Japan. The original proceedings contained both papers in Japanese and those in English.

Now, for the fourth conference, the papers written in Japanese were translated into English and all papers published in the present volume were refined.

The last word is my gratitude to authors who contributed their papers for this English version of the proceedings with additional endeavour and to each member of the program committee who spent much of his precious time to organize the conference.

Eiiti Wada
The University of Tokyo

Program Committee / Editorial Board

Eiiti Wada(Chief)	The University of Tokyo
Hitoshi Aida	The University of Tokyo
Kazuhiro Fuchi	ICOT
Koichi Furukawa	ICOT
Susumu Kunifuji	ICOT
Fumio Mizoguchi	Science University of Tokyo
Tohru Moto-oka	The University of Tokyo
Katsumi Nitta	ETL
Hidetoshi Shirai	Tamagawa University
Hozumi Tanaka	Tokyo Institute of Technology
Satoru Tomura	ETL
Akinori Yonezawa	Tokyo Institute of Technology

Referees

H. Aida,	T. Fujita,	K. Futatsugi,	A. Goto,	S. Goto,
M. Hagiya,	K. Handa,	S. Hayashi,	K. Hirata,	A. Ishii,
M. Ishikawa,	H. Kondou,	S. Kunifuji,	T. Kurita,	F. Maruyama,
T. Maruyama,	H. Matsuda,	T. Miyachi,	T. Miyaji,	T. Miyazaki,
H. Miyoshi,	F. Mizoguchi,	F. Motoyosi,	K. Mukai,	M. Nakagawa,
H. Nakashima,	K. Nitta,	M. Ohki,	R. Onai,	K. Sakai,
T. Sato,	E. Shibayama,	K. Shibayama,	H. Shirai,	A. Takeuchi,
T. Takewaki,	T. Takizuka,	H. Tanaka,	J. Tanaka,	Y. Tanaka,
S. Tomita,	S. Tomura,	O. Watanabe,	H. Yasukawa,	H. Yokota,
K. Yokota,	H. Yokouchi,	A. Yonezawa,	K. Yuasa,	M. Yuhara

Table of Contents

Architecture and Evaluation of a Reduction-Based Parallel Inference Machine : PIM-R

Rikio ONAI [1] , Hajime SHIMIZU, Kanae MASUDA [2] , Akira MATSUMOTO and Moritoshi ASO

Institute for New Generation Computer Technology
Mita Kokusai Bldg. 21F, 4-28, Mita 1-Chome, Minato-ku, Tokyo 108, Japan

ABSTRACT

This paper proposes a Reduction-based Parallel Inference Machine : PIM-R and describes the architecture and its evaluation using two kinds of software simulators. Target languages of PIM-R are Prolog and Concurrent Prolog. PIM-R executes Prolog programs in OR parallel and Concurrent Prolog programs in AND parallel. The simulation results show that PIM-R is able to exploit the parallelism in Prolog and Concurrent Prolog programs.

1 INTRODUCTION

Currently there are several proposals for parallel inference machine architecture (Moto-oka 84 ; Ito 84) and predicate logic languages (Shapiro 83 ; Clark 84 ; Pereira 84). We have chosen Prolog and Concurrent Prolog (Shapiro 83) as the target languages of PIM-R. These have been selected by ICOT as the base languages for its Kernel Language version 1 (KL1(84)). The basic operation of PIM-R consists of parallel generation of new resolvents. PIM-R executes Prolog programs in OR parallel and Concurrent Prolog programs in AND parallel. In PIM-R, if a process has multiple goals (the multiple goals, as a whole, are called the parent process), only the reducible goals, specified by various operators, are copied and reduced. Each resolvent generated contains a pointer to its parent process; the solution obtained is returned to the parent process using the pointer. That is, PIM-R executes Prolog and Concurrent Prolog programs by expanding and reducing a process tree. When the processing ends, the tree is logically deleted.

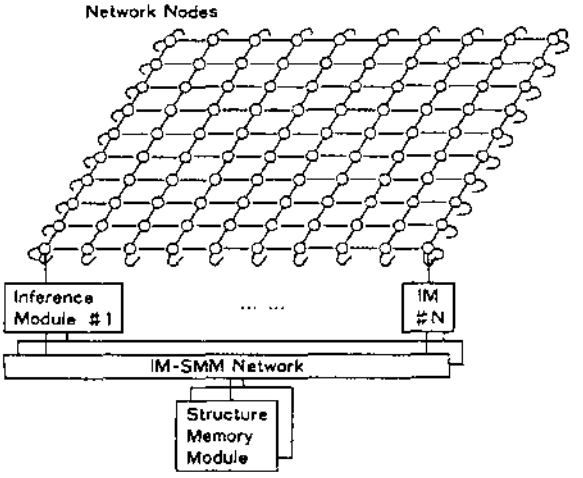


Fig. 1 Conceptual configuration of PIM-R

Present Address :
1.NTT Basic Research Laboratories, 3-9-11 Midori-cho Musashino-shi Tokyo 180 Japan
2.Mitsubishi Electric Corporation, Computer Works, New Product Development Dept.
325 Kamimachiya Kamakura-shi Kanagawa 247 Japan