

EDITORIAL NOTE

This special issue of Parallel Processing Letters is the product of a workshop held at Schloß Dagstuhl, Wadern, Germany in June 1993 (Dagstuhl Seminar Report 66). The workshop was organized by the four editors of this issue.

The main idea of the workshop was to bring together researchers from areas of parallelizing compilation and regular array design. These two areas found common ground when the relevance of loop parallelization increased due to advances in parallel (particularly massively parallel) processor technology. With the help of researchers in both areas, the parallelization of nested loops could be put on a theoretical basis of linear programming, linear algebra, convex polyhedra and formal semantics.

The following questions were addressed at the workshop:

- Where do the parallelizing compilation and regular array design overlap? In particular, mathematical models and methods from both areas were compared.
- What techniques in either area are relevant to loop parallelization? In particular, the impact of constraints present in different target architectures was studied.
- How do (should) recent developments in parallel hardware influence loop parallelization, and vice versa?
- What degree of automation can be expected in loop parallelization and what shape do (should) loop parallelization tools take?

Partial answers to these questions are given by the 13 papers comprising this special issue. All papers are revised and extended versions of the contri-

butions presented during the workshop and have been evaluated according to the standard PPL refereeing policy.^a

We have classified the 13 papers of this special issue (somewhat arbitrarily) along the following categories:

Space-time transformations. Three papers deal with computing dependencies and scheduling loop nest programs:

- “Computing linear data dependencies in nested loop programs” by Christian Heckler and Lothar Thiele,
- “Selecting affine mappings based on performance estimation” by Wayne Kelly and William Pugh, and
- “On the space-time mapping of WHILE-loops” by Martin Griebel and Chris Lengauer.

Mapping techniques. Mapping data and computations onto virtual and/or physical processors is the subject of much recent research. Three papers belong to this category:

- “Toward automatic distribution” by Paul Feautrier,
- “Data compiling for systems of uniform recurrence equations” by Catherine Mongenet, and
- “On the alignment problem” by Alain Darté and Yves Robert.

Code generation. Rewriting programs in a form suitable for execution is the subject of the following three papers:

- “Transformation of nested loops with modulo indexing to affine recurrences” by Florin Balasa, Frank Franssen, Francky Catthoor and Hugo De Man,
- “A fast heuristic for loop parallelization” by Richard Anderson and Barbara Simons, and
- “Compiling distributed loops onto SPMD code” by Vincent van Dongen.

^aPapers co-authored by one of the editors of this issue were handled fully independently by another editor.

Formal semantics and program construction. Two papers deal with formal methods for the design of parallel programs that are correct by construction:

- “A mathematical theory and its environment for parallel programming” by Eric Violard, and
- “A correctness proof of parallel scan” by John O’Donnell.

Hardware-oriented synthesis. Two papers address VLSI design:

- “Optimal synthesis of processor arrays with pipelined arithmetic units” by Kumar Ganapathy and Benjamin Wah, and
- “A loop-based scheduling algorithm for hardware description languages” by Maher Rahmouni, Kevin O’Brien, and Ahmed Jeraya.

We hope that this issue will contribute to a further stimulation of research in formal automatic parallelization techniques, and we would like to thank all authors and referees for their contribution.

We dedicate this issue to the memory of Hervé Le Verge, who died in an accident on Sunday, February 28, 1994. Hervé was 27 years old and worked at IRISA in the team headed by Patrice Quinton. He participated in the Dagstuhl workshop. Hervé was well known in the “systolic community” for his scientific contributions and well liked for his human qualities. He will be greatly missed.

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