



# Scheduling and Automatic Parallelization

*Alain Darte, Yves. Robert, Frederic Vivien*

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Readership This book is devoted to the study of compiler transformations that are needed to expose the parallelism hidden in a program. This book is not an introductory book to parallel processing, nor is it an introductory book to parallelizing compilers. We assume that readers are familiar with the books *High Performance Compilers for Parallel Computing* by Wolfe [121] and *Super-compilers for Parallel and Vector Computers* by Zima and Chapman [125], and that they want to know more about scheduling transformations. In this book we describe both task graph scheduling and loop nest scheduling. Task graph scheduling aims at executing tasks linked by precedence constraints; it is a run-time activity. Loop nest scheduling aims at executing statement instances linked by data dependences; it is a compile-time activity. We are mostly interested in loop nest scheduling, but we also deal with task graph scheduling for two main reasons: (i) Beautiful algorithms and heuristics have been reported in the literature recently; and (ii) Several graph scheduling, like list scheduling, are the basic techniques used in task of the loop transformations implemented in loop nest scheduling. As for loop nest scheduling our goal is to capture in a single place the fantastic developments of the last decade or so. Dozens of loop transformations have been introduced (loop interchange, skewing, fusion, distribution, etc.) before a unifying theory emerged. The theory builds upon the pioneering papers of Karp, Miller, and Winograd [65] and of Lamport [75], and it relies on sophisticated mathematical tools (unimodular transformations, parametric integer linear programming, Hermite decomposition, Smith decomposition, etc.).

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