

Book Review:**Structured Parallel Programming.
Patterns for efficient computation**

**Michael McCool, Arch D Robison, James Reinders
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In this book the authors, who are parallel computing experts and industry insiders, describe how to design and implement maintainable and efficient parallel algorithms using a pattern-based approach. They present both theory and practice, and give some specific examples using multiple programming models.

The book begins with two introductory chapters related with “Why is necessary to Think Parallel” and presenting background related with hardware trends that have lead to need explicit parallel programming. Subsequent chapters are organized in two parts:

Part I (Chapters 3 to 9): *Patterns*. These chapters cover:

- Different patterns that lead to well-structured, efficient and maintainable parallel programs. Some programming support for patterns is presented, such as CILK plus, Open MP and Open CL.
- The map pattern related with embarrassing parallelism: sets of independent operations in parallel computation are presented with a meaningful analysis of the Mandelbrot problem.
- Then the collective reduce, scan patterns, and various options for their implementation are presented, giving some simple examples of their use.
- Chapter 6 focuses on data reorganization patterns and discusses some issues related with data layout. In Chapter 7 a special case of the map pattern, the stencil pattern, which has a regular data access pattern, is discussed.
- Then the fork-join pattern is described, giving several examples, including its use to implement other patterns.
- At last a simple pipeline model is presented, presenting two programming model support for pipelines (TBB and CILK plus).

Part II (Chapters 10 to 15): *Examples*. Each chapter focused in a different problem, presenting a model of structured parallel programming to solve it. Problems are:

- Seismic simulation.
- K-means clustering.
- Bzip2 Data Compression
- Merge Sort
- Sample Sort.
- Cholesky factorization

Finally, four appendices present complementary information about *Further reading, CILK plus, TBB and C++*.

I think this book is very useful to keep as a reference. It's written by Intel engineers, so they heavily promote Thread Building Blocks and CilkPlus, but they give a fair amount of attention to other parallel processing models (e.g., OpenML, OpenCV, etc.) It's well written and can be read by both beginners and experienced professionals.

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