

Books

Parallel Systems and Computation, G. Paul and G. S. Almasi, Eds., North-Holland, Elsevier Science Publishers, Amsterdam, 1988. 294 pp. (ISBN 0-444-70371-3).

This volume is a collection of papers presented at the 1986 Europe Institute Seminar on Parallel Computing. The collection covers a significant range of topics in the area of parallel computing, from the conceptualization of parallel algorithms, through software systems issues for compiling and executing in concurrent environments, to some issues in the structure of parallel systems.

Parallel processing has a literature that reaches back into the mid-1960s. It seems, finally, an idea whose time has come, at least from the point of view of hardware technology. Many of the articles published in this 1986 collection address the same issues in algorithm and software that were addressed in the 1960s and 1970s. This time, however, there is an air of reality about the material deriving from many positive experiences with the large population of processing units built from microprocessors, and from serious advances in our understanding of the network topologies that are necessary for efficient interconnection of large populations of computing elements. We have come a long way from the ILIAC IV on the hardware side, although the basic structural principles of hardware organization remain similar to earlier concepts.

Since this volume is a collection of papers from a particular symposium, there are a number of interesting projects that are not represented. However, what the collection lacks in completeness it makes up in elegance. Fran Allen's article, "Compiling for Parallelism," is a crisp overview of the issues involved in detecting parallel opportunity in programming structures of various granularity (although it omits much of the earlier fascination with rearranging single assignment statements for SIMD systems), and a reading will provide an appreciation for the issues and the state of the art. Ron Cytron continues the discussion of finding implicit parallelism by program restructuring and its relation to programming constructs. Together the two articles form an invaluable platform for those who may be exploring this area. David George's article discusses quite critical

issues in the efficiency of run-time environments on large population processing units. Combined with the Carnevali, Squazzero, and Zecca article on light weight processes in IBM XA environments, a reasonably complete view of run time issues is provided.

A number of articles address what is perhaps the true constraint on the growth of parallelism: the conceptualization of problems in a form that lends itself to parallel solution. Our mathematical and intellectual tradition is strongly biased toward sequential, convergent solutions, and there is need for a mind-set revision in order to perceive of parallel solutions. The articles in the volume address some aspects of this problem. It is not a criticism of any individual article that the focus remains on the discovery of parallel algorithms for specialized scientific problems. However, this reviewer has long thought that there is a tremendous potential for high degrees of parallelism in commercial applications, my favorite being the parallel potential of the payroll application. I hope that the community dealing with parallel algorithms will begin to pay more attention to this potential and that commercial applications will be added to the long-standing traditional subjects of parallel research.

The architecture of a few highly parallel systems is discussed. These articles provide crisp descriptions of architectural and design structures that reveal the underlying data and control flow issues that must be addressed for efficient parallel computing. We see that the University of Illinois is still in the game, years after it gave us the ILIAC IV. And we are also happy to see the source of so much computer innovation, Manchester University, making a contribution to parallel computing.

There are a number of related articles, all of high quality, that make this volume an indispensable addition to the topic area. It is usable both as a tutorial to the topic area for computer people who are reasonably mature, and as a partial description of the state of the art.

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