



Advanced Computer Arithmetic Design

Michael J. Flynn, Stuart F. Oberman

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Innovative techniques and cutting-edge research in computer arithmetic design

Computer arithmetic is a fundamental discipline that drives many modern digital technologies. High-performance VLSI implementations of 3-D graphics, encryption, streaming digital audio and video, and signal processing all require fast and efficient computer arithmetic algorithms. The demand for these fast implementations has led to a wealth of new research in innovative techniques and designs.

Advanced Computer Arithmetic Design is the result of ten years of effort at Stanford University under the Sub-Nanosecond Arithmetic Processor (SNAP) project, which author Michael Flynn directs. Written with computer designers and researchers in mind, this volume focuses on design, rather than on other aspects of computer arithmetic such as number systems, representation, or precision.

Each chapter begins with a review of conventional design approaches, analyzes the possibilities for improvement, and presents new research that advances the state of the art. The authors present new data in these vital areas:

- * Addition and the Ling adder
- * Improvements to floating-point addition
- * Encoding to reduce execution times for multiplication
- * The effects of technology scaling on multiplication
- * Techniques for floating-point division
- * Approximation techniques for high-level functions such as square root, logarithms, and trigonometric functions
- * Assessing cost performance of arithmetic units
- * Clocking to increase computer operation frequency
- * New implementation of continued fractions to the approximation of functions

This volume presents the results of a decade's research in innovative and progressive design techniques.

Covering all the most important research topics in the field, Advanced Computer Arithmetic Design is the most up-to-date and comprehensive treatment of new research currently available.

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