FCCM20 Endorsement

Closing the gap: CPU and FPGA trends in sustainable floating-point BLAS performance

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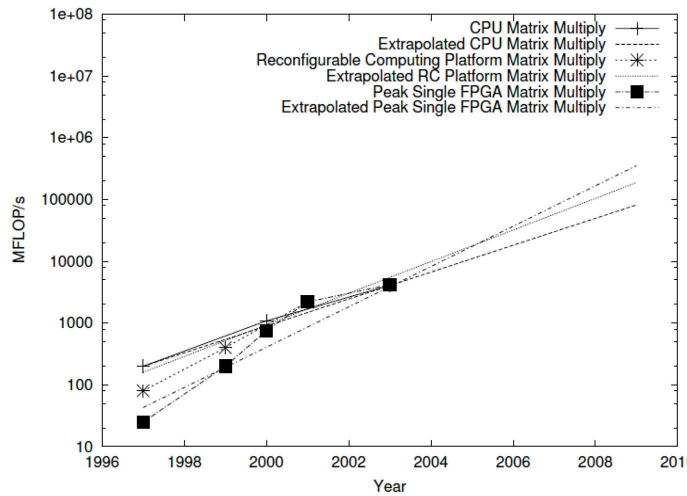

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This paper presents a performance study of double precision, floating-point, dense matrix operations implemented on several conventional microprocessor and FPGA platforms, predicting that FPGA peak performance on these operations will outstrip commodity CPU's and offer the promise of significantly higher future performance. To support these predictions, issues of memory bandwidth and on-chip/off-chip memory size are examined in detail.

The dense matrix operations implemented in this paper are members of the Basic Linear Algebra Subroutines (BLAS) library, an industry standard library defined by Jack Dongarra et al. in the late 1970's. BLAS, in turn, is closely tied to the LINPACK benchmark that has become the standard to gauge the performance of high performance scientific computers. Many microprocessor companies, such as Intel and AMD, have spent a great deal of time and money optimizing their versions of these libraries to give the highest performance on their products.

The contribution of this paper is the recognition of the emergence of high-performance, double precision, floating-point FPGA arithmetic that challenged the long held position of the commodity microprocessor in scientific computing. This was particularly significant since floating-point computations were not generally considered viable on FPGAs just a few years prior to this paper. This seminal paper also sparked a flurry of research in FPGA applications that require double precision floating-point arithmetic.

Since the publication of this paper, the rapid rise of scientific computing on Graphics Processor Units (GPU's) has currently eclipsed both conventional microprocessors and FPGAs alike in many, if not most, floating-point applications.

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