

FFTC : Fastest Fourier Transform for the IBM Cell Broadband Engine

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Abstract

The Sony-Toshiba-IBM Cell Broadband Engine is a heterogeneous multicore chip architected for intensive gaming applications and high performance computing. It consists of a traditional microprocessor (called the PPE) that controls eight SIMD co-processing units called synergistic processor elements (SPEs). We exploit the architectural features of the Cell processor to design an efficient parallel implementation of Fast Fourier Transform (FFT). FFT is of primary importance and a fundamental kernel in many computationally intensive scientific applications. There have been several attempts to develop a fast implementation of FFT on the Cell, but none have been able to achieve high performance for several thousand points with complex inputs. We use an iterative out-of-place approach to design our parallel implementation of FFTs with 1K to 16K complex input samples. We demonstrate a performance of 15 GigaFlop/s for a FFT on input of 8K complex samples. Our implementation beats FFTW on Cell by several GigaFlops/s for these input sizes and outperforms Intel Duo Core (Woodcrest) for input size $> 4K$. To our knowledge we have the fastest FFT for these range of complex input samples.
