Radar Pulse Compression Using the NVIDIA CUDA SDK

Stephen Bash, David Carpman, and David Holl

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NVIDIA Compute Unified Device Architecture SDK

- Create custom kernels that run on GPU
- Extension of C language
- Provides driver- and runtime-level APIs
- Includes numerical libraries
  - CUFFT
  - CUBLAS
- $/GFLOP \rightarrow \text{GPU} = \$1.27 \quad \text{CPU} = \$29.18$

HPEC 07:

Benchmarking the NVIDIA 8800GTX with the CUDA Development Platform

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![Chart](chart.png)
Radar Pulse Compression

- Waveform design and processing to achieve higher range resolution and sensitivity*

- Processing consists of convolution with FIR filter
  - Doppler tolerant (top): traditional frequency domain convolution
  - Doppler intolerant (bottom): additional FFT and Doppler correction required

GPU vs. CPU Comparison

- CPU vs GPU comparison in real-world conditions
  - 2 GHz dual quad-core AMD Opterons vs eVGA eGeForce 8800 Ultra
  - Memory transfer to and from GPU included in timing

![Graph showing CPU vs. GPU comparison](image)

![Graph showing processing time per stage](image)

MIT Lincoln Laboratory
As of July 2007, these products represent the top of the line consumer CPU and graphics card according to floating point computational power:

1. **Kentsfield Core 2 Extreme QX6800**
   - 37.7 GFLOPS – fastest CPU as of 7/16/2007
   - $1100 – price as of March 10, 2008
   - [http://www.google.com/products?q=Kentsfield+Core+2+Extreme+QX6800](http://www.google.com/products?q=Kentsfield+Core+2+Extreme+QX6800)
   - $/GFLOPS = $29.18
   - Notes: Price excludes motherboard + power supply + memory + GPU

2. **EVGA GeForce 8800 Ultra Superclocked (NVIDIA)**
   - 576 GFLOPS – theoretical peak
   - $730 – price as of March 10, 2008
   - $/GFLOPS = $1.27
   - Notes: Price includes 768 MB GDDR3 memory, but excludes: motherboard + power supply + CPU