Performance Analysis of Application Kernels in Multi/Many-Core Architectures

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Overview

- Performance comparison of application kernels.
- Image Convolution, Histogram and Bilateral filtering
- Multi-core CPU, many-core NVIDIA GPUs and GeMTC (GPU enabled Many Task Computing)

Proposed Work

- Performance analysis of Histogram, Image convolution, Bilateral filtering.
- These kernels have a large amount of data-level parallelism.
- All these applications are executed in CPU, GPU and GeMTC.
- GeMTC is an execution model and runtime system which enables NVIDIA GPUs to be programmed with many concurrent and independent tasks of potentially short or variable duration.
- The target test bed for this implementation is GTX 670 GPU with AMD Phenom(tm) II X6 1100T Processor with 6GB RAM.
- For GPU, the test are conducted with varying threads and varying problem size.
- Throughput and FLOPS are taken as performance analysis factor.
- Through this we better understand the behavior of different applications that belong to the Many-Task Computing paradigm.

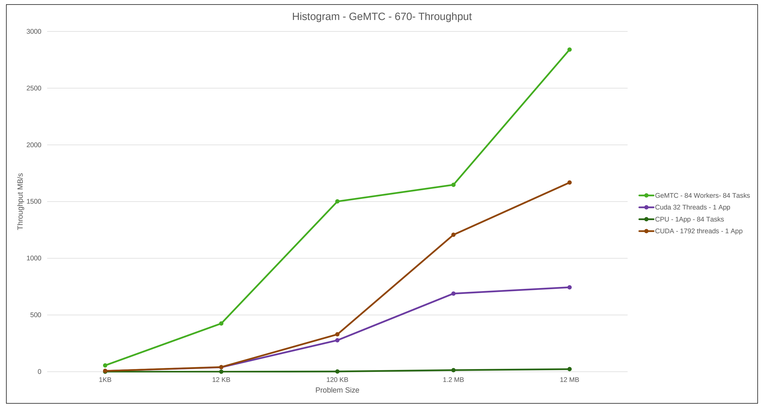
Conclusion & Future Work

- GPU and GeMTC performs really well when compared to CPU.
- More speedup compared to CPU
- Many factors contributed to the reported large gap in performance, such as which CPU and GPU are used and what optimizations are applied to the code.
- Future Work includes explore additional application for GeMTC, improving locking mechanism in GeMTC to improve total run time. Integrating with Swift/T.

Reference

- GeMTC - http://datasys.cs.iit.edu/projects/GeMTC
- NVIDIA - nvidia.com/object/cuda_home_new.htm
- Lee, Victor W., et al. "Debunking the 100X GPU vs. CPU myth: an evaluation of throughput computing on CPU and GPU".
- Bilateral Filtering with CUDA, Lasse Klojgaard Staal, University of Aarhus

Histogram



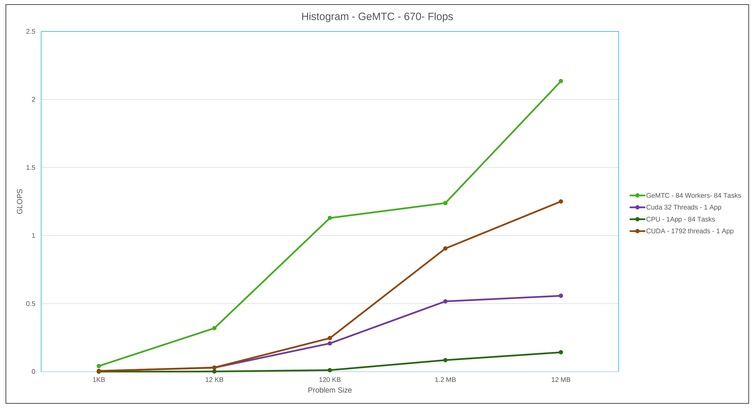
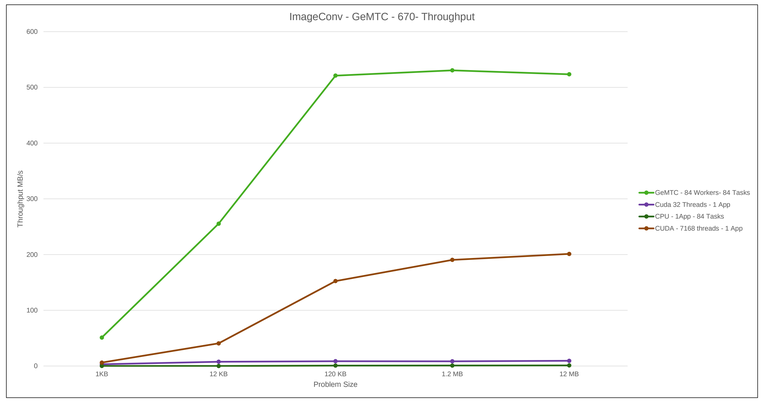
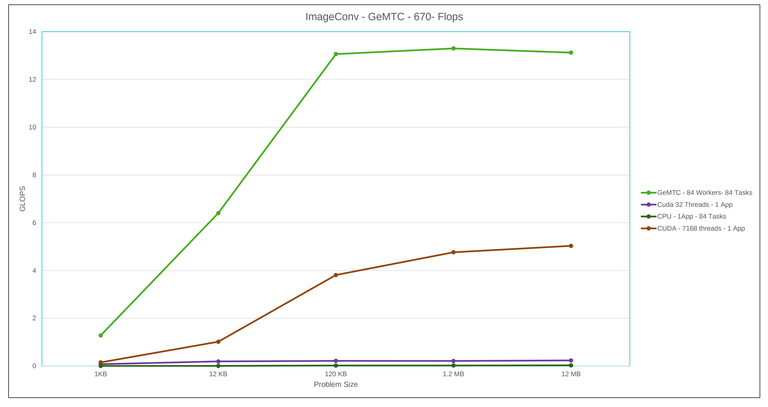


Image Convolution





Bilateral Filtering