Université de Pau et des Pays de l'Adour
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M2-BigData : GPGPU
Chapter 8 – Exercice 2

Objectives

Improve the convolution kernel from previous exercice.

Instructions

From your previous program, implement the following elements :

— tile in shared memory, using dynamic shared memory allocation (`extern __shared__ float tile[];` in the kernel and the size in byte is given as the third parameter of `<<<>>>` kernel call syntax).
— threads grid dimensions must be computed from output tile size and block dimensions is computed from tile size.
— Implement the constraints on tile and output tile in the kernel
— Do not forget appropriate threads synchronizations.

Questions

1. How many floating operations are being performed in your convolution kernel ? explain.
2. How many global memory reads are being performed by your kernel ? explain.
3. How many global memory writes are being performed by your kernel ? explain.
4. Compute the arithmetic intensity of the kernel. Compare with the previous version.
5. Measure the kernel computational time of the kernel, using the profiler. Then, compute the computational power of the kernel (in GFLOPS). Compare with the CPU version given.
6. Compare the computational power evolution using different images sizes. Compare with the evolution from previous version. Compare with the theoretical power obtained from chapter 2 exercice 2 ? Give an explanation.