OpenCL Tutorial

CEPHIS

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Let’s get some relief

Goals

- •Compile and Use our first OpenCL kernel
- Use the emulator
- Use the early estimator
- Execute in the real FPGA platform
- Familiarize with the tutorial infrastructure setup

Compiling for the Emulator

YOU DO...

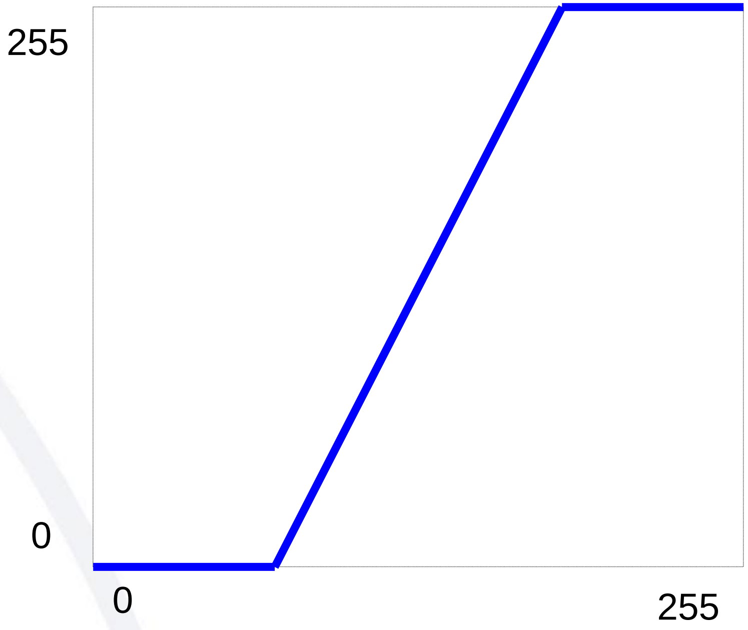
- Open a Terminal
  - module load intelfpga-opencl-17.1
  - /opt/netbeans-8.2/bin/netbeans
- Go to LAB1_2_cpu
  - right click build to compile it
- Open another Terminal
  - go to ../LABs/LAB1.2/fpga
  - make
    - it will compile the emulation version of the system

The Code

```
#define FRAC_NUM 3
#define FRAC_DEN 2
#define N 64

__kernel void contrast(int inv, __global int* outv)
{
   int s1 = inv * FRAC_NUM;
   int s2 = s1 / FRAC_DEN;
   int s3 = s2 - N;

   *outv =  (s2 < N) ? 0 : (s3 > 255) ? 255 : s3;
}
```



Execute with the Emulator

YOU DO...

- Execute the
  - go to ../LABs/LAB1.2/cpu
  - make
    - it will compile host (it is the same that you did in netbeans with build)
  - execute
    - The emulator needs export CL_CONTEXT_EMULATOR_DEVICE_ALTERA=1 (the fpga make does it)
  - **You get a crash dump (INTEL BUG)**

Early Estimation

YOU DO...

- Execute the
  - go to ../LABs/LAB1.2/fpga
  - make early
    - it will run the “aoc -c” command to compile an early version of the design (no FPGA place & route)
  - open the contrast/reports/report.html
    - you can do it from netbeans (right click “view”)
    - or from terminal “firefox contrast/reports/report.html”

WHY SO MUCH RESOURCE CONSUMPTION?

FPGA compilation

YOU NOT DO THIS UNLESS NECESSARY...

- Execute
  - go to ../LABs/LAB1.2/fpga
  - make submit
    - it will connect you to the compilation cluster and submit a job to SLURM
  - make status
    - to query the queue

Real Execution

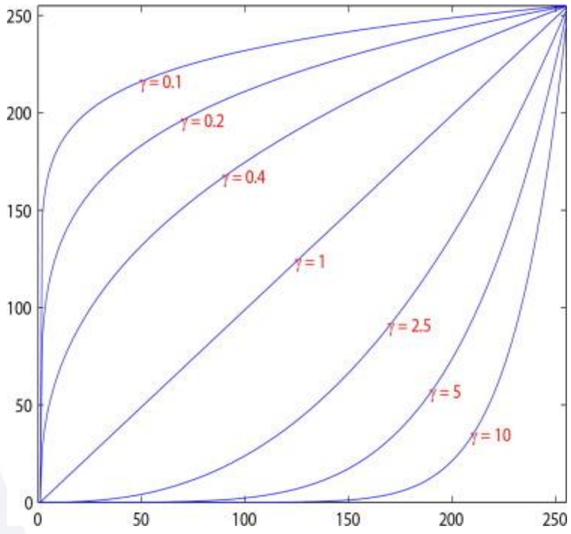
YOU DO...

- Execute
  - –go to ../LABs/LAB1.2/fpga
  - –make deploy
    - it will connect you to mountain machine
  - – navigate to .../LABs/LAB1.2/fpga
  - – make download
    - •it will download the compiled file
  - – go to ../cpu
  - – execute the app “./test_contrast”

Floating Point

- Floating point implementations in FPGA where not common
  - More complex
  - Typically less energy efficient that fixed point

- Do ../LABs/LAB1.3/ for a floating point version of Gamma correction



Accelerating?

- We did some FPGA designs, but we are not accelerating...

WHY?