

SpaceE FPGA Users Workshop, 2nd Edition

Algorithm implementation on ATF280 and CPUGEN board

LAURENT PERRAUD

CNES DCT/TV/AV

Summary

- **Instance of algorithm implementation:**

- **FFT**
- **DCT2D**
- **JPEG**

FFT Implementation

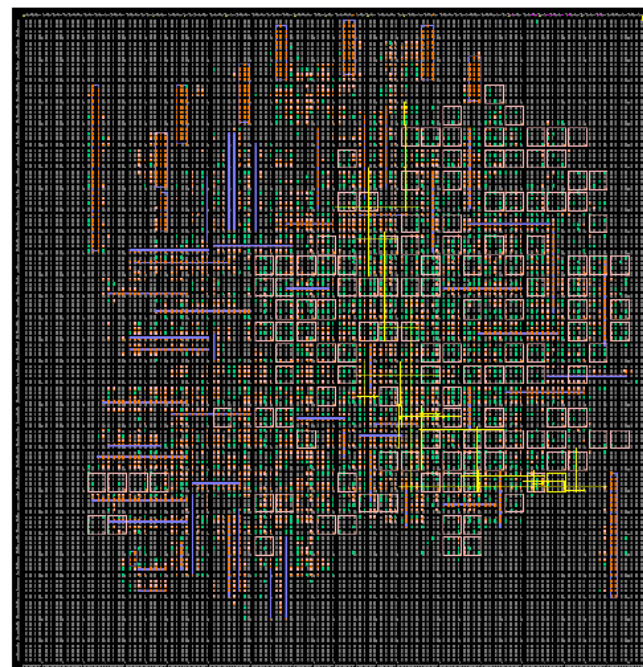
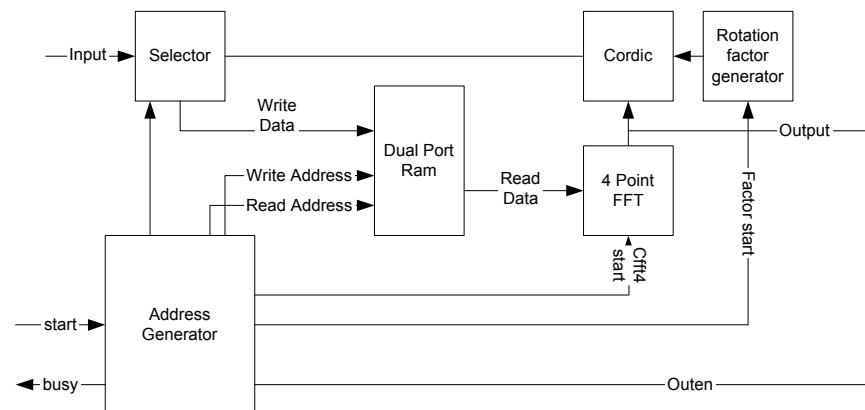
□ Main features:

- FFT complex : 1D 1024 points of 12bits
- Algorithm used : Radix-4
- Take advantage of ATF280 FreeRam

□ Results:

- Performances :
 - ◆ 330μs / FFT on ATF280
- Max Frequency : 15,6MHz on ATF280
- ATF280 utilization:

Cells	Utilization	Percentage
Core Cells	3997	28%
FreeRam	137	16%



DCT2D Implementation

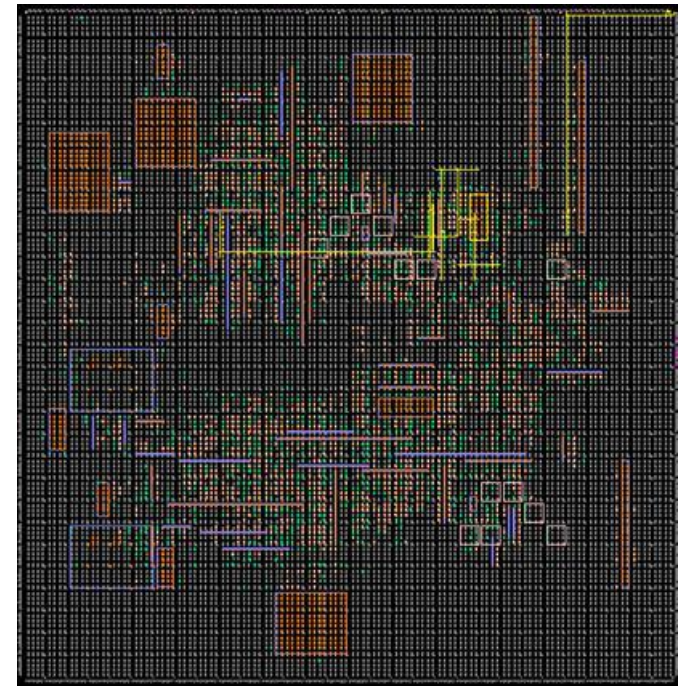
❑ Main features:

- DCT 2D: block 8*8pixels of 8bits
- Algorithm used : AAN algorithm
- Take advantage of ATF280 Multipliers

❑ Results:

- Performances :
 - ✦ 3,4µs / DCT2D 8*8 on ATF280
- Max Frequency : 19,0MHz on ATF280
- ATF280 utilization:

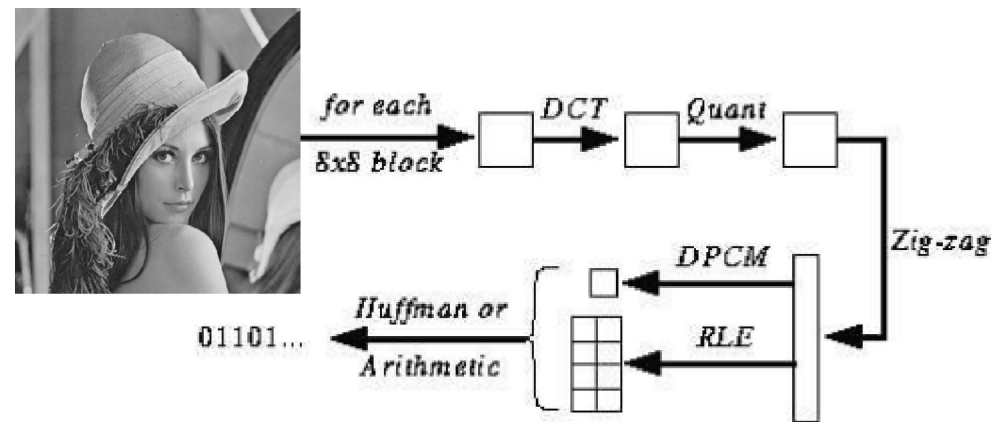
Cells	Utilization	Percentage
Core Cells	3645	25%
FreeRam	33	3,6%



JPEG Implementation (1/2)

□ Main features:

- JPEG: 512*512pixels of 8bits
- Take advantage of ATF280 Multipliers
- Algorithm:



□ Implementation:

- As Huffman coding is well suited for software implementation, the processing is optimized by sharing it between ATF280 and GR712 :
 - ◆ DCT , Quantizer , Zig-Zag, RLE are implemented on ATF280
 - ◆ Huffman coding is implemented on software on GR712

JPEG Implementation (2/2)

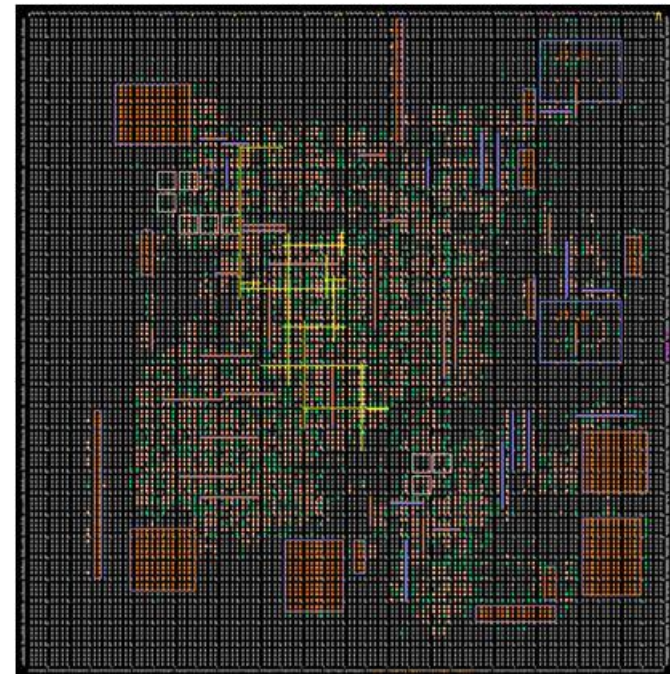
□ Results:

● Performances :

- ◆ 16ms / image 512*512pixels on ATF280
- ◆ Max Frequency : 17,8MHz on ATF280

● ATF280 utilization:

Cells	Utilization	Percentage
Core Cells	4449	31%
FreeRam	33	3,9%





Thanks for your attention