

## A brief report on implementing GPU arithmetic coder.

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compression<sup>1</sup> and decompression<sup>1</sup> - real speed including all mem copy and disk operations.

compression<sup>2</sup> and decompression<sup>2</sup> - maximum speed (only GPU kernels execution time).

HW:

GPU – GTX680

CPU – Core i7 3770, 3.4 Ghz.

- AC\_CPU – block-based arithmetic coder on CPU.
- AC\_GPU – block-based arithmetic coder on GPU.
- LZMA – LAZM from 7z.

Test 1 – The book “War and Piece.” Size = 4.8 MB.

implementation	coeff	compression <sup>1</sup>	compression <sup>2</sup>	decompression <sup>1</sup>	decompression <sup>2</sup>
AC_CPU	1.61	13.3 MB/s	13.7 MB/s	12.2 MB/s	12.5 MB/s
<b>AC_GPU</b>	<b>1.61</b>	<b>220 MB/s</b>	<b>615 MB/s</b>	<b>237 MB/s</b>	<b>554 MB/s</b>
LZ4-c0	1.49	49.8 MB/s	49.8 MB/s	334 MB/s	334 MB/s
LZ4-c1	2.08	22.8 MB/s	22.8 MB/s	360 MB/s	360 MB/s
LZMA	4.0	~4.7 MB/s	~4.7 MB/s	?	?

Test number 2 – disassembled executable. Size = 72.0 MB.

implementatio n	coeff. comp.	compression <sup>1</sup>	compression <sup>2</sup>	decompression <sup>1</sup>	decompression <sup>2</sup>
AC_CPU	2.01	17.0 MB/s	17.5 MB/s	14.1 MB/s	14.4 MB/s
<b>AC_GPU</b>	<b>2.01</b>	<b>293 MB/s</b>	<b>912 MB/s</b>	<b>325 MB/s</b>	<b>932 MB/s</b>
LZ4-c0	4.8	505 MB/s	505 MB/s	889 MB/s	889 MB/s
LZ4-c1	7.0	43.5 MB/s	43.5 MB/s	989 MB/s	989 MB/s
LZMA	18.0	~3.3 MB/s	~3.3 MB/s	~200 MB/s ?	~200 MB/s ?

Test number 3 –uniformly distributed “a” and “b”. Size =128 MB.

implementation	coeff. comp.	compression <sup>1</sup>	compression <sup>2</sup>	decompression <sup>1</sup>	decompression <sup>2</sup>
AC_CPU	6.9	13.2 MB/s	13.6 MB/s	19.9 MB/s	19.3 MB/s
<b>AC_GPU</b>	<b>6.9</b>	<b>366 MB/s</b>	<b>1094MB/s</b>	<b>418 MB/s</b>	<b>1087 MB/s</b>
LZ4-c0	1.66	392 MB/s	505 MB/s	531 MB/s	531 MB/s
LZ4-c1	3.8	2.5**MB/s	43.5 MB/s	859 MB/s	859 MB/s
LZMA	3.5	~2.8 MB/s	~2.8 MB/s	~200 MB/s	~200 MB/s

\*\* It seems some-thing was broken in LZ4-c1, like hash-tables. I checked it several times

Test 3 - PNG файл, size = 2.6 MB.

implementation	coeff. comp.	compression <sup>1</sup>	compression <sup>2</sup>	decompression <sub>1</sub>	decompression <sup>2</sup>
AC_CPU	0.98	9.4 MB/s	9.7 MB/s	9.8 MB/s	10.0 MB/s
<b>AC_GPU</b>	<b>0.98</b>	<b>193 MB/s</b>	<b>610 MB/s</b>	<b>213 MB/s</b>	<b>572 MB/s</b>
LZ4-c0	1.0	505 MB/s	505 MB/s	531 MB/s	531 MB/s
LZ4-c1	1.0	33 MB/s	33 MB/s	859 MB/s	859 MB/s
LZMA	1.004	~2.8 MB/s	~2.8 MB/s		