

JVET-L0325
**CE7-Related : High throughput coefficient coding
depending on the sub-block size**

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Summary

- Purpose: to improve the throughput of the arithmetic coding engine
 - By reducing the number of context coded bins for coefficients level coding
- Proposed methods
 - Restrict the maximum number of context coded bins for pass 1 (sig, par, gt1)
 - Restrict the maximum number of context coded bins for pass 2 (gt2)
 - The number of worst case context coded bins is dependent on the sub-block size (4x4, 2x2)

Background

- Four passes of residual coding in VTM2.0.1
 - Syntax elements included in *pass 1* and *pass 2* are coded as context coded bins
 - ***pass 1***: the following flags are transmitted for each scan position using the regular mode:
 - sig_coeff_flag* and, when *sig_coeff_flag* is equal to 1, *par_level_flag* and *rem_abs_gt1_flag*;
 - ***pass 2***: for all scan positions with *rem_abs_gt1_flag* equal to 1, *rem_abs_gt2_flag* is coded using the regular mode of the arithmetic coding engine;
 - ***pass 3***: for all scan positions with *rem_abs_gt2_flag* equal to 1, the non-binary syntax element *abs_remainder* is coded in the bypass mode of the arithmetic coding engine;
 - ***pass 4***: for all scan positions with *sig_coeff_flag* equal to 1, a *sign_flag* is coded in the bypass mode of the arithmetic coding engine.
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- Context-based bin coding is one of the main bottlenecks of the throughput of the arithmetic coding engine

Proposed Methods

- Method I (on top of CE7.1.3a)

Sub-block	HEVC	VTM2.0.1		Method I					
				Test #1		Test #2		Test #3	
4x4	25	48	16	34	2	34	2	34	2
2x2	-	12	4	7	1	4	0	0	0

- Method II (on top of CE7.1.3b)

Sub-block	HEVC	VTM2.0.1		Method II					
				Test #4		Test #5		Test #6	
4x4	25	48	16	28	4	28	4	28	4
2x2	-	12	4	6	2	3	1	0	0

if(cctx.log2CGSize() == 2)	<i>use 2x2 sub-block constraint</i>
else	<i>use 4x4 sub-block constraint</i>

Context Coded Bins Per Coefficient

- Method I

Sub-block	HEVC	VTM2.0.1	Method I		
			Test #1	Test #2	Test #3
4x4	1.56	4	2.25	2.25	2.25
2x2	-	4	2	1	0

- Method II

Sub-block	HEVC	VTM2.0.1	Method II		
			Test #4	Test #5	Test #6
4x4	1.56	4	2	2	2
2x2	-	4	2	1	0

Experimental Results

- Method I

– Test #1: 34/2/7/1, Test #2: 34/2/4/0, Test #3: 34/2/0/0

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
Test #1	0.05%	0.13%	0.18%	0.04%	0.15%	0.15%	0.21%	0.11%	0.18%
Test #2	0.07%	0.14%	0.20%	0.05%	0.24%	0.24%	0.13%	0.09%	-0.04%
Test #3	0.14%	0.78%	0.86%	0.14%	1.37%	1.41%	0.19%	1.95%	2.15%

- Method II

– Test #4: 28/4/6/2, Test #5: 28/4/3/1, Test #6: 28/4/0/0

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
Test #4	-0.17	-0.03	-0.01	-0.07%	0.02%	-0.02%	-0.12%	0.01%	-0.12%
Test #5	-0.14	0.01	0.09	-0.06%	0.17%	0.23%	-0.11%	0.04%	0.01%
Test #6	-0.07	0.63	0.74	0.03%	1.20%	1.29%	-0.09%	1.72%	1.81%

Thank you