JCTVC-F612: Modifications to intra blocks coefficient coding with VLC

VLC Tables

- New intra VLC tables are designed to reflect changes in the coefficient statistic:
  - Introduction of horizontal and vertical scan for 4x4 and 8x8 blocks;
  - Modification of 16x16 and 32x32 block coding.
- Modified mapping between index of the VLC table, vlcNum, used to code {runOfZeros, levelGreaterThanOneFlag} pair and maximum run maxRunIdx for intra luma 4x4, 8x8 and 16x16 (32x32) blocks.
  - Same table used for all block sizes with the exception of vlcNum for maxRunIdx = 28 for 16x16 blocks.
- Tables used to derive variable largeOnePos from trOne and maxRunIdx modified.
  - Table for 16x16 and 32x32 blocks added – currently they share tables with 8x8 blocks. 5x29 element table (8x8 blocks) replaced by 2 tables 2x29 element each (table for 8x8 blocks, table for 16x16 and above blocks).

trOne	maxRunIdx														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0,4	2	2	1	2	2	2	2	4	2	2	2	2	2	4	4
1-3	2	3	3	3	3	4	4	8	4	2	4	4	4	6	6

Results – Tables Update

All Intra LC			Random Access LC			Low delay B LC		
Y	U	V	Y	U	V	Y	U	V
-0.27	-0.31	-0.29	-0.21	-0.29	-0.06			
-0.51	-0.34	-0.39	-0.17	-0.16	-0.19	-0.04	-0.10	-0.08
-0.52	-0.46	-0.47	-0.17	-0.26	-0.25	-0.07	-0.01	-0.16
-0.69	-0.54	-0.56	-0.23	-0.44	-0.09	-0.07	0.03	0.32
-0.39	-0.36	-0.40				-0.09	0.38	-0.93
-0.48	**-0.40**	**-0.42**	**-0.19**	**-0.28**	**-0.15**	**-0.06**	**0.04**	**-0.16**
99%			99%			98%		
101%			99%			101%		

Scans

- Extended usage of strong horizontal (scan row-by row) and strong vertical scan (scan column by column) to 16x16 and 32x32 blocks.

IntraPredMode	Block Size	
	16x16	32x32
0	1	1
1	2	2
2-20	0	0
21-22	1	0
23-28	0	0
29-30	2	0
31-35	0	0

scanIdx= 0 – zig-zag
scanIdx =1 – horizontal
scanIdx =2 - vertical

Values of scanIdx for different intra prediction modes IntraPredMode.

Results - Scans

All Intra LC			Random Access LC			Low delay B LC		
Y	U	V	Y	U	V	Y	U	V
-0.06	-0.18	-0.10	-0.25	-0.46	-0.23			
-0.68	-1.07	-1.03	-0.36	-0.72	-0.61	-0.18	-0.58	-0.64
-0.20	-0.41	-0.44	-0.13	-0.36	-0.38	-0.07	-0.16	-0.08
-0.18	-0.28	-0.13	-0.06	-0.34	-0.02	-0.06	-0.19	-0.24
-0.67	-1.01	-0.72				-0.48	0.37	-0.40
-0.36	**-0.60**	**-0.50**	**-0.21**	**-0.48**	**-0.33**	**-0.18**	**-0.20**	**-0.36**
99%			99%			99%		
99%			98%			100%		

Sub-blocks

- The 16x16 and 32x32 transform coefficients blocks are divided into 4x4 sub-blocks.
- After the position of the last nonzero coefficient is sent, for each 4x4 sub-block two conditions are checked:
  - The number of coded coefficients in this sub-block is larger than 4.
  - The average number of non-zero coefficients in this sub-block in the previously coded blocks is smaller than 3.
- If they are both true, coded-not-coded information (1 bit) is sent for this sub-block.
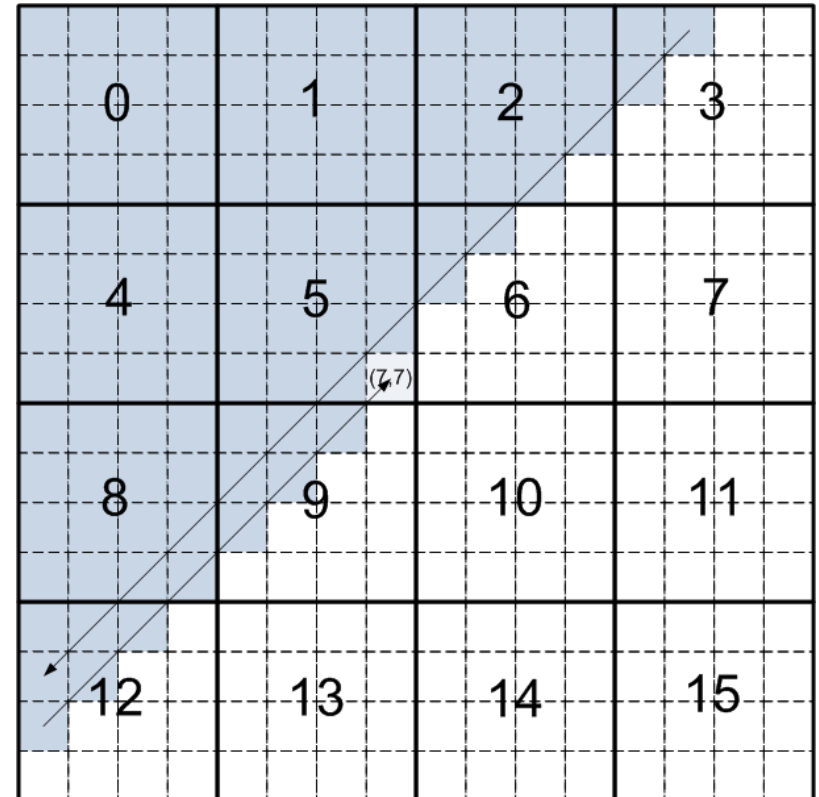
Results – Sub-blocks

All Intra LC			Random Access LC			Low delay B LC		
Y	U	V	Y	U	V	Y	U	V
-0.97	0.17	0.40	-0.24	-0.23	0.38			
-0.72	0.42	0.38	-0.28	0.11	0.28	-0.04	-0.12	-0.28
-0.48	0.28	0.13	-0.27	0.07	-0.11	-0.11	-0.02	-0.13
-0.43	0.04	0.07	-0.21	-0.24	-0.06	-0.05	-0.10	-0.07
-0.66	-0.21	-0.13				-0.21	-0.11	-1.45
-0.65	**0.17**	**0.19**	**-0.25**	**-0.06**	**0.13**	**-0.09**	**-0.09**	**-0.41**
100%			99%			98%		
100%			100%			98%		

Results – Tables, Scans and Sub-blocks

All Intra LC			Random Access LC			Low delay B LC		
Y	U	V	Y	U	V	Y	U	V
-1.26	-0.32	-0.12	-0.48	-0.53	0.04			
-1.74	-0.88	-0.96	-0.69	-0.85	-0.72	-0.24	-0.50	-0.57
-1.19	-0.50	-0.66	-0.59	-0.35	-0.54	-0.18	-0.23	-0.23
-1.24	-0.80	-0.66	-0.48	-0.63	-0.30	-0.13	-0.15	-0.40
-1.60	-1.55	-1.07				-0.48	-1.00	-2.32
-1.41	**-0.78**	**-0.69**	**-0.57**	**-0.61**	**-0.40**	**-0.24**	**-0.44**	**-0.77**
101%			99%			97%		
101%			99%			100%		