

A decorative geometric shape, resembling a stylized star or a series of overlapping triangles, is located on the left side of the slide. It is light gray and partially transparent.

Non-CE6: JVET-N0160

Simplification on transform selection for Intra Sub-Partitions

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Introduction

■ Transform selection for ISP in VTM-4.0

- If $w=1$ or $h=1$, only vertical or horizontal transform
- If $w=2$ or $w \geq 32$, $t_H = \text{DCT2}$
- If $h=2$ or $h \geq 32$, $t_V = \text{DCT2}$
- Otherwise, transform is selected as in following table 1:

Intra mode	t_H	t_V
Planar Ang. 31,32,34,36,37	DST7	DST7
DC Ang. 33, 35	DCT2	DCT2
Ang. 2, 4, 6...28,30 Ang. 39,41,43...63,65	DST7	DCT2
Ang. 3,5,7...27,29 Ang. 38,40,42...64,66	DCT2	DST7

Proposed simplified version 1

- simplified transform selection in ISP with table2
 - Same size restriction as original ISP.
 - transform is selected as in following table2:

Intra mode	t_H	t_V
Planar	DST7	DST7
DC	DCT2	DCT2
Ang. [2-34] && even Ang. [35-66] && odd	DST7	DCT2
Ang. [2-34] && odd Ang. [35-66]&& even	DCT2	DST7

Proposed simplified version 2

- simplified transform selection in ISP with table3
 - Same size restriction as original ISP.
 - transform is selected as in following table3:

Intra mode	t_H	t_V
Planar Ang. [2-66] && odd	DST7	DST7
DC	DCT2	DCT2
Ang. [2-34] && even	DST7	DCT2
Ang. [35-66] && even	DCT2	DST7

Proposed simplified version 3

- simplified transform selection in ISP with table4
 - Same size restriction as original ISP.
 - transform is selected as in following table4:

Sub-block shape	t_H	t_V
W=H	DST7	DST7
W>H	DCT2	DST7
W<H	DST7	DCT2

Experimental Results for version 1

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.04%	-0.03%	100%	99%
Class A2	0.00%	0.08%	-0.03%	101%	99%
Class B	0.00%	0.02%	0.12%	100%	98%
Class C	0.00%	-0.02%	0.00%	101%	101%
Class E	-0.01%	0.02%	-0.04%	101%	99%
Overall	0.00%	0.02%	0.02%	101%	99%
Class D	-0.01%	-0.02%	0.07%	100%	99%
Class F	0.00%	0.03%	-0.06%	100%	98%

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	-0.01%	-0.07%	-0.01%	100%	100%
Class A2	-0.03%	0.00%	0.01%	100%	98%
Class B	-0.01%	0.06%	-0.07%	100%	100%
Class C	0.02%	-0.17%	-0.18%	100%	101%
Class E					
Overall	-0.01%	-0.04%	-0.07%	100%	100%
Class D	0.03%	-0.30%	-0.20%	100%	101%
Class F	-0.01%	-0.10%	0.00%	100%	101%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.00%	-0.16%	-0.03%	100%	99%
Class C	0.00%	0.05%	0.00%	100%	100%
Class E	-0.04%	-0.07%	0.81%	100%	101%
Overall	-0.01%	-0.06%	0.19%	100%	100%
Class D	0.02%	0.99%	0.02%	100%	100%
Class F	-0.10%	-0.44%	-0.15%	101%	99%

Experimental Results for version 2

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	-0.02%	0.04%	-0.05%	100%	99%
Class A2	-0.02%	0.05%	-0.06%	101%	100%
Class B	-0.01%	-0.02%	0.01%	100%	99%
Class C	0.00%	-0.06%	-0.14%	101%	100%
Class E	-0.05%	-0.10%	-0.17%	101%	101%
Overall	-0.02%	-0.02%	-0.07%	101%	100%
Class D	0.02%	-0.01%	-0.17%	101%	102%
Class F	0.01%	0.00%	-0.20%	100%	98%

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	-0.01%	-0.23%	-0.05%	100%	101%
Class A2	-0.01%	-0.07%	0.05%	100%	99%
Class B	0.01%	-0.07%	-0.22%	100%	100%
Class C	0.03%	-0.08%	-0.13%	100%	101%
Class E					
Overall	0.01%	-0.10%	-0.11%	100%	100%
Class D	-0.01%	-0.31%	-0.43%	100%	101%
Class F	0.00%	-0.09%	0.02%	100%	100%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.01%	0.02%	0.05%	100%	100%
Class C	-0.03%	0.31%	-0.10%	100%	100%
Class E	0.04%	0.66%	0.95%	100%	102%
Overall	0.00%	0.27%	0.22%	100%	101%
Class D	-0.02%	-0.06%	0.26%	100%	99%
Class F	-0.11%	-0.23%	-0.56%	101%	100%

Experimental Results for version 3

	All Intra Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.02%	0.04%	-0.04%	100%	100%
Class A2	0.02%	0.13%	0.00%	100%	100%
Class B	0.03%	0.09%	0.14%	100%	99%
Class C	0.07%	0.03%	0.08%	100%	101%
Class E	0.13%	0.16%	0.13%	101%	102%
Overall	0.05%	0.09%	0.07%	100%	100%
Class D	0.05%	0.01%	-0.04%	101%	100%
Class F	0.00%	0.13%	0.09%	100%	98%

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.01%	0.01%	-0.02%	100%	100%
Class A2	0.00%	0.06%	-0.07%	100%	98%
Class B	0.03%	0.10%	-0.03%	100%	100%
Class C	0.07%	0.08%	0.05%	100%	102%
Class E					
Overall	0.03%	0.07%	-0.02%	100%	100%
Class D	0.03%	-0.09%	-0.05%	101%	102%
Class F	0.01%	0.00%	-0.09%	100%	102%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.01%	-0.10%	-0.53%	100%	101%
Class C	-0.02%	0.34%	-0.12%	100%	99%
Class E	0.08%	0.44%	0.19%	101%	101%
Overall	0.02%	0.18%	-0.22%	100%	100%
Class D	-0.07%	-0.37%	-0.57%	100%	100%
Class F	-0.08%	-0.07%	-0.37%	100%	99%

Conclusion

- This contribution proposed 3 simplified transform selection for ISP:
 - simplification 1: all angular mode with parity switching.
 - simplification 2: odd angular mode fixed with (DST7,DST7).
 - simplification 3: based on isp shape instead of intra mode.
- Summary of experimental results

	All Intra Main10					Random access Main10					Low delay B Main10				
	Over VTM-4.0					Over VTM-4.0					Over VTM-4.0				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Method1	0.00%	0.02%	0.02%	101%	99%	-0.01%	-0.04%	-0.07%	100%	100%	-0.01%	-0.06%	-0.19%	100%	100%
Method2	-0.02%	-0.02%	-0.07%	101%	100%	0.01%	-0.10%	-0.11%	100%	100%	0.00%	0.27%	0.22%	100%	101%
Method3	0.05%	0.09%	0.07%	100%	100%	0.03%	0.07%	-0.02%	100%	100%	0.02%	0.18%	-0.22%	100%	100%

- It is recommendable to be adopt in the VTM.
- Thanks Tencent for the cross-checking.