

CE2 subtest C.1: Harmonization of unified scan and NSQT

JCTVC-G517

Geneva, CH, November 2011

Motivation

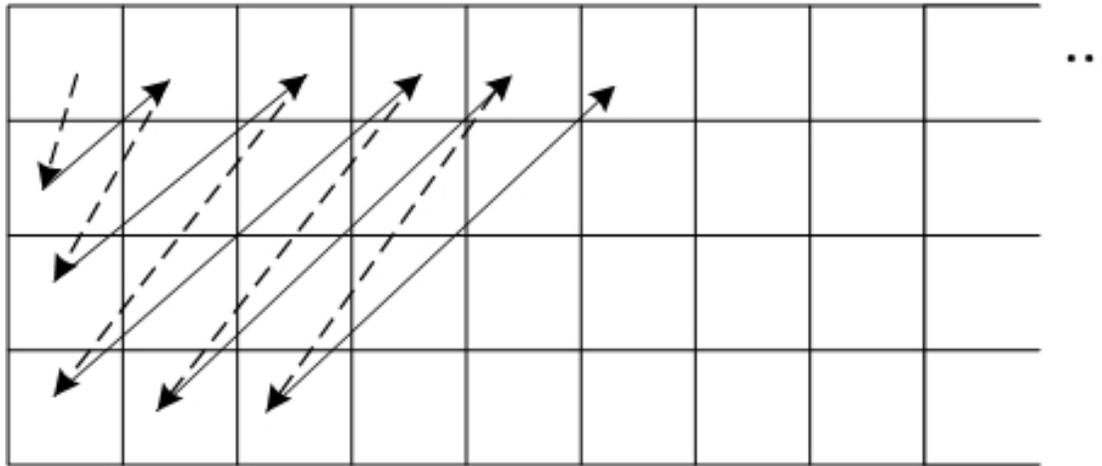
- Remove $2N \times 0.5N$ / $0.5N \times 2N$ to $N \times N$ coefficient data reordering process at non-square block CABAC coefficient coding
- Harmonize unified scan and NSQT
- Explore the relationship between unified scan for non-square block and removal of non-square residual data transpose (bug fixed for NSQT)

Background

- A data reordering process is used to map $2N \times 0.5N$ / $0.5N \times 2N$ coefficient to $N \times N$ coefficient when CABAC is used
 - ◆ Reordering process is used prior to coefficient coding at encoder side
 - ◆ Reordering process is used after coefficient decoding at decoder side
- Unified scan and diagonal scan have been adopted at Torino meeting
 - ◆ 4x4 subblock scan is removed
 - ◆ 4x4 coefficient scan inside a larger block is also removed
 - ◆ Diagonal scan is used to derive coefficient position when CABAC is used

Harmonization solution

- $2N \times 0.5N$ / $0.5N \times 2N$ diagonal scan are used to derive non-square block coefficient position



Harmonization solution (continue)

- Modification of ctxInc for last_significant_coeff_x and ctxIdxIncH last_significant_coeff_y
 - ◆ ctxInc of last_significant_coeff_x and last_significant_coeff_y is updated depending on the length of width and height of a non-square block
- Modification of ctxInc for significant_coeff_flag
 - ◆ 16x4 / 4x16 block: same derivation process as 8x8 block
 - ◆ 32x8 / 8x32 block: same derivation process as 16x16 block

Test results

- Reference: HM4.0
- Tested: HM4.0 + G517
(without classF)

	Random Access HE		
	Y	U	V
Class A	0.0%	-0.1%	-0.2%
Class B	0.0%	0.1%	0.0%
Class C	0.0%	-0.1%	0.0%
Class D	0.0%	0.0%	0.1%
Class E			
Overall	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%
Enc Time[%]	100%		
Dec Time[%]	99%		

	Low delay P HE		
	Y	U	V
Class A			
Class B	0.0%	0.2%	0.4%
Class C	0.0%	0.0%	0.0%
Class D	0.1%	-0.1%	-0.6%
Class E	0.0%	-0.5%	-0.2%
Overall	0.0%	-0.1%	-0.1%
	0.0%	-0.1%	-0.2%
Enc Time[%]	101%		
Dec Time[%]	99%		

	Low delay B HE		
	Y	U	V
Class A			
Class B	0.0%	0.2%	0.2%
Class C	0.0%	0.0%	0.1%
Class D	0.0%	0.1%	-0.3%
Class E	0.1%	-0.3%	0.6%
Overall	0.0%	0.0%	0.1%
	0.0%	0.0%	0.1%
Enc Time[%]	101%		
Dec Time[%]	98%		

Test results (continue)

- Reference: HM4.0
- Tested: HM4.0 + G517 with classF

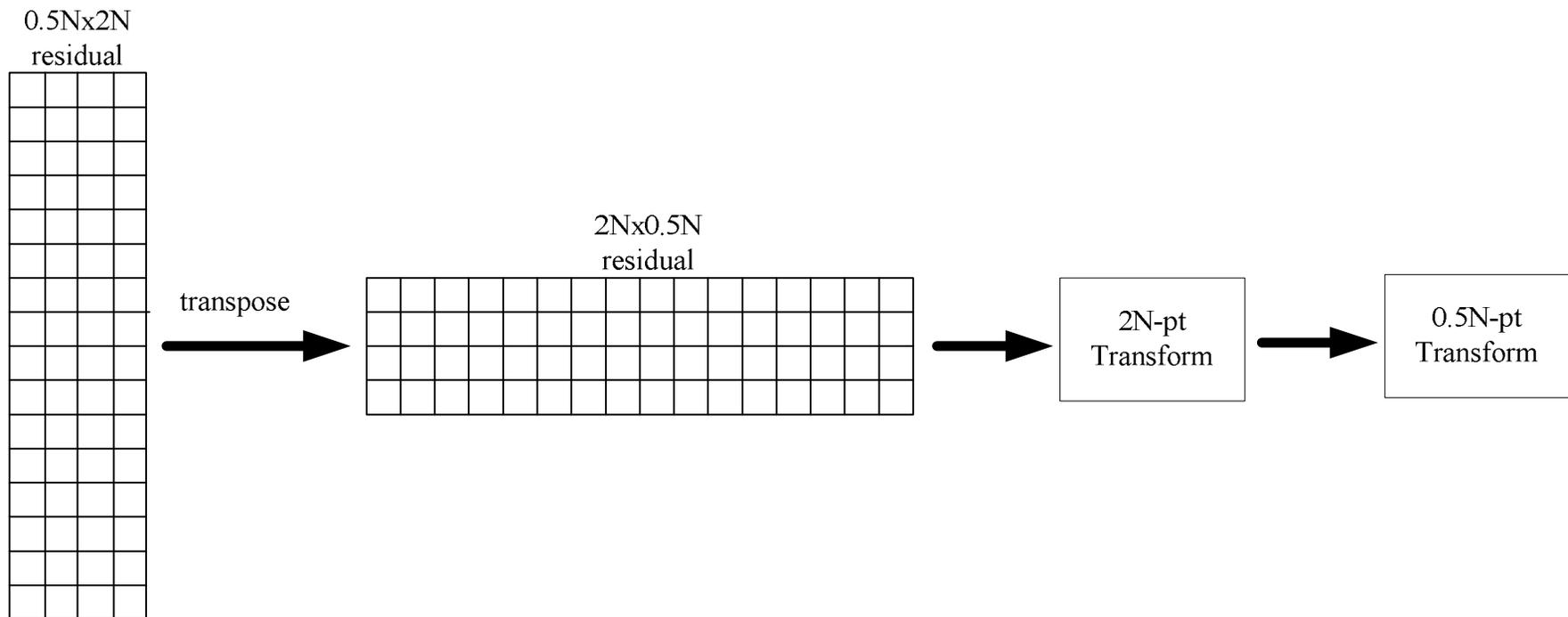
	Random Access HE		
	Y	U	V
Class A	0.0%	-0.1%	-0.2%
Class B	0.0%	0.1%	0.0%
Class C	0.0%	-0.1%	0.0%
Class D	0.0%	0.0%	0.1%
Class E			
Class F	0.0%	-0.1%	-0.1%
Overall	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%
Enc Time[%]	99%		
Dec Time[%]	99%		

	Low delay P HE		
	Y	U	V
Class A			
Class B	0.0%	0.2%	0.4%
Class C	0.0%	0.0%	0.0%
Class D	0.1%	-0.1%	-0.6%
Class E	0.0%	-0.5%	-0.2%
Class F	-0.3%	-0.2%	-0.2%
Overall	0.0%	-0.1%	-0.1%
	0.0%	-0.1%	-0.2%
Enc Time[%]	99%		
Dec Time[%]	99%		

	Low delay B HE		
	Y	U	V
Class A			
Class B	0.0%	0.2%	0.2%
Class C	0.0%	0.0%	0.1%
Class D	0.0%	0.1%	-0.3%
Class E	0.1%	-0.3%	0.6%
Class F	-0.2%	-0.1%	0.0%
Overall	0.0%	0.0%	0.1%
	0.0%	0.0%	0.1%
Enc Time[%]	98%		
Dec Time[%]	98%		

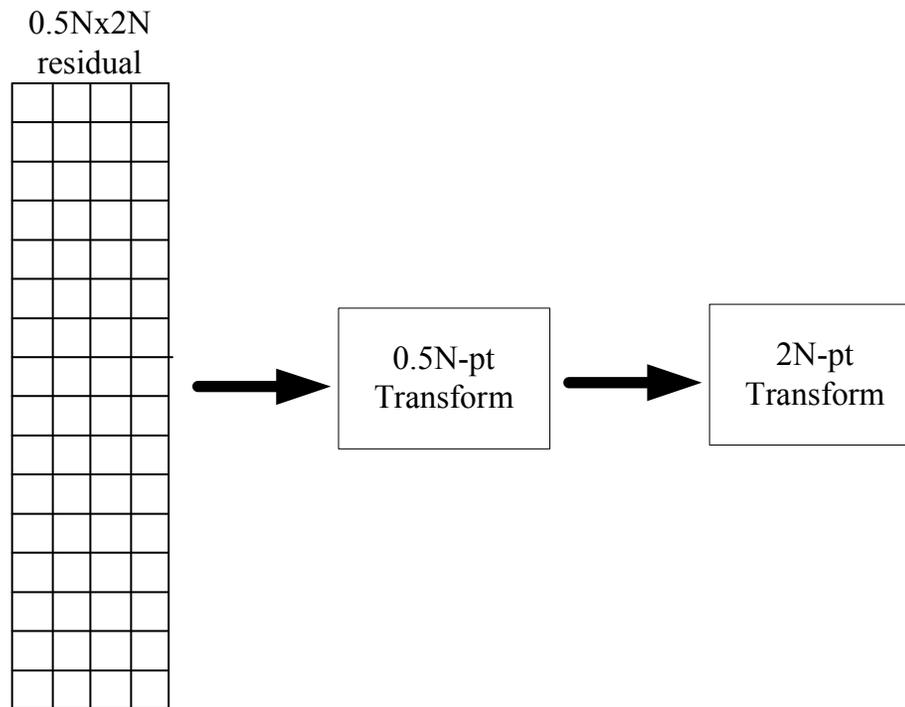
Harmonization solution + Removal of non-square residual data transpose

- At NSQT design, a mismatch exists between HM and working draft
 - ◆ $0.5N \times 2N$ residual is transposed to $2N \times 0.5N$ data, then $2N \times 0.5N$ transform is used



Harmonization solution + Removal of non-square transform data reordering (continue)

- A ticket (#214) has been submitted to HM bug tracker to fix the mismatch
 - ◆ Remove residual transpose process, and use $0.5N \times 2N$ transform directly



Test results

- Reference: HM4.0
- Tested: HM4.0 + G517 +
Remove 0.5Nx2N to 2Nx0.5N
residual transpose

	Random Access HE		
	Y	U	V
Class A	0.0%	-0.2%	-0.3%
Class B	0.0%	0.1%	0.1%
Class C	0.0%	-0.1%	0.0%
Class D	0.0%	-0.1%	0.0%
Class E			
Overall	0.0%	-0.1%	-0.1%
	0.0%	-0.1%	0.0%
Enc Time[%]	102%		
Dec Time[%]	100%		

	Low delay B HE		
	Y	U	V
Class A			
Class B	0.0%	0.2%	0.2%
Class C	0.0%	0.0%	-0.1%
Class D	0.0%	0.3%	0.3%
Class E	0.0%	0.4%	0.4%
Overall	0.0%	0.2%	0.2%
	0.0%	0.1%	0.1%
Enc Time[%]	101%		
Dec Time[%]	96%		

Test results (continue)

- Reference: HM4.0
- Tested: HM4.0 – Removal of residual transpose
- Test condition: JCTVC-F900

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0%	-0.1%	-0.1%	0.0%	0.1%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.1%	0.0%	0.0%	-0.1%	0.0%
Class E						
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]		100%			100%	
Dec Time[%]		101%			100%	

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	-0.2%	-0.1%	0.0%	0.0%	0.1%
Class C	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%
Class D	0.0%	0.1%	-0.2%	0.0%	0.2%	-0.1%
Class E	-0.1%	-0.1%	0.2%	0.0%	0.1%	-0.1%
Overall	0.0%	-0.1%	0.0%	0.0%	0.1%	-0.1%
	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%
Enc Time[%]		100%			100%	
Dec Time[%]		99%			98%	

Conclusion

- Coefficient reordering process is removed from the harmonization solution
- No negative impact on coding performance
- Recommend to adopt harmonization solution of unified scan and NSQT
- Recommend to remove NSQT mismatch between working draft and software, adopt the change to software

Thanks HHI's help on cross-checking!



Thank you!

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