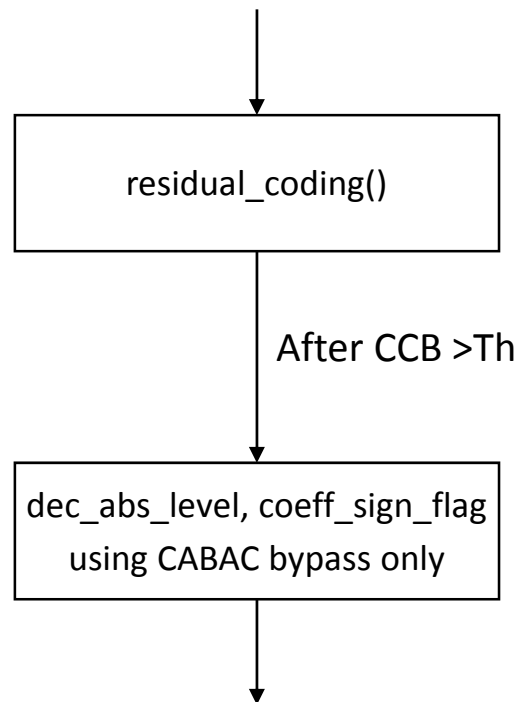


Non-CE7: Unification of residual syntaxes after CCB count exceeds the maximum number (JVET-O0406)

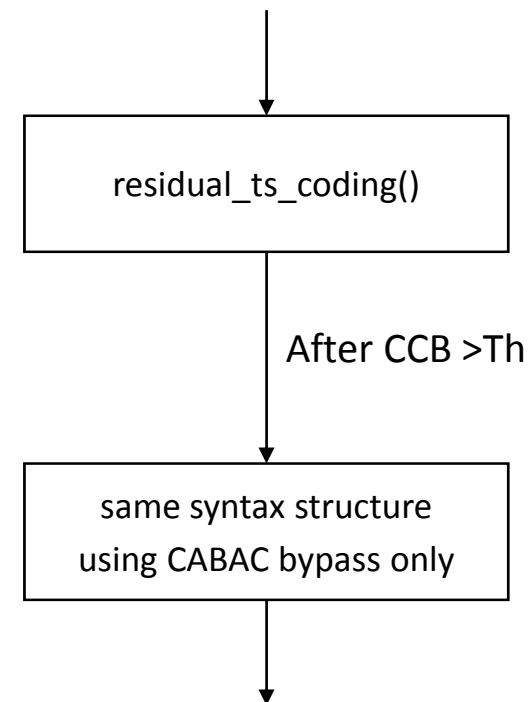
Y. Kato, K. Abe, T. Toma
Panasonic Corporation

VTM5.0 specification

Trans residual coding:



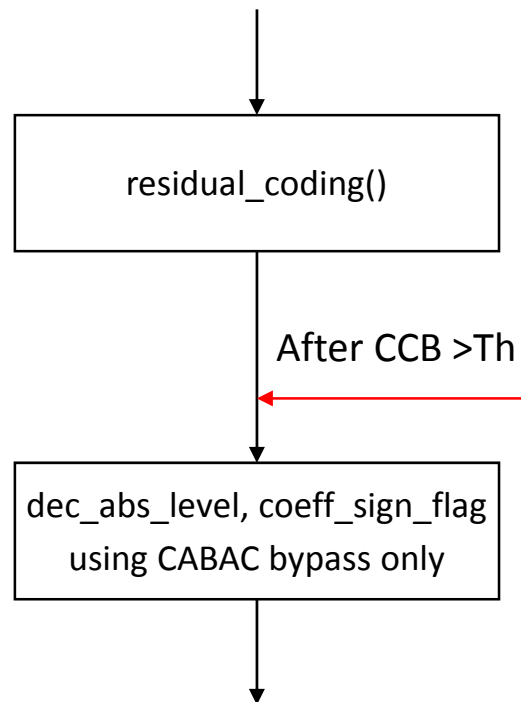
Transskip residual coding:



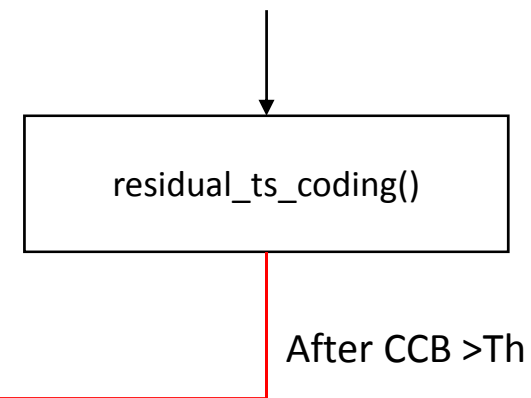
← Completely different →

Proposal

Trans residual coding:



Transskip residual coding:



Proposal

Method1:

Completely same processing as that of trans residual.

Method2:

With following modifications of transskip residual on top of Method1.

- Disable poszero mapping
- Refer 2 neighboring samples instead of 5 for rice parameter prediction.

Simulation results

Method1 (standard QP)

	All Intra Main10				
	Over VTM-5.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	-0.02%	0.00%	100%	100%
Class A2	0.00%	-0.02%	-0.02%	101%	99%
Class B	0.00%	-0.05%	0.03%	100%	101%
Class C	0.02%	-0.08%	-0.04%	101%	102%
Class E	0.02%	0.03%	-0.01%	100%	101%
Overall	0.01%	-0.03%	-0.01%	100%	101%
Class D	0.01%	0.03%	0.18%	100%	102%
Class F	0.13%	0.07%	0.14%	101%	100%
TGM	0.35%	0.35%	0.34%	101%	102%

On average, there are almost no coding loss. Some coding losses are seen for TGM.

	Random Access Main 10				
	Over VTM-5.0				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.00%	0.02%	101%	100%
Class A2	0.00%	-0.02%	0.05%	100%	100%
Class B	0.01%	0.03%	-0.22%	100%	100%
Class C	-0.03%	-0.20%	-0.12%	100%	101%
Class E					
Overall	-0.01%	-0.05%	-0.09%	100%	100%
Class D	0.06%	-0.12%	0.16%	101%	99%
Class F	0.11%	0.13%	0.10%	101%	100%
TGM	0.18%	0.22%	0.23%	101%	100%

	Low delay B Main10				
	Over VTM-5.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.00%	0.17%	0.00%	101%	99%
Class C	0.04%	0.13%	-0.10%	100%	100%
Class E	0.17%	-0.27%	0.05%	100%	100%
Overall	0.06%	0.05%	-0.02%	100%	100%
Class D	0.01%	-0.37%	0.74%	100%	100%
Class F	0.01%	-0.12%	0.27%	100%	100%
TGM	0.13%	0.05%	0.11%	101%	100%

Simulation results

■ Method2 (standard QP)

All Intra Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.00%	-0.01%	-0.02%	99%	100%
Class A2	0.00%	-0.01%	-0.01%	101%	100%
Class B	0.00%	-0.05%	-0.01%	100%	101%
Class C	0.01%	0.03%	0.07%	100%	105%
Class E	0.02%	0.02%	-0.01%	100%	101%
Overall	0.01%	-0.01%	0.01%	100%	101%
Class D	0.01%	0.07%	0.05%	100%	103%
Class F	0.01%	0.02%	0.10%	100%	98%
TGM	0.17%	0.17%	0.16%	100%	100%

Except for the slight loss of TGM in AI,
the results are lossless for SCC.

Random Access Main 10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.00%	0.00%	0.00%	101%	100%
Class A2	0.00%	-0.06%	0.10%	100%	100%
Class B	0.01%	-0.04%	-0.18%	100%	100%
Class C	-0.02%	-0.16%	-0.14%	100%	100%
Class E					
Overall	0.00%	-0.07%	-0.08%	101%	100%
Class D	0.02%	-0.16%	0.40%	101%	100%
Class F	-0.02%	0.03%	0.09%	101%	100%
TGM	0.02%	0.04%	-0.01%	101%	99%

Low delay B Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.01%	0.10%	0.00%	100%	99%
Class C	0.00%	-0.07%	0.09%	100%	99%
Class E	0.23%	-0.18%	0.16%	101%	100%
Overall	0.06%	-0.03%	0.07%	100%	99%
Class D	0.02%	-0.17%	0.94%	100%	100%
Class F	0.05%	-0.13%	-0.81%	100%	100%
TGM	0.04%	-0.02%	-0.03%	101%	100%

Simulation results

Method1 (low QP)

	All Intra Main10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	0.03%	0.02%	0.02%	101%	99%
Class A2	0.00%	-0.01%	0.00%	100%	99%
Class B	-0.01%	-0.01%	0.01%	100%	100%
Class C	-0.08%	-0.03%	-0.01%	100%	100%
Class E	0.01%	-0.03%	-0.02%	100%	99%
Overall	-0.01%	-0.01%	0.00%	100%	100%
Class D	-0.15%	-0.08%	-0.11%	101%	98%
Class F	-0.41%	-0.31%	-0.33%	101%	99%
TGM	-1.03%	-0.64%	-0.63%	100%	99%

Coding gains are archived mainly with SCC.

	Random Access Main 10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	0.02%	0.01%	0.00%	101%	101%
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	0.00%	0.00%	0.02%	100%	99%
Class C	-0.05%	-0.06%	-0.01%	101%	102%
Class E					
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	-0.12%	-0.08%	-0.11%	101%	101%
Class F	-1.94%	-0.26%	-0.30%	100%	100%
TGM	-0.40%	-0.59%	-0.58%	101%	99%

	Low delay B Main10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.00%	-0.01%	-0.01%	100%	100%
Class C	-0.05%	0.01%	-0.02%	100%	100%
Class E	-0.01%	-0.02%	-0.12%	101%	99%
Overall	-0.02%	0.00%	-0.04%	100%	100%
Class D	-0.08%	-0.08%	-0.03%	101%	99%
Class F	-0.17%	-0.05%	0.01%	100%	99%
TGM	-0.78%	-0.14%	-0.24%	101%	100%

Simulation results

Method2 (low QP)

	All Intra Main10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	0.01%	-0.01%	0.00%	100%	98%
Class A2	0.00%	0.00%	0.00%	100%	100%
Class B	0.00%	-0.02%	-0.01%	100%	100%
Class C	-0.04%	0.00%	-0.03%	100%	99%
Class E	-0.01%	0.00%	0.02%	100%	98%
Overall	-0.01%	-0.01%	-0.01%	100%	99%
Class D	-0.07%	-0.06%	-0.04%	101%	98%
Class F	-0.53%	-0.42%	-0.43%	100%	99%
TGM	-1.36%	-0.90%	-0.93%	100%	99%

There are better coding gains than Method1.

	Random Access Main 10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	0.00%	0.03%	0.01%	101%	101%
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	0.00%	-0.01%	0.01%	100%	99%
Class C	-0.03%	-0.04%	0.01%	100%	100%
Class E					
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	-0.07%	-0.02%	-0.11%	101%	101%
Class F	-1.66%	-0.43%	-0.42%	99%	99%
TGM	-1.42%	-0.95%	-0.94%	100%	98%

	Low delay B Main10				
	Over VTM-5.0(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.00%	-0.02%	-0.02%	100%	100%
Class C	-0.04%	-0.01%	-0.03%	100%	100%
Class E	-0.02%	-0.04%	-0.13%	101%	100%
Overall	-0.02%	-0.02%	-0.05%	101%	100%
Class D	-0.04%	0.00%	0.02%	100%	99%
Class F	-0.34%	-0.28%	-0.20%	100%	99%
TGM	-1.16%	-0.61%	-0.64%	100%	99%

Simulation results (Additional information)

Method1 + O0405 over O0405 (low QP)

	All Intra Main10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-1.18%	-0.38%	-0.42%	#NUM!	#NUM!
TGM	-1.93%	-0.66%	-0.66%	#NUM!	#NUM!

In RA, the gain of ClassF is -1.39%, and the gain of TGM is -2.26%

	Random Access Main 10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-1.39%	-0.30%	-0.31%	#NUM!	#NUM!
TGM	-2.26%	-0.55%	-0.54%	#NUM!	#NUM!

	Low delay B Main10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-0.35%	-0.06%	-0.04%	#NUM!	#NUM!
TGM	-0.54%	-0.13%	-0.19%	#NUM!	#NUM!

Simulation results (Additional information)

■ Method2 + O0405 over O0405 (low QP)

	All Intra Main10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-1.17%	-0.47%	-0.49%	#NUM!	#NUM!
TGM	-2.23%	-0.92%	-0.95%	#NUM!	#NUM!

The gain of TGM exceeds 2.0% in AI and RA.

	Random Access Main 10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class A2	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-1.31%	-0.43%	-0.41%	#NUM!	#NUM!
TGM	-2.07%	-0.93%	-0.92%	#NUM!	#NUM!

	Low delay B Main10				
	Over O0405(100Frm4K_LowQP)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class C	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class E	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Overall	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class D	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class F	-0.51%	-0.29%	-0.27%	#NUM!	#NUM!
TGM	-0.83%	-0.57%	-0.59%	#NUM!	#NUM!

- **Method1 enables to use the same processing between two residual modes after CCB count exceeds the limit with the benefit of interesting gains in LowQP.**
- **Method2 has two modifications on Method1, and gets the better gains in LowQP**

→ Propose to adopt Method1 or Method2 into the test model

Thank MediaTek for cross checking our proposal.