

REDEFINING MOBILITY



JCTVC-R0180: Non-SCCE5: Deblocking filter for in-loop color-space transform

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Summary of the proposed method

- Align the QP used in de-quantization and deblocking filter process
- For blocks without signaling the color transform flag, they are treated as color transform on

Background

- In JCTVC-R0147, it is proposed to use different QPs for blocks coded with color transform on
 - Different QP is used in YCoCg space to normalize the transform
 - (QP-5, QP-3, QP-5) are used for Y, Co, and Cg component, respectively

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 0 & 1 \\ 1 & -1 & -1 \end{bmatrix} \begin{bmatrix} Y \\ Co \\ Cg \end{bmatrix}$$

- However, in the deblocking filter process, the original QP is used.

Proposed method

- (QP-5, QP-5, QP-5) is used in the deblocking filter process
 - Considering the importance of Y, reuse the QP of Y for all three components

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 0 & 1 \\ 1 & -1 & -1 \end{bmatrix} \begin{bmatrix} Y \\ Co \\ Cg \end{bmatrix}$$

- Since color transform flag is conditionally signalled, when one block is coded without the presence of color transform flag, it is treated in the same way as those with the flag equal to 1.

Experimental results

- 2-CTU based IntraBC, lossy coding
- Anchor: JCTVC-R0147 wo/ non-normative coding tools

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.1%	-1.0%	-0.9%	-0.4%	-1.4%	-1.3%	-0.6%	-1.3%	-1.2%
RGB, text & graphics with motion,720p	-0.3%	-1.2%	-1.4%	-0.5%	-1.6%	-1.8%	-1.0%	-1.2%	-1.4%
RGB, mixed content, 1440p	-0.4%	-1.2%	-1.2%	-0.7%	-1.8%	-1.8%	-1.1%	-1.6%	-1.5%
RGB, mixed content, 1080p	-0.2%	-1.1%	-1.0%	-0.5%	-1.8%	-1.7%	-1.5%	-1.7%	-1.9%
RGB, Animation, 720p	-0.6%	-1.5%	-1.5%	-1.0%	-1.3%	-1.2%	-2.0%	-0.3%	-0.3%
RGB, camera captured, 1080p	0.0%	-0.4%	0.0%	0.7%	-0.2%	-0.1%	0.3%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	0.0%	-0.2%	-0.3%	-0.1%	-0.5%	-0.5%	-0.5%	-0.7%	-0.7%
YUV, text & graphics with motion,720p	0.0%	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.3%	-0.6%	0.0%
YUV, mixed content, 1440p	0.0%	-0.1%	-0.1%	0.0%	-0.2%	-0.1%	0.0%	-0.1%	-0.3%
YUV, mixed content, 1080p	0.0%	-0.1%	-0.1%	-0.1%	-0.3%	-0.2%	-0.8%	-1.0%	-1.0%
YUV, Animation, 720p	-0.1%	-0.2%	-0.3%	-0.2%	-0.2%	-0.3%	-0.5%	0.3%	0.2%
YUV, camera captured, 1080p	0.1%	0.0%	0.0%	0.4%	0.0%	0.1%	0.3%	-0.1%	0.1%
Average RGB	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.8%	-1.1%	-1.1%
Average YUV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	101%			100%			100%		
Dec Time[%]	101%			100%			97%		

- Thanks Microsoft for the cross-check (JCTVC-R0290)

Experimental results

- 2-CTU based IntraBC, lossy coding

JCTVC-R0147+ JCTVC-R0180 vs SCM1.0

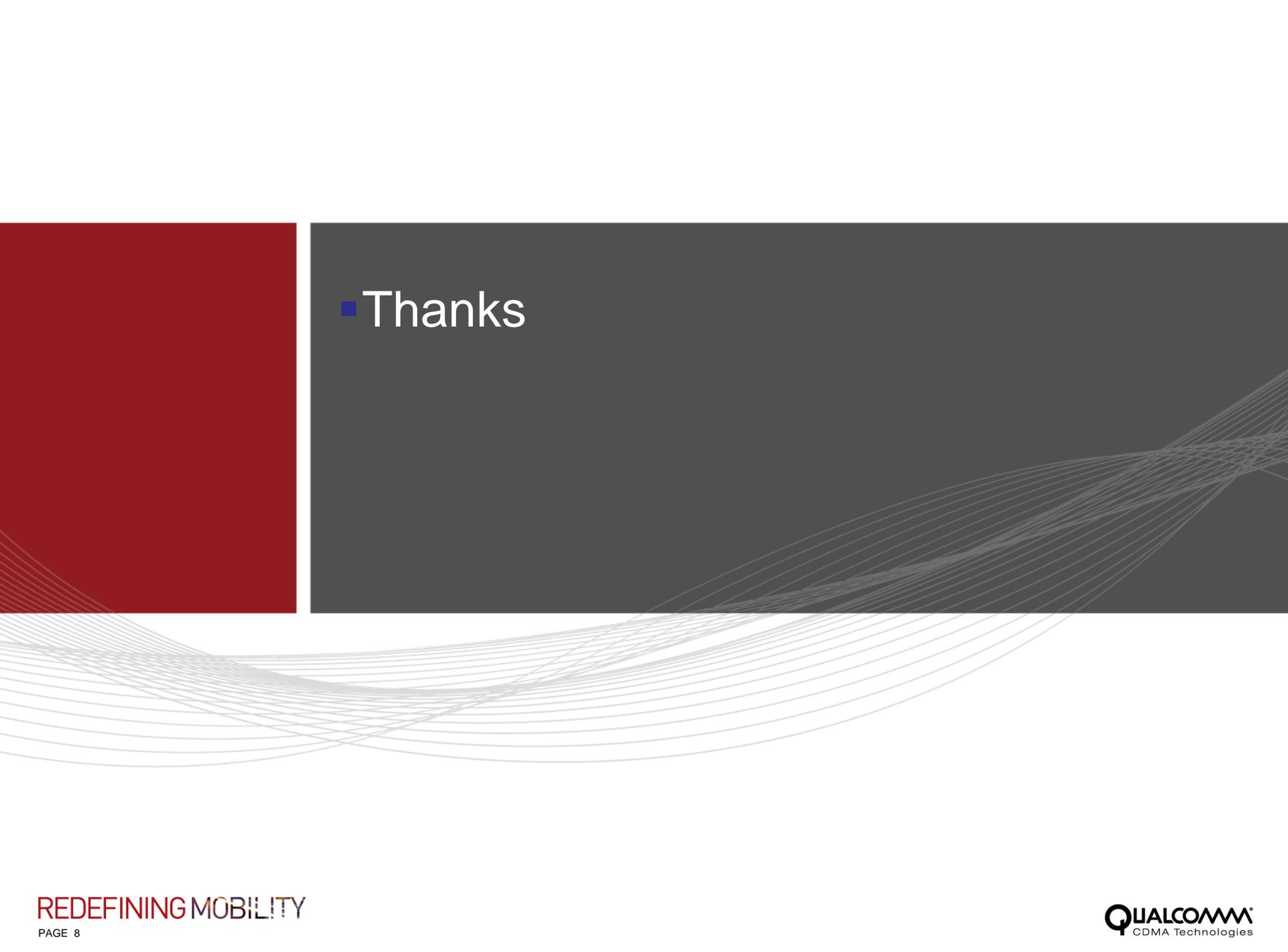
	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-10.7%	-5.1%	-5.0%	-10.5%	-4.3%	-4.3%	-9.4%	-2.8%	-2.5%
RGB, text & graphics with motion,720p	-17.4%	-5.5%	-8.9%	-20.1%	-6.5%	-11.4%	-21.2%	-4.8%	-9.9%
RGB, mixed content, 1440p	-20.2%	-8.0%	-8.0%	-27.2%	-12.1%	-11.7%	-28.9%	-9.6%	-8.4%
RGB, mixed content, 1080p	-15.7%	-4.3%	-5.5%	-19.7%	-6.7%	-7.6%	-21.7%	-3.1%	-3.7%
RGB, Animation, 720p	-25.6%	-18.8%	-16.1%	-26.3%	-17.0%	-12.6%	-25.8%	-11.7%	-5.4%
RGB, camera captured, 1080p	-25.2%	-5.4%	-9.9%	-27.4%	-5.5%	-14.0%	-25.9%	-1.7%	-12.1%
YUV, text & graphics with motion, 1080p	-1.6%	-1.4%	-1.9%	-1.5%	-1.8%	-2.1%	-2.3%	-2.4%	-2.4%
YUV, text & graphics with motion,720p	-0.9%	-1.2%	-1.8%	-1.8%	-1.9%	-3.1%	-2.5%	-2.8%	-4.0%
YUV, mixed content, 1440p	0.0%	-1.5%	-1.4%	0.1%	-1.1%	-1.1%	0.1%	-1.3%	-1.1%
YUV, mixed content, 1080p	-0.1%	-0.7%	-0.8%	-0.1%	-0.9%	-1.0%	-1.1%	-1.7%	-2.3%
YUV, Animation, 720p	0.1%	-6.9%	-4.1%	-0.2%	-7.0%	-3.6%	-0.7%	-5.7%	-3.6%
YUV, camera captured, 1080p	0.2%	-0.1%	0.0%	0.9%	0.1%	0.3%	0.6%	-0.2%	-0.1%
Average RGB	-18.0%	-6.7%	-8.3%	-20.5%	-7.5%	-10.0%	-20.8%	-5.0%	-7.5%
Average YUV	-0.6%	-1.5%	-1.6%	-0.8%	-1.8%	-1.9%	-1.3%	-2.3%	-2.4%
Enc Time[%]		143%			112%			111%	
Dec Time[%]		99%			98%			97%	

Experimental results

- Full-frame based IntraBC, lossy coding

JCTVC-R0147+ JCTVC-R0180 vs SCM1.0

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-10.8%	-5.4%	-5.6%	-10.4%	-4.7%	-4.8%	-9.2%	-3.2%	-3.0%
RGB, text & graphics with motion,720p	-17.4%	-5.8%	-9.1%	-20.3%	-6.8%	-11.8%	-20.8%	-4.8%	-9.8%
RGB, mixed content, 1440p	-21.1%	-8.7%	-8.7%	-28.1%	-12.5%	-12.0%	-29.0%	-9.7%	-8.6%
RGB, mixed content, 1080p	-16.0%	-4.5%	-5.7%	-20.3%	-6.9%	-7.7%	-21.2%	-2.9%	-3.8%
RGB, Animation, 720p	-25.6%	-18.8%	-16.0%	-26.3%	-16.9%	-12.5%	-25.7%	-11.7%	-5.3%
RGB, camera captured, 1080p	-25.2%	-5.4%	-9.9%	-27.4%	-5.5%	-14.0%	-26.0%	-1.7%	-12.1%
YUV, text & graphics with motion, 1080p	-2.1%	-1.7%	-2.1%	-1.5%	-1.9%	-2.2%	-2.1%	-2.7%	-2.7%
YUV, text & graphics with motion,720p	-1.3%	-1.6%	-2.3%	-1.9%	-2.0%	-3.1%	-2.3%	-2.4%	-4.1%
YUV, mixed content, 1440p	-0.1%	-1.2%	-1.3%	0.2%	-1.4%	-1.1%	0.1%	-1.3%	-1.4%
YUV, mixed content, 1080p	-0.2%	-0.7%	-0.8%	0.0%	-0.6%	-1.0%	-0.6%	-3.0%	-1.7%
YUV, Animation, 720p	0.1%	-6.8%	-4.1%	-0.2%	-7.3%	-3.6%	-0.6%	-6.0%	-3.7%
YUV, camera captured, 1080p	0.2%	0.0%	0.0%	0.9%	0.0%	0.2%	0.6%	-0.1%	-0.1%
Average RGB	-18.2%	-7.0%	-8.6%	-20.7%	-7.8%	-10.3%	-20.6%	-5.1%	-7.6%
Average YUV	-0.9%	-1.7%	-1.8%	-0.8%	-1.8%	-1.9%	-1.2%	-2.3%	-2.5%
Enc Time[%]		143%			112%			111%	
Dec Time[%]		99%			98%			97%	



- Thanks