JCTVC-R0178: Non-SCCE5: On index signaling of cross component prediction

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Summary of the proposed method

- The mapping from the decoded index to the actual scaling parameter is modified

- Syntax design and parsing process in HEVC Range Extension are reused

- No additional memory is required

Cross-component prediction in HEVC RExt

- A scaling parameter α is selected per transform unit

- α is represented by two syntax elements
  - Sign flag
  - Magnitude of α, denoted by abs(α)

- Mapping process is applied when converting the decoded index M(α) to the actual magnitude abs(α)

$$abs(\alpha) = (\ 1 << (M(\alpha) - 1\ )\ )\ \text{for non-zero } M(\alpha) \qquad (1)$$

abs(α)	M(α)
0	0
1	1
2	2
4	3
8	4

Proposed method

- Mapping function

$$abs(\alpha) = (1 << (4 - M(\alpha))) \text{ for non-zero } M(\alpha) \qquad (2)$$

  - Binarization and contexts for $M(\alpha)$ are kept unchanged

abs(α)	M(α)
0	0
1	4
2	3
4	2
8	1

- In addition, the initialization value for the context used by coding the sign flag is further modified (from 154 to 79)

- A SPS flag is introduced to control the usage of the new mapping function

REDEFINING MOBILITY

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Experimental results

- Full-frame based IntraBC, lossy coding

	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%	0.0%	0.0%	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%
RGB, text & graphics with motion,720p	0.0%	-0.1%	0.0%	-0.2%	-0.1%	-0.2%	-0.3%	-0.3%	-0.2%
RGB, mixed content, 1440p	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.2%	-0.4%	-0.2%
RGB, mixed content, 1080p	-0.1%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.6%	0.2%	-0.4%
RGB, Animation, 720p	-0.1%	0.0%	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%	-0.2%	-0.1%
RGB, camera captured, 1080p	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.2%	-0.2%	-0.1%	-0.2%
Enc Time[%]	98%			97%			96%		
Dec Time[%]	99%			98%			96%		

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Experimental results

- 2-CTU based IntraBC, lossy coding

	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	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.3%	-0.2%	-0.2%
RGB, text & graphics with motion,720p	-0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%	-0.4%	-0.4%	-0.3%
RGB, mixed content, 1440p	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.2%	-0.3%	-0.2%	-0.1%
RGB, mixed content, 1080p	-0.1%	0.0%	0.0%	-0.1%	0.0%	-0.1%	-0.2%	0.0%	-0.3%
RGB, Animation, 720p	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.2%	-0.2%	-0.1%	-0.1%
RGB, camera captured, 1080p	-0.1%	-0.1%	-0.1%	-0.2%	0.0%	-0.1%	-0.2%	-0.1%	-0.2%
Enc Time[%]	98%			96%			99%		
Dec Time[%]	98%			96%			98%		

- For lossless coding, performance is the same

- Thanks MERL for cross-check (JCTVC-R0284)

Conclusion

- A new mapping function for converting the decoded index to the magnitude of scaling parameter is introduced.
  - It is done with a simple shift operation, similar in HEVC RExt
  - No need to change the syntax tables and binarization process
  - No need to allocate additional memory and only the initialization value of the contexts for coding the sign flag is changed

- Coding gains for all test sets are observed.
  - For LD, the BD rate reduction for G component are from 0.2~0.6% (under full-frame based IntraBC)

- Recommend adoption to HEVC SCC profile.

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- Thanks

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