

# Restriction of CU sizes for Intra Block Copy (JCTVC-R0056)

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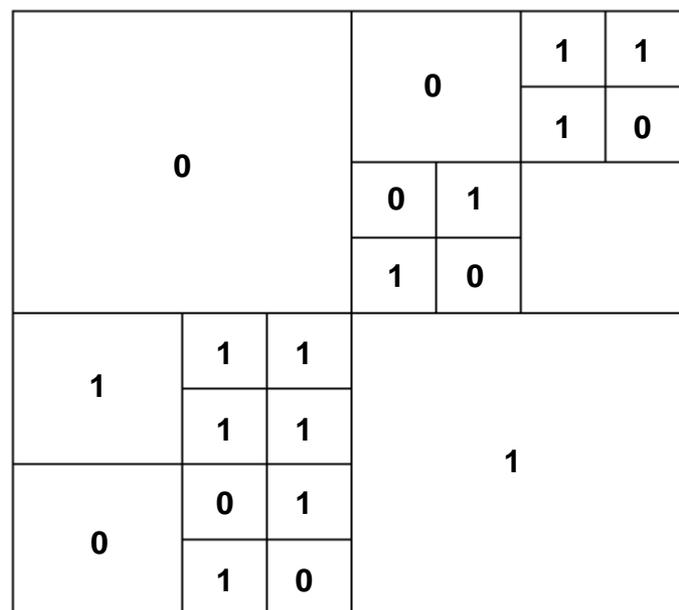
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# Introduction

- Intra Block Copy (Intra BC) on/off flag is coded on each CU-level to indicate if its coding mode is intra block copying mode or not.



64x64 CTU

0 → Intra BC off

1 → Intra BC on

# Problems

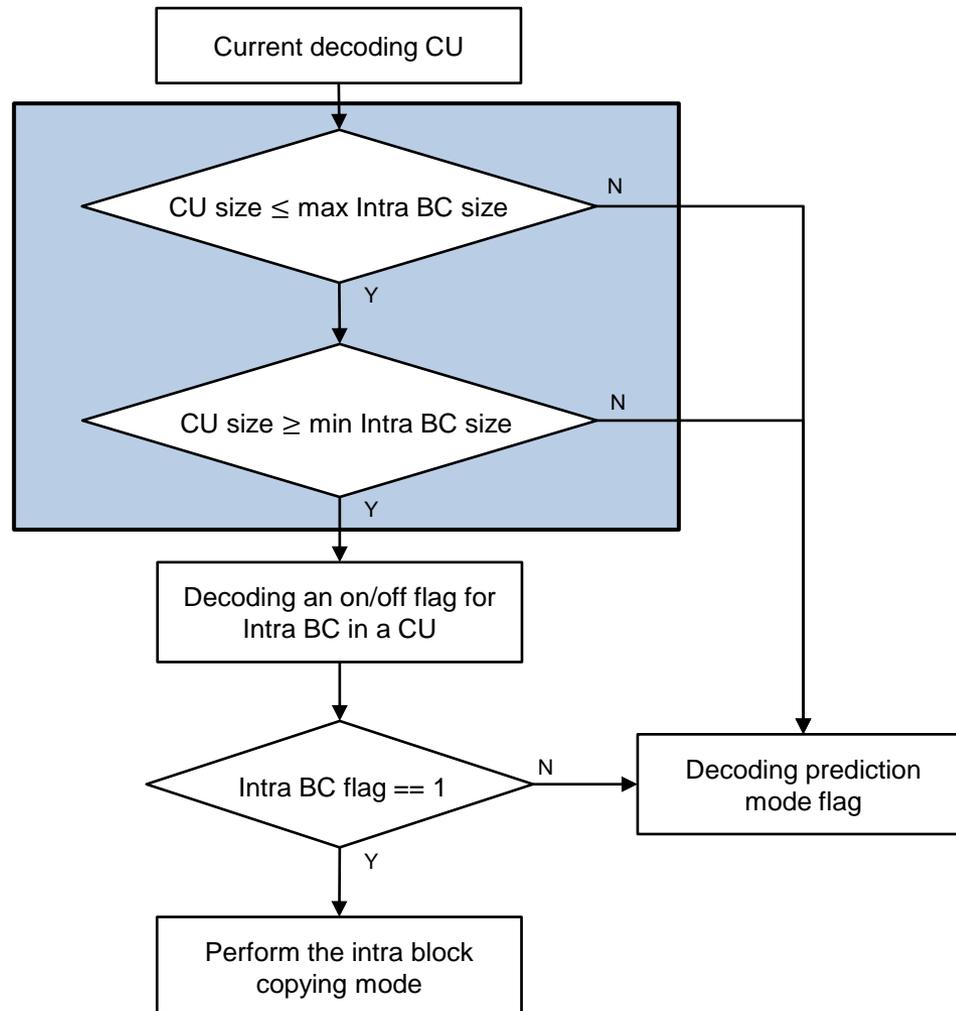
- Selected dominant block sizes for Intra BC may vary depending on different sequences.
  - Some sequences are efficiently coded with only small Intra BC block sizes.
  - On the contrary, some other sequences can be coded with large Intra BC block sizes.
- Based on the fact, the intra block copying mode can be selectively performed on limited CU-levels, depending on sequences.
- For SCM-1.0, the on/off flags for Intra BC are coded on all the CU-levels.

# Proposed method (1/2)

- Two syntax elements are added in the sequence parameter set (SPS) syntax for restricting the CU sizes for Intra BC.
  - Minimum size of Intra BC
  - Maximum size of Intra BC
- With these two syntax elements, on/off flags for Intra BC are coded only for restricted block sizes.

# Proposed method (2/2)

- Syntax flow and decoding process of the proposed algorithm



# Experimental results (1/3)

- The proposed method is integrated on SCM-1.0
- For this evaluation, restricted CU sizes for Intra BC are set as below.
  - Minimum Intra BC size:  $8 \times 8$
  - Maximum Intra BC size:  $16 \times 16$

# Experimental results (2/3)

- Proposed vs The anchor (SCM-1.0 Lossy)

	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	-0.07%	-0.09%	-0.08%	0.03%	0.03%	-0.05%	-0.03%	-0.07%	-0.01%
RGB, text & graphics with motion,720p	-0.01%	-0.03%	-0.01%	0.04%	-0.02%	0.01%	-0.05%	-0.04%	0.04%
RGB, mixed content, 1440p	-0.02%	-0.04%	-0.02%	0.02%	0.04%	0.08%	-0.01%	-0.16%	-0.08%
RGB, mixed content, 1080p	-0.04%	-0.03%	-0.05%	-0.05%	-0.08%	-0.08%	-0.27%	0.18%	-0.26%
RGB, Animation, 720p	-0.01%	0.01%	-0.01%	-0.03%	0.00%	0.00%	0.00%	0.07%	0.08%
RGB, camera captured, 1080p	0.01%	-0.01%	0.00%	0.03%	0.00%	0.02%	-0.06%	-0.01%	0.02%
YUV, text & graphics with motion, 1080p	-0.06%	-0.04%	-0.06%	-0.05%	-0.04%	-0.05%	-0.07%	-0.05%	-0.08%
YUV, text & graphics with motion,720p	-0.12%	-0.08%	-0.20%	-0.02%	0.08%	0.12%	-0.10%	0.30%	-0.17%
YUV, mixed content, 1440p	-0.07%	-0.03%	-0.06%	0.11%	-0.02%	-0.04%	0.14%	0.09%	0.08%
YUV, mixed content, 1080p	-0.03%	-0.01%	-0.04%	-0.01%	-0.11%	0.08%	0.38%	-0.20%	-0.01%
YUV, Animation, 720p	0.01%	0.01%	0.03%	-0.06%	-0.05%	0.20%	0.02%	-0.19%	-0.18%
YUV, camera captured, 1080p	-0.01%	-0.01%	-0.02%	-0.02%	-0.16%	-0.01%	0.01%	0.08%	-0.03%

# Experimental results (3/3)

- Proposed vs The anchor (SCM-1.0 Lossless)

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	0.02%	0.02%	0.01%	0.02%	0.01%	0.01%	0.01%	0.02%	0.01%	0.02%	0.01%	0.05%
RGB, text & graphics with motion,720p	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	-0.01%	-0.01%	0.00%
RGB, mixed content, 1440p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
RGB, mixed content, 1080p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
RGB, Animation, 720p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RGB, camera captured, 1080p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
YUV, text & graphics with motion, 1080p	0.02%	0.02%	0.01%	0.02%	0.01%	0.02%	0.00%	0.03%	0.00%	0.00%	0.00%	0.01%
YUV, text & graphics with motion,720p	0.00%	0.01%	0.00%	0.01%	0.01%	0.02%	-0.01%	0.05%	0.00%	0.00%	-0.01%	0.02%
YUV, mixed content, 1440p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
YUV, mixed content, 1080p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.01%
YUV, Animation, 720p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
YUV, camera captured, 1080p	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

# Conclusion

- Restriction of CU sizes for Intra BC is proposed to reduce on/off flags for Intra BC, depending on sequences.
- Minor coding gain is observed in the experimental results when the min and max Intra BC block sizes are given with  $8 \times 8$  and  $16 \times 16$ , respectively.
- Coding performance of the proposed method can be improved by adaptively modifying the min/max Intra BC block sizes, depending on sequences.