

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

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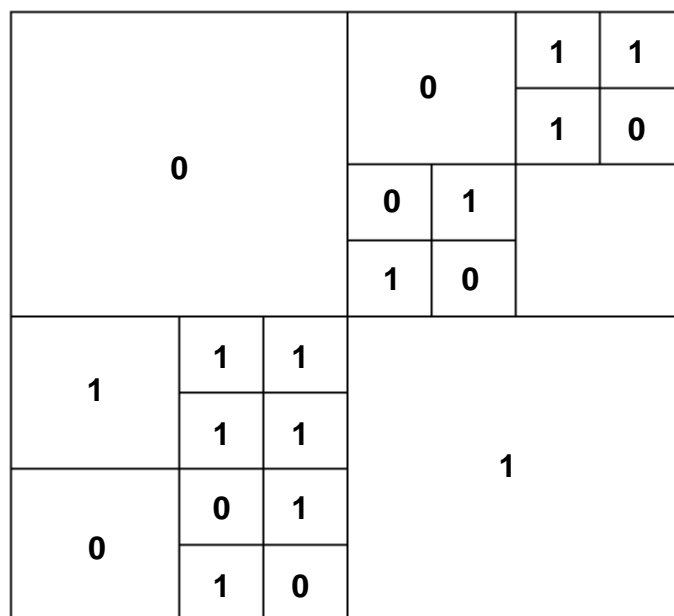
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Introduction

- 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

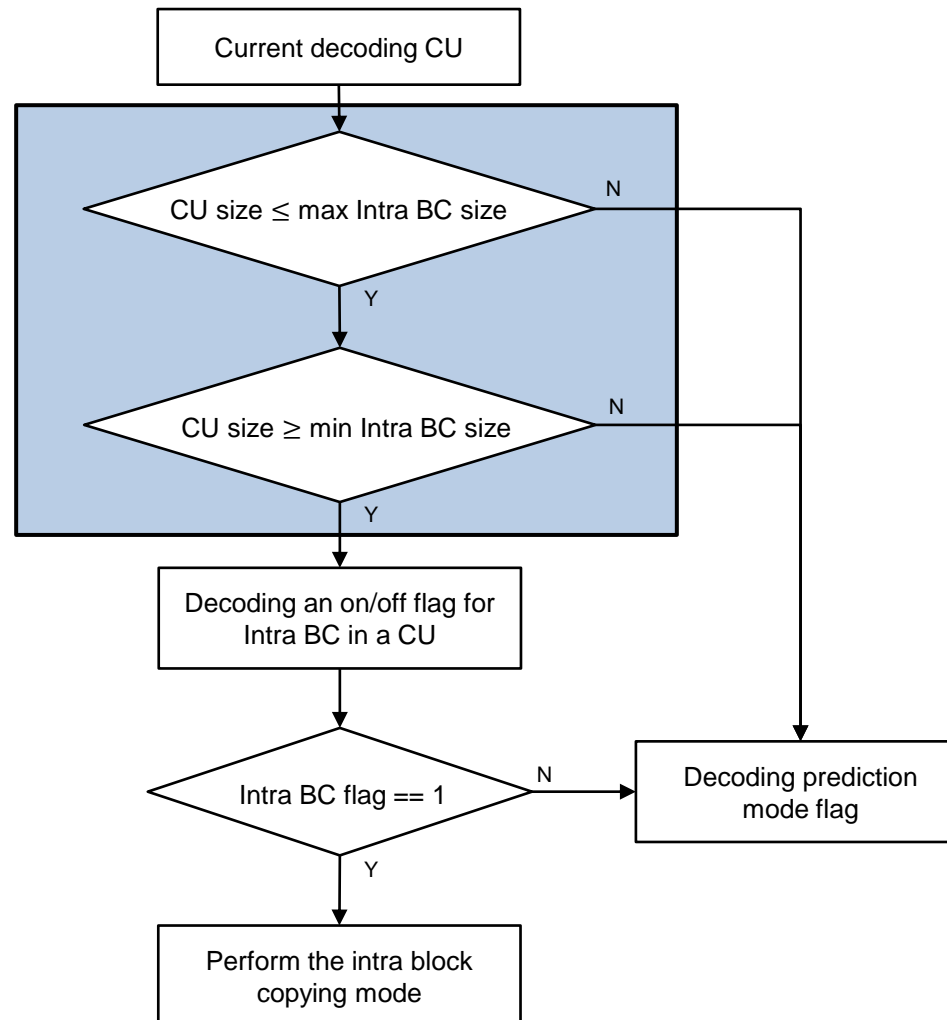
- Selected dominant block sizes for Intra BC may vary depending on different sequences.
 - Some sequences are efficiently coded with only small Intra BC block sizes.
 - On the contrary, some other sequences can be coded with large Intra BC block sizes.
- Based on the fact, the intra block copying mode 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: 8×8
 - Maximum Intra BC size: 16×16

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 8×8 and 16×16 , respectively.
- Coding performance of the proposed method can be improved by adaptively modifying the min/max Intra BC block sizes, depending on sequences.