

JCTVC-R0112

Non-SCCE3: Bi-color intra mode for screen content coding

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Single color mode

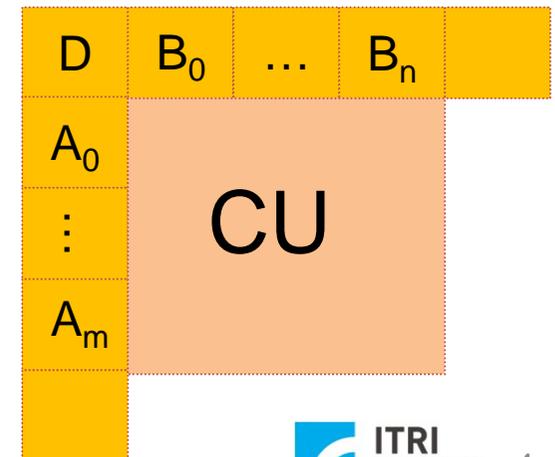
- Proposed in Valencia meeting
 - JCTVC-Q0093
- Reconstruct the CU as a smooth area with only one color
- Only single color in the CU may not fully represent the smooth area
 - Use bi color to reconstruct the current CU

Bi-color intra mode

- On top of single color intra mode
 - JCTVC-R0058
- A slice level enabling flag and a Cu level flag are used for signaling
- Three steps in our solution:
 - Select a candidate pair with a fixed order
 - Convert sample values into indices
 - Use run-length coding to code the indices

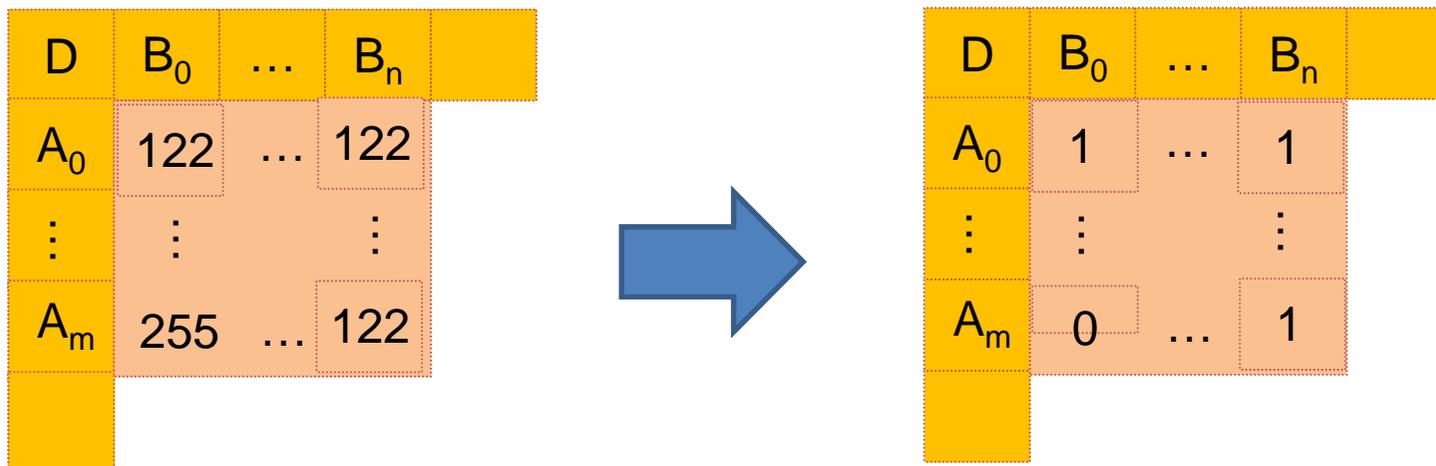
1st step: Candidate pair selection

- Candidates locations and candidate list size, redundancy checking are identical to JCTVC-R0058
- Orders of candidate pairs are as follows:
 - $\{A_m, B_n\}$, $\{A_m, B_0\}$, $\{B_n, B_0\}$, $\{A_m, A_0\}$, $\{B_n, A_0\}$, $\{B_0, A_0\}$, $\{A_m, D\}$, $\{B_n, D\}$, $\{B_0, D\}$, and $\{A_0, D\}$.
- Need to signal candidate pair index in the bitstream



2nd step: Convert samples to indices

- Convert the sample values into indices
- An example:
 - There are two colors : 255 and 122
 - Meet the candidate pairs $\{A_m, B_n\}$
 - Convert color 255 and 122 into index number 0 and 1



3rd step: Code index map

- Our run-length coding method is identical to JCTVC-R0076
 - Copy-above run mode
 - Copy-left run mode
 - Skip coding the index of candidate pair

Results of AI, Lossy

- Test condition: palette is off

	All Intra (Full Frame)			All Intra (2CTU)		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-1.9%	-2.0%	-2.2%	-2.3%	-2.4%	-2.5%
RGB, text & graphics with motion, 720p	-0.2%	-0.4%	-0.3%	-0.4%	-0.5%	-0.5%
RGB, mixed content, 1440p	-0.3%	-0.2%	-0.2%	-0.4%	-0.2%	-0.3%
RGB, mixed content, 1080p	-0.4%	-0.3%	-0.3%	-0.4%	-0.4%	-0.4%
RGB, Animation, 720p	0.0%	-0.2%	-0.1%	0.0%	-0.2%	-0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-2.7%	-2.1%	-1.9%	-2.9%	-2.7%	-2.5%
YUV, text & graphics with motion, 720p	-0.6%	-0.4%	-0.9%	-0.6%	-0.4%	-0.9%
YUV, mixed content, 1440p	-0.2%	-0.7%	-0.8%	-0.2%	-0.7%	-0.8%
YUV, mixed content, 1080p	-0.2%	-0.5%	-0.6%	-0.3%	-0.5%	-0.5%
YUV, Animation, 720p	0.1%	-0.4%	-0.3%	0.1%	-0.4%	-0.3%
YUV, camera captured, 1080p	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%

Results of AI, Lossy

- Test condition: palette is on

	All Intra (Full Frame)			All Intra (2CTU)		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.3%	-0.3%	-0.3%	-0.7%	-0.7%	-0.6%
RGB, text & graphics with motion, 720p	-0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%
RGB, mixed content, 1440p	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%
RGB, mixed content, 1080p	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.2%
RGB, Animation, 720p	0.0%	-0.2%	-0.1%	0.0%	-0.2%	-0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.6%	-0.4%	-0.4%	-0.9%	-0.7%	-0.7%
YUV, text & graphics with motion, 720p	-0.1%	-0.3%	-0.3%	-0.2%	-0.3%	-0.4%
YUV, mixed content, 1440p	-0.2%	-0.4%	-0.6%	-0.2%	-0.5%	-0.5%
YUV, mixed content, 1080p	-0.1%	-0.3%	-0.4%	-0.1%	-0.3%	-0.3%
YUV, Animation, 720p	0.1%	-0.3%	-0.3%	0.1%	-0.4%	-0.3%
YUV, camera captured, 1080p	-0.3%	-0.3%	-1.0%	-0.3%	-0.3%	-1.0%

Conclusion

- Bi-color mode is proposed to efficiently code a smooth area with two colors.
- Bi-color mode achieves 2.9%, 2.3%, 2.7%, 1.9% BD-rate saving for sequences of “text & graphics with motion, 1080p” under AI Lossy on 2-CTU and full-frame IBC conditions.

Recommendations

- Recommend further study with Palette-related CEs in the scope of Screen Content Coding.

Acknowledgement

- Thanks MERL for cross check

Thank You

Appendix

An example of JCTVC-R0076

- For the first row:

– ‘Index (0)’ + ‘Run (1)’ + ~~‘Index (1)’~~ + ‘Run (1)’ +
~~‘Index (0)’~~ + ‘Run (1)’ + ~~‘Index (1)’~~ + ‘Run (1)’ +

...

0	0	1	1	0	0	1	1
0	0	1	0	0	0	1	0
0	0	1	0	0	0	1	0
0	0	0	1	0	0	0	1

⋮