

# JCTVC-R0112

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

Yao-Jen Chang, Chun-Lung Lin,  
Ching-Chieh Lin, Jih-Sheng Tu,  
and Chao-Hsiung Hung

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# Single color mode

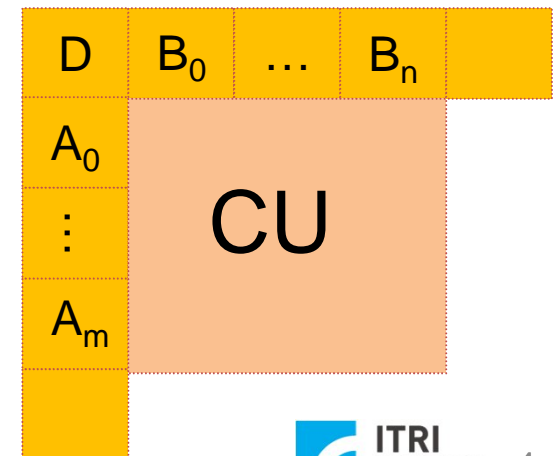
- Proposed in Valencia meeting
  - JCTVC-Q0093
- Reconstruct the CU as a smooth area with only one color
- Only single color in the CU may not fully represent the smooth area
  - Use bi color to reconstruct the current CU

# 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

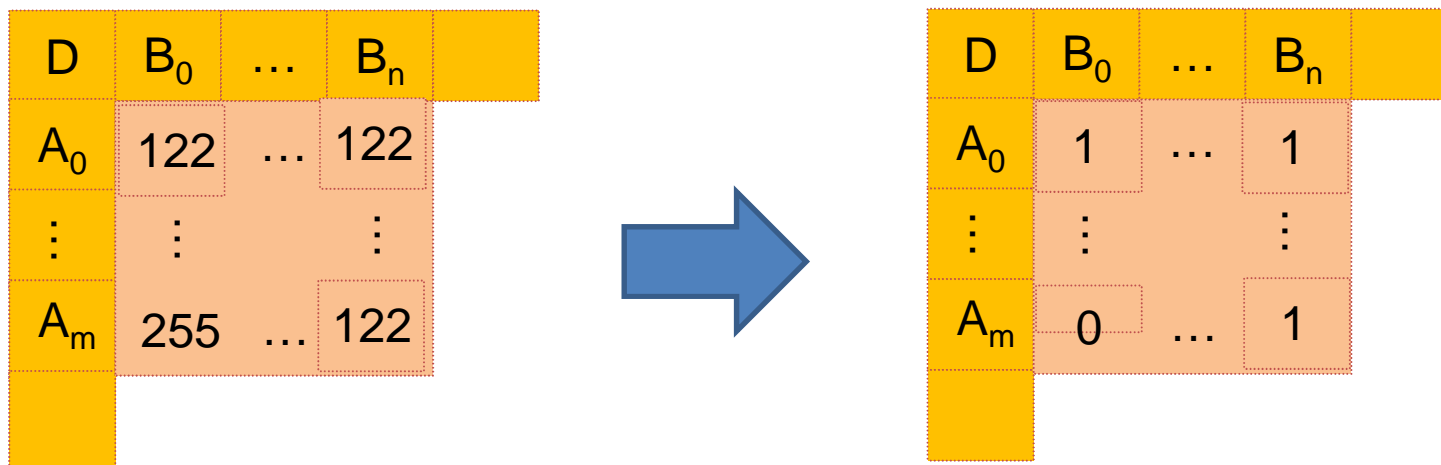
# 1<sup>st</sup> step: Candidate pair selection

- 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



## 2<sup>nd</sup> 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



## 3<sup>rd</sup> 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
■							
■							
■							