

Non-RCE4: Palette Prediction for Palette mode

G. Laroche, T. Poirier, C. Gisquet,
P. Onno

16th JCTVC Meeting, San José, January 2014

Palette mode JCTVC–00218/RCE4 Test2

- On JCTVC–00218: Palette elements are directly coded
- On RCE4 Test 2: Palette element can be predicted by the left Palette CU if it exists
- In this proposal, the palette is predicted from the last decoded palette

Proposal

■ Palette predictor:

- Use the Palette of the last decoded CU palette
- Reset the palette predictor at each CTB line

■ Palette prediction:

- Transmit one flag for each palette element of the palette predictor
 - Selected elements are copy in the current palette
- Other palette elements are coded with the usual method

■ Palette size coding:

- The palette size is equal to the number of non-predicted palette elements.

Remark on memory complexity

- Proposal: For the worst case one palette predictor of 24 elements requires:
 - $24 \times 3 = 72$ bytes
- When using the neighboring palette CU, all neighboring palettes need to be store. So for the worst case:
 - Left predictor : 72×8 left CU = 576 bytes
 - Up predictor, by considering a CTB line memory ~**36KB** for 4K content.

Experiments results: vs JCTVC-00218

- Anchor: Rext 5.1 + 00218
- Test: Rext 5.1 + 00218 + Palette prediction
- Results AI/RA/LB:
 - SC:
3.2%/1.6%/2.1%
 - OSC:
8.9%/7.1%/6.1%
- Memory complexity:
 - 72 bytes

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.2%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-2.2%	-2.2%	-2.2%	-3.0%	-3.0%	-2.9%	-3.7%	-3.8%	-3.7%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-1.7%	-2.1%	-2.1%	-2.6%	-2.9%	-2.8%	-3.6%	-3.7%	-3.7%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-7.8%	-7.5%	-7.8%	-9.0%	-8.6%	-8.7%	-10.0%	-9.9%	-9.9%
YCbCr 4:4:4 SC (Optional)	-7.6%	-8.5%	-8.4%	-9.0%	-8.9%	-9.0%	-10.1%	-9.8%	-10.0%
Enc Time[%]	97%			98%			98%		
Dec Time[%]	102%			102%			102%		

	Random Access Main-tier			Random Access High-tier		
	Y	U	V	Y	U	V
Class F	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-2.3%	-2.2%	-2.2%	-3.0%	-2.9%	-2.8%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-1.9%	-2.2%	-2.2%	-2.7%	-2.8%	-2.8%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-6.5%	-6.2%	-6.4%	-7.7%	-7.3%	-7.3%
YCbCr 4:4:4 SC (Optional)	-6.6%	-7.3%	-7.3%	-7.6%	-7.3%	-7.1%
Enc Time[%]	99%			99%		
Dec Time[%]	104%			104%		

	Low delay B Main-tier			Low delay B High-tier		
	Y	U	V	Y	U	V
Class F	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-1.5%	-1.4%	-1.5%	-2.0%	-2.0%	-2.0%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-1.2%	-1.6%	-1.4%	-1.8%	-1.9%	-2.0%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-5.4%	-5.1%	-5.3%	-6.5%	-6.3%	-6.5%
YCbCr 4:4:4 SC (Optional)	-5.9%	-6.2%	-6.5%	-6.7%	-6.6%	-6.8%
Enc Time[%]	99%			99%		
Dec Time[%]	103%			102%		

Experiments results: vs RCE4 Test 2

- Anchor: RCE4 Test 2
- Test: RCE4 Test 2 + Palette prediction

■ Results AI/RA/LB:

- SC: 1.2%/ 1.0%/ 0.5%
- OSC: 4.4%/ 3.4%/ 3.4%

■ Memory complexity:

- Proposal: 96 bytes
- RCE4.2: 768 bytes

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-1.2%	-1.2%	-1.2%	-1.3%	-1.2%	-1.2%	-1.2%	-1.1%	-1.0%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-1.1%	-1.1%	-1.2%	-1.1%	-1.2%	-1.2%	-1.1%	-1.1%	-1.1%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-4.2%	-4.0%	-4.1%	-4.1%	-3.9%	-3.9%	-4.1%	-3.9%	-3.9%
YCbCr 4:4:4 SC (Optional)	-4.7%	-5.1%	-5.1%	-4.7%	-4.5%	-4.4%	-4.7%	-4.2%	-4.3%
Enc Time[%]	99.8%			99.7%			99.7%		
Dec Time[%]	91.4%			91.1%			91.6%		

	Random Access Main-tier			Random Access High-tier		
	Y	U	V	Y	U	V
Class F	0.0%	-0.1%	-0.1%	0.0%	-0.1%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-1.0%	-0.9%	-0.9%	-1.1%	-1.0%	-0.9%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-0.9%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-3.0%	-2.8%	-2.9%	-3.3%	-3.0%	-3.0%
YCbCr 4:4:4 SC (Optional)	-3.6%	-3.8%	-3.9%	-3.8%	-3.4%	-3.4%
Enc Time[%]	99.3%			100.0%		
Dec Time[%]	93.8%			94.1%		

	Low delay B Main-tier			Low delay B High-tier		
	Y	U	V	Y	U	V
Class F	0.2%	0.0%	0.2%	0.2%	0.2%	0.2%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC	-0.4%	-0.4%	-0.5%	-0.6%	-0.5%	-0.6%
RGB 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YCbCr 4:4:4 SC	-0.4%	-0.4%	-0.7%	-0.5%	-0.6%	-0.6%
YCbCr 4:4:4 Animation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB 4:4:4 SC (Optional)	-2.7%	-2.6%	-2.6%	-3.8%	-3.8%	-3.9%
YCbCr 4:4:4 SC (Optional)	-3.3%	-3.5%	-3.7%	-3.8%	-3.4%	-1.4%
Enc Time[%]	100.7%			101.1%		
Dec Time[%]	89.6%			90.2%		

Conclusion

■ Proposal:

- Prediction of the current palette with the last used palette.

■ Results compared to RCE4 Test 2:

- Gains: SC: 1.2%/ 1.0%/ 0.5%
- Divide by 8 the worst case memory complexity of RCE4.2

■ Recommend to use this palette prediction method if the Palette Mode coding is adopted for the Range Extensions.