



REDEFINING MOBILITY



## AHG10: Simplification of Palette Based Coding

Wei Pu, Feng Zou, Rajan Joshi, Joel Sole, Marta Karczewicz

# Content

- On Top of AGH10 (JCTVC-Q0094)
  - Bug fixes
  - Encoder only improvements
  - Index and escape pixel coding simplification

# Bug fixes

- Non444 Palette Prediction

- The current palette size was mistakenly set to 0

- Logic Bug in Deriving Copy Left Run

- Zero length copy left run was mistakenly disabled  
[Identified and fixed by Canon]

- Bit Counting Bug

- Redundancy in encodePLTModelInfo and encodePredMode  
[Identified and fixed by Canon]

# Results: AHG10 Bug Fix vs AHG10

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	-0.2%	-0.3%	-0.3%	-0.2%	-0.3%	-0.3%	-0.3%	-0.2%	-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	-0.6%	-0.4%	-0.5%	-0.9%	-0.7%	-0.8%	-1.2%	-1.0%	-1.1%
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	-0.1%	-0.1%	-0.2%	-0.4%	-0.3%	-0.4%	-0.8%	-0.7%	-0.8%
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)	-0.2%	-0.2%	-0.2%	-0.4%	-0.3%	-0.3%	-0.6%	-0.7%	-0.7%
YCbCr 4:4:4 SC (Optional)	-0.2%	-0.1%	-0.1%	-0.4%	-0.3%	-0.3%	-0.5%	-0.5%	-0.6%
Enc Time[%]		102%			101%			101%	
Dec Time[%]		98%			99%			99%	

# Remove JCTVC-P0108

- In AHG10

- Last palette index is reserved to indicate escape pixel
- This approach introduced noticeable loss for RExt6.0 based software

- New Method:

- A flag is explicitly signaled to indicate escape pixel

# Results: AGH10 Bug Fix – P0108 vs AHG10

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	-0.5%	-0.7%	-0.6%	-0.4%	-0.5%	-0.5%	-0.4%	-0.4%	-0.4%
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	-0.9%	-0.7%	-0.8%	-1.4%	-1.1%	-1.2%	-1.8%	-1.5%	-1.7%
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	-0.3%	-0.3%	-0.3%	-0.6%	-0.6%	-0.6%	-1.1%	-1.0%	-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)	-2.0%	-1.9%	-1.9%	-2.2%	-2.1%	-2.1%	-2.6%	-2.6%	-2.7%
YCbCr 4:4:4 SC (Optional)	-1.2%	-1.0%	-1.0%	-1.4%	-1.2%	-1.2%	-1.7%	-1.6%	-1.8%
Enc Time[%]		98%			98%			98%	
Dec Time[%]		100%			100%			99%	

# Encoder Only Improvements

- New Methods in Major Color Derivation
  - Step 1: Generating histogram using three color component triplet;
  - Step 2: Sorting the histogram;
  - Step 3: Scanning from the beginning of the sorted histogram to derive major color triplets;
  - Step 4: R-D to determine between escape and palette index;
  - Step 5: Refining triplets to centroids and mapping the centroids to their nearest physically existing pixels in the CU.

# Results: AGH10 Bug Fix – P0108 + Encoder Improvements vs AHG10

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	-1.1%	-1.8%	-2.0%	-1.0%	-1.4%	-1.5%	-1.0%	-1.0%	-1.2%
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	-3.3%	-2.4%	-2.5%	-3.8%	-2.9%	-3.1%	-4.2%	-3.6%	-3.9%
RGB 4:4:4 Animation	0.0%	-0.1%	0.0%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
YCbCr 4:4:4 SC	-1.8%	-3.3%	-4.1%	-2.1%	-3.0%	-3.9%	-2.8%	-3.2%	-3.9%
YCbCr 4:4:4 Animation	0.0%	-0.3%	-0.2%	0.0%	-0.3%	-0.2%	0.0%	-0.2%	-0.2%
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)	-2.9%	-2.9%	-2.8%	-3.5%	-3.3%	-3.3%	-4.4%	-4.4%	-4.5%
YCbCr 4:4:4 SC (Optional)	-1.9%	-1.7%	-1.8%	-2.1%	-1.7%	-1.6%	-2.8%	-2.9%	-2.9%
Enc Time[%]	108%			107%			106%		
Dec Time[%]	98%			98%			98%		

# Simplification of Index and Escape Pixel Coding

- In AGH 10
  - Index: Fixed Length Code, bypass
  - Escape: Fixed Length Code, MSB with context, others bypass
- Proposed
  - Truncated Binary Code for both Index and Escape
  - All the bins are bypass coded (i.e. no context coded bin)
  - Reduce index codeword by 1 if the top index value is less than the current index after a copy above mode.
  - Reduce index codeword by 1 if the left index value is less than the current index after a copy left mode.

# Results: JCTVC-Q0047 vs AGH10

	All Intra Main-tier			All Intra High-tier			All Intra Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	-2.0%	-3.1%	-3.4%	-1.9%	-2.4%	-2.6%	-1.7%	-1.8%	-2.0%
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	-5.9%	-4.8%	-4.9%	-6.2%	-5.2%	-5.4%	-6.3%	-5.7%	-6.0%
RGB 4:4:4 Animation	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%
YCbCr 4:4:4 SC	-3.6%	-5.8%	-6.9%	-4.2%	-5.7%	-6.7%	-5.0%	-5.8%	-6.6%
YCbCr 4:4:4 Animation	0.0%	-0.4%	-0.3%	0.0%	-0.4%	-0.3%	0.0%	-0.3%	-0.2%
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%	-7.7%	-7.7%	-8.3%	-8.1%	-8.1%	-9.1%	-9.2%	-9.2%
YCbCr 4:4:4 SC (Optional)	-5.6%	-5.3%	-5.2%	-6.2%	-5.7%	-5.5%	-6.9%	-6.9%	-7.0%
Enc Time[%]		107%			107%			106%	
Dec Time[%]		97%			97%			96%	



- Thanks