

Non-CE1: Palette based coding for non-4:4:4 format [JCTVC-T0053]

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- In SCM3.0, palette mode is only applied to RGB/YUV4:4:4.
- This contribution presents a palette coding scheme for YUV4:2:2 and YUV4:2:0.

Proposed method (1/4)

■ Same palette coding process as in 4:4:4

1. palette is coded
2. index map is coded
3. If escaped, escaped pixel value is coded

■ There are 2 parts in palette

- 1st part: 3 components palette (Y,U,V)
- 2nd part: Y only
- Prediction is used in both parts

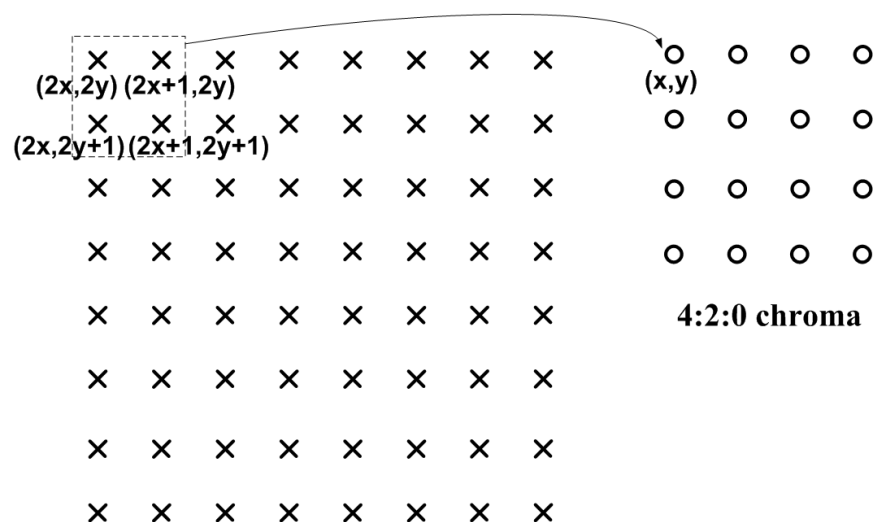
	Palette part 1				Palette part 2			
Index	0	1	...	n1-1	n1	n1+1	...	n1+n2-1
Y	Y0	Y1	...	Y(n1-1)	Y(n1)	Y(n1+1)	...	Y(n1+n2-1)
U	U0	U1	...	U(n1-1)				
V	V0	V1	...	V(n1-1)				

Proposed method (2/4)

- Index map is coded similarly as in 4:4:4
 - Same copy_left and copy_above process
 - Index can be taken from palette part 1 or part 2
- Escape pixel coded value can either be (Y,U,V) or just Y

Proposed method (3/4)

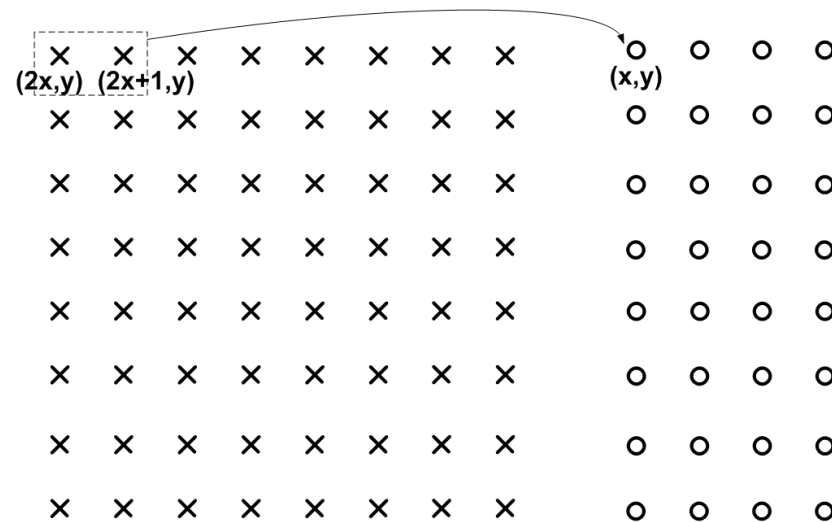
- In 4:2:0, chroma values ($U(x,y)$, $V(x,y)$) can be signaled along with $Y(2x,2y)$, $Y(2x+1,2y)$, $Y(2x,2y+1)$ and/or $Y(2x+1,2y+1)$, whether in palette mode or in escape mode.
- In 4:2:2, chroma values ($U(x,y)$, $V(x,y)$) can be signaled along with $Y(2x,y)$ and/or $Y(2x+1,y)$, whether in palette mode or in escape mode.



Legend:

- X = Location of luma sample
- O = Location of chroma sample

(1)



Legend:

- X = Location of luma sample
- O = Location of chroma sample

(2)

- Chroma values can be signaled with more than one luma value through index or escape mode coding
- When chroma values are signaled more than once in a set of 4 luma values, the first couple of chroma values in scanning order is used
- When a value is escape coded
 - When the chroma values for the current set of 4 luma values have been signaled, the escape value only contains the luma information
 - When the chroma values for the current set of 4 luma values have not been signaled yet, a flag signals whether the escape value also contains the chroma values or only the luma value

Simplified implementation for 4:2:0

- Pixel $(2x, 2y)$ always have the 3 components signaled
 - Whether in palette or in escape
- Luma values $Y(2x+1, 2y)$, $Y(2x, 2y+1)$ and $Y(2x+1, 2y+1)$ can be coded using palette indexes from either Palette part 1 or Palette part 2
- For escaped coded pixel, no flag is required to indicate whether 1 or 3 components are coded because location $(2x, 2y)$ has 3 components.

Simulation results (lossless, simplified)

- Anchor: SCM3.0
- MAX_PLT_SIZE=32
- MAX_Part1_PLT_PRED_SIZE=64,MAX_Part2_PLT_PRED_SIZE=32

	All Intra			
	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)
Text & graphics with motion, 720p	-0.2%	-0.2%	-0.2%	-0.1%
Mixed content, 480p	-0.3%	-0.3%	-0.3%	-0.3%
Animation, 768p	-1.0%	-1.0%	-1.0%	-1.0%
Average of all sequences	-0.5%	-0.4%	-1.0%	-0.1%
Enc Time[%]	127%			
Dec Time[%]	104%			

- Thanks cross-checking of Qualcomm.

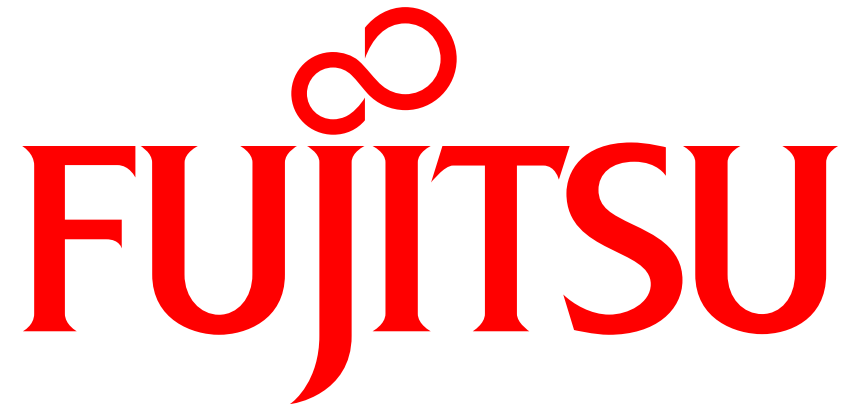
Simulation results (lossy, simplified)

- Anchor: SCM3.0
- MAX_PLT_SIZE=32
- MAX_Part1_PLT_PRED_SIZE=64,MAX_Part2_PLT_PRED_SIZE=32

	All Intra		
	G/Y	B/U	R/V
Text & graphics with motion, 720p	-0.9%	-1.1%	-1.2%
Mixed content, 480p	-0.7%	-2.9%	-3.1%
Animation, 768p	-4.0%	-11.0%	-2.5%
Average of all sequences	-1.6%	-4.0%	-2.0%
Enc Time[%]	119%		
Dec Time[%]	104%		

- Thanks cross-checking of Qualcomm.

- There is a need for non 4:4:4 palette coding
- We can adapt the palette tools to better encode non 4:4:4 content
- We ask to start a CE activity to further study non 4:4:4 palette coding



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