

Nearest placement of Y/Cb/Cr transform coefficients locating at same spatial position

*Youji Shibahara
Kyoko Uchibayashi
Takahiro Nishi*

Panasonic Corporation

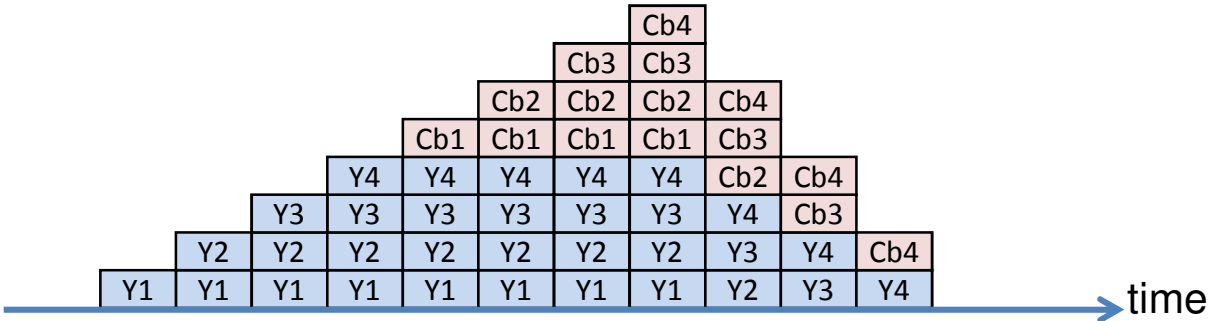
- ## ▶ Example

1	2
3	4

5	6
7	8

9	10
11	12

Until decoding top-left Cr (time 9), the decoder needs to store all Y and all Cb in buffers.

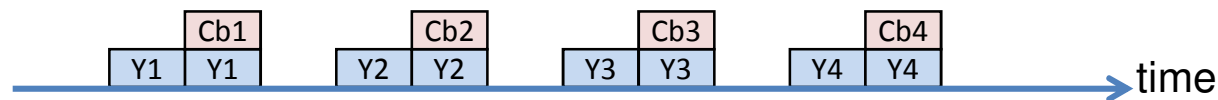


Solution

- ▶ Y/Cb/Cr at same spatial position are coded as nearest in the stream.
- ▶ Example

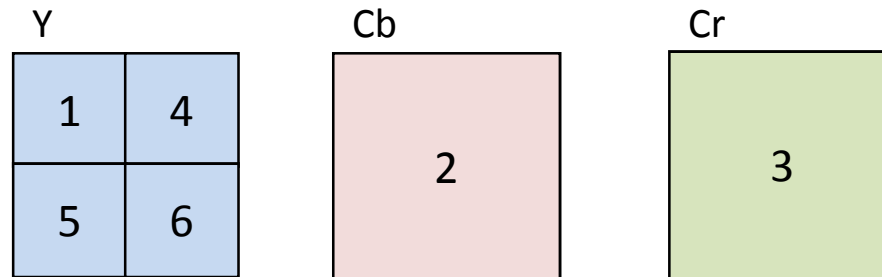
Y		Cb		Cr	
1	4	2	5	3	6
7	10	8	11	9	12

Buffer can be flushed at every end of Cr decoding.

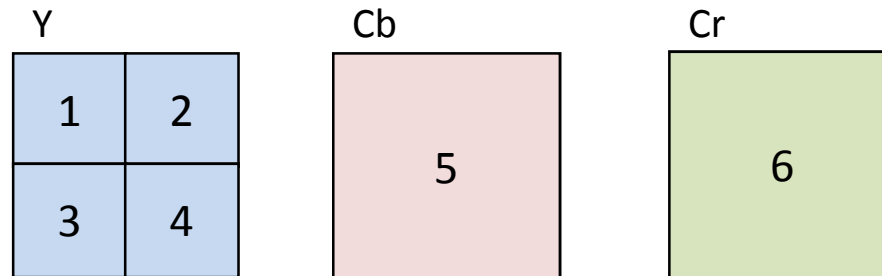


Solution for TrSize == MinTrafoSize

- ▶ There are 4 Luma and 1 Chroma for TrSize == MinTrafoSize
- ▶ Method 1) Chroma locates after **first** Luma



- ▶ Method 2) Chroma locates after **all** Luma



Switching between luma and chroma is reduced from 2 to 1
The order is not changed from current HM

Experimental Results

- ▶ Method 1 (Chroma locates after **first** Luma at MinTrafoSize)

	AI-HE	AI-LC	RA-HE	RA-LC	LB-HE	LB-LC
Class A	0.0%	0.0%	0.0%	0.0%		
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%			0.0%	-0.1%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	100%	99%	99%	99%	100%	100%
Dec Time[%]	100%	100%	99%	99%	99%	100%

Thank to Samsung for cross check (G904)

Experimental Results

- ▶ Method 2 (Chroma locates after **all** Luma at MinTrafoSize)

	AI-HE	AI-LC	RA-HE	RA-LC	LB-HE	LB-LC
Class A	0.0%	0.0%	0.0%	0.0%		
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%			0.0%	0.1%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	100%	99%	100%	100%	100%	100%
Dec Time[%]	100%	100%	100%	99%	100%	99%

Conclusion

- ▶ Current Y/Cb/Cr transform coefficients order requires large size of buffer on the decoding.
- ▶ Recommend followings to be adopted in WD/HM
 - Y/Cb/Cr interleave at TU
 - For TrSize==MinTrafoSize, chroma is coded after **all** Luma
- ▶ Simulation results show no loss
- ▶ G112 from BroadCom reports almost same issue and almost same solution.