



MEDIATEK

JVET-P0165

CE5-related: Simplified CCALF

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Overall Summary

- Two simplifications are proposed to reduce the complexity of CE5-2.1 CCALF
 - 1) Select CCALF, chroma ALF, or ALF-off for each chroma CTB, and explicitly signal the selection
 - 2) Align filter shape between CCALF and chroma ALF

	RA YCbCr BD-rate	Preserved coding gain of CE5-2.1 CCALF	Reduced multiplications of CE5-2.1 CCALF
CE5-2.1 CCALF	-0.85%	-	-
Method 1	-0.66%	78.3%	43%
Method 1+2a	-0.68%	80.7%	50%
Method 1+2b	-0.64%	75.4%	64%
Method 1+2c	-0.60%	71.4%	71%

Introduction

- CCALF was tested in the CE5-2.1
- Luma samples before ALF are used in CCALF
- Filtered result of CCALF added on top of the output of chroma ALF (Figure 1)
- 18 taps with 14 coefficients in the filter shape, corresponding luma position is marked in red (Figure 2)
- The increase of multiplications is 46.7% of VTM6.0 ALF.

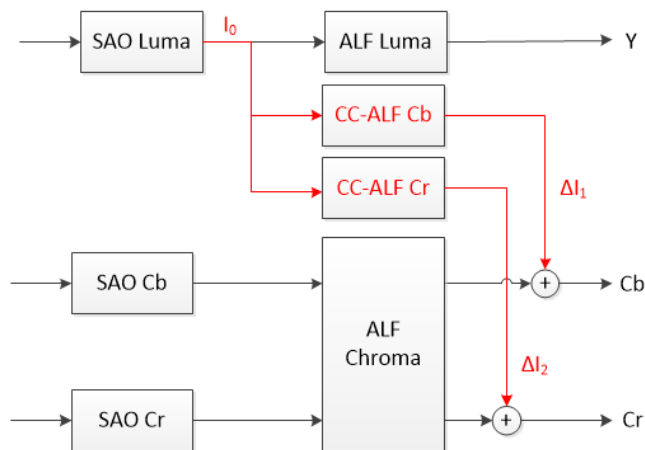


Figure1. CCALF scheme

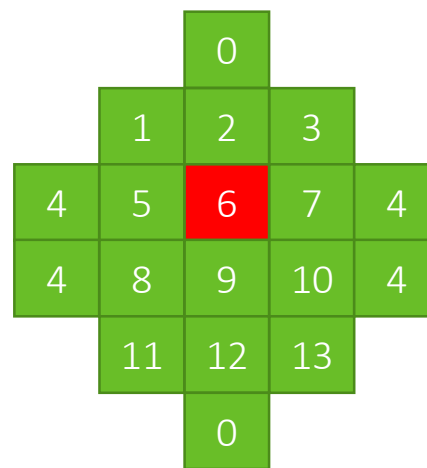


Figure2. CCALF filter shape

Method 1: Exclusive Application of CCALF and Chroma ALF

For each chroma CTB:

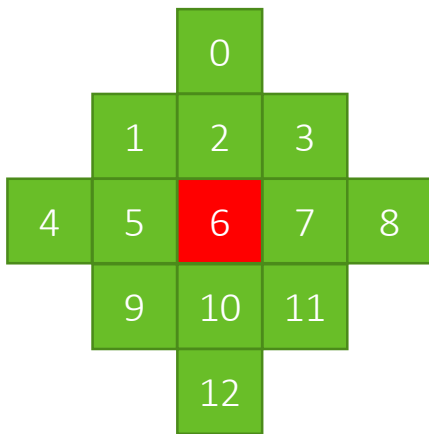
- CCALF on/off flag signalled
- If CCALF is enabled, chroma ALF is disabled
- Otherwise one chroma ALF on/off flag signalled

of multiplications per pixel reduced from 22 to 19

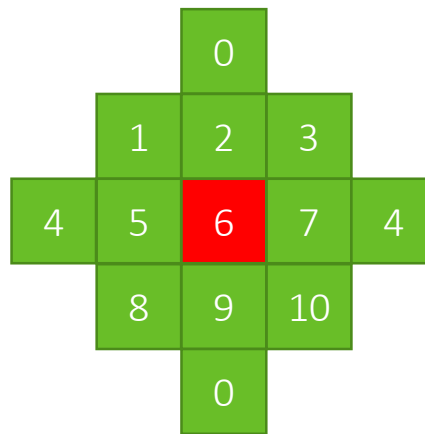
Reduced 43% multiplications of CE5-2.1 CCALF

Method 2: Apply the Filter Shape of Chroma ALF for CCALF

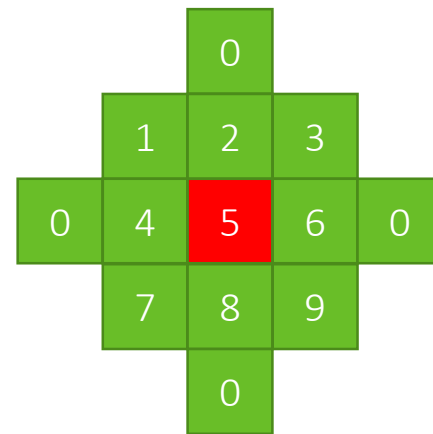
- 13 taps with a) 13, b) 11, and c) 10 coefficients, respectively
- # of multiplications per pixel reduced from 22 to a) 21.5, b) 20.5, and c) 20, respectively
- Reduced a) 7%, b) 21%, and c) 29% multiplications of CE5-2.1 CCALF, respectively



a) 13 coefficients



b) 11 coefficients



c) 10 coefficients

Simulation Results

	RA YCbCr BD-rate	Preserved coding gain of CE5-2.1 CCALF	Reduced multiplications of CE5-2.1 CCALF
CE5-2.1 CCALF	-0.85%	-	-
Method 1	-0.66%	78.3%	43%
Method 2a	-0.84%	99.9%	7%
Method 2b	-0.81%	95.5%	21%
Method 2c	-0.76%	89.7%	29%
Method 1+2a	-0.68%	80.7%	50%
Method 1+2b	-0.64%	75.4%	64%
Method 1+2c	-0.60%	71.4%	71%

Conclusion

- Proposed to significantly simplify CCALF by:
 - Introducing exclusive mode for CCALF and chroma ALF
 - Aligning filter shape between CCALF and chroma ALF

	RA YCbCr BD-rate	Preserved coding gain of CE5-2.1 CCALF	Reduced multiplications of CE5-2.1 CCALF
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Method 1	-0.66%	78.3%	43%
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Combined Test

- JVET-P0739: Combine JVET-P0165 and JVET-P0556, JVET-P0557 proposed by Qualcomm

	RA YCbCr BD-rate	Preserved coding gain of CE5-2.1 CCALF
CE5-2.1 CCALF	-0.85%	-
Combination 1	-0.64%	75.7%
Combination 2	-0.64%	75.4%

Worst case # of ALF operations reduced to exactly the same as that of VTM6.0 ALF