

Simplification of ALF filter coefficients coding

(JCTVC-I0346)

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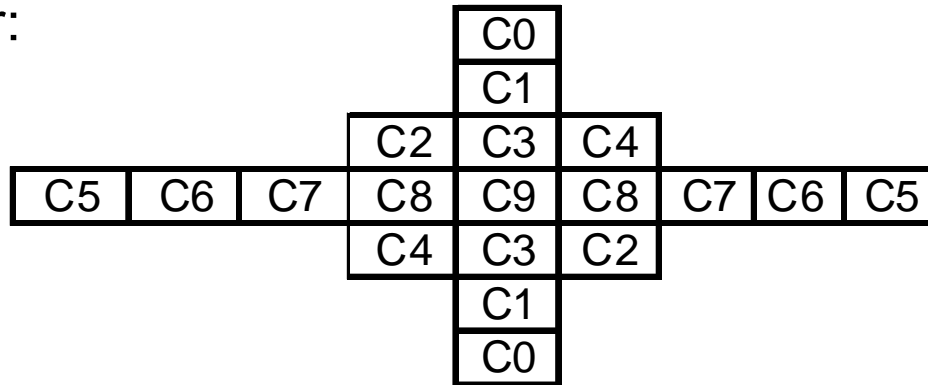
9th Meeting: Geneva, CH, 27 April – 7 May 2012

Overview

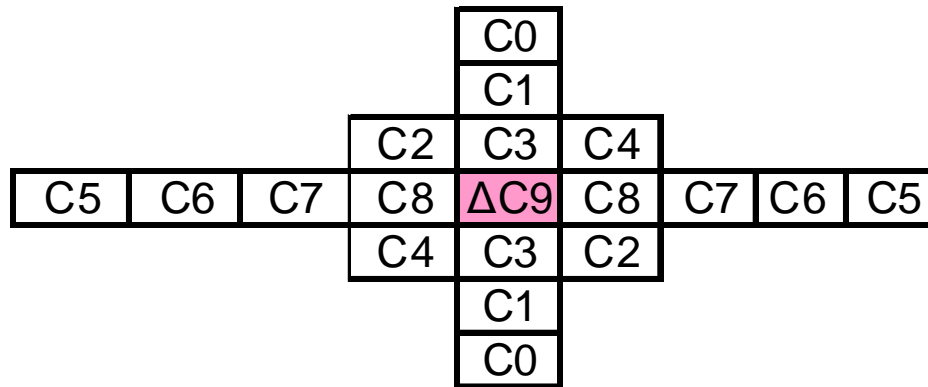
- Simplifies VLC coding of ALF filter coefficients
- E.g. ALF option 2, APS part of ALF option 3, APS mode of HM-6.0

HM-6.0 Luma ALF coefficients coding (1)

- ALF filter:



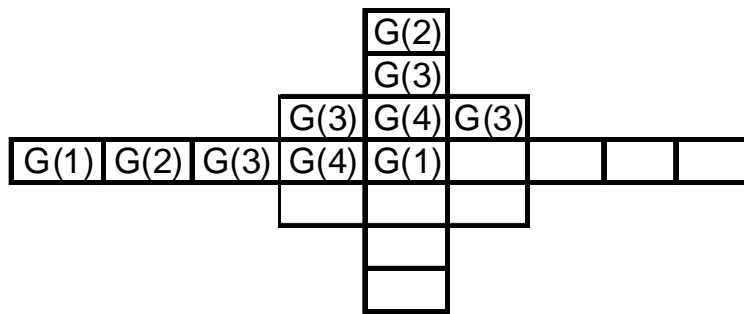
- Transmitted information:



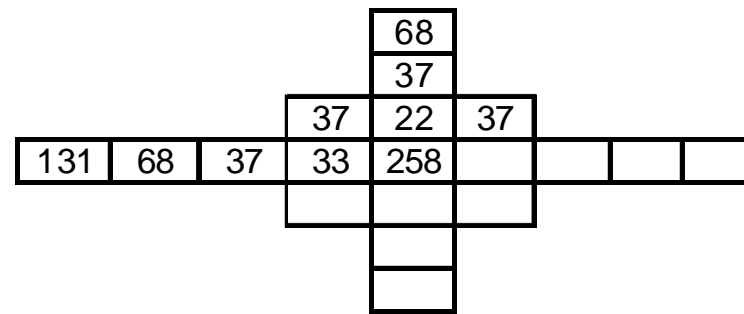
- $$\Delta C9 = C9 - (1.0 - 2 * (C0 + C1 + C2 + C3 + C4 + C5 + C6 + C7 + C8))$$

HM-6.0 Luma ALF coefficients coding (2)

- In HM-6.0, Golomb coding is used to encode ALF filter coefficients with different k parameters for different positions



Golomb k-parameters

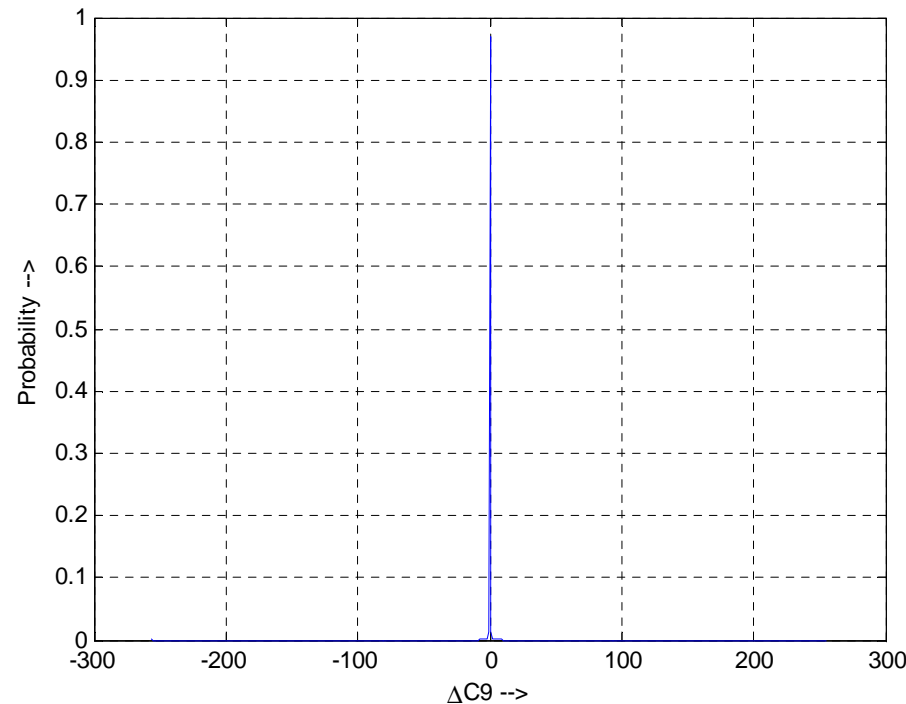


Worst case code word length

- Worst case codeword length is **258 bits** for $\Delta C9$
 - Desirable to reduce worst case code word length from implementation point of view
- Also desirable to have filter position independent entropy coder

Proposal 2: Do not transmit $\Delta C9$ (1)

- $\Delta C9$ distribution on common conditions



- 97% of the time $\Delta C9$ is zero for region based ALF and 97.5% of the time $\Delta C9$ is zero for block based ALF for luma coefficients.
- The distribution for $\Delta C9$ for chroma is similar to the luma case.

Proposal 2: Do not transmit $\Delta C9$ (2)

- C9 is calculated from received C0, C1, ..., C8
 - $C9 = 1.0 - 2*(C0+C1+C2+C3+C4+C5+C6+C7+C8)$
 - (Fixed point representation of 1.0 in HM-6.0 is 256)
- Implication:
 - ALF is constrained to be always unit gain filter
 - $2*(C0+C1+C2+C3+C4+C5+C6+C7+C8) + C9 = 1.0$
- BD-Rate results (reference is AHG6 Option 2)

	AI- HE10	RA- HE10	LB- HE10	LP- HE10
Y	0.0%	0.0%	0.0%	0.0%
U	-0.1%	-0.1%	-0.2%	0.0%
V	-0.2%	-0.1%	0.0%	-0.2%

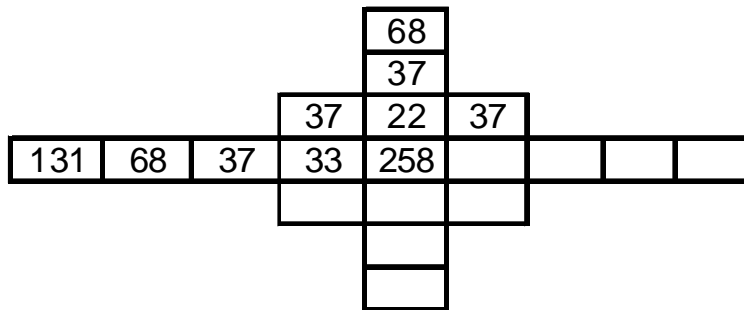
Region based ALF

	AI- HE10	RA- HE10	LB- HE10	LP- HE10
Y	0.0%	0.0%	0.0%	0.0%
U	-0.2%	0.0%	0.1%	0.0%
V	-0.3%	-0.2%	0.0%	0.1%

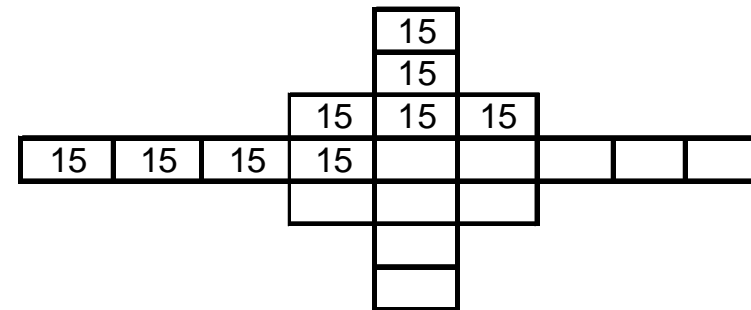
Block adaptive ALF

Proposal 3: Use EG(3) to code remaining coeffs

- Uses filter position independent VLC v/s position dependent VLC of HM-6.0
- Worst case code word length



HM-6.0



Proposal 3

- BD-Rate results (reference is AHG6 Option 2)

	AI- HE10	RA- HE10	LB- HE10	LP- HE10
Y	0.0%	0.0%	0.0%	0.0%
U	-0.1%	-0.1%	0.0%	-0.1%
V	-0.2%	-0.1%	0.0%	-0.3%

Region based ALF

	AI- HE10	RA- HE10	LB- HE10	LP- HE10
Y	0.0%	0.0%	0.0%	0.0%
U	-0.2%	-0.1%	0.1%	0.1%
V	-0.3%	-0.2%	-0.1%	0.1%

Block adaptive ALF

Conclusions

- Desirable to reduce worst case VLC code word length from implementation point of view
- Desirable to also have filter position independent entropy coder
- Adopt Proposal 2 and 3 into HEVC DIS if AHG6 ALF Option 2 gets adopted
 - Worst case codeword length goes down from 258 bits to 15 bits