



JCTVC-G155

Non-CE1: On CABAC context initialization

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Summary

- Implementation of 8-bit context initialization entries for CABAC
 - Previously proposed in F268
 - Proposal avoids computing intermediate PIPE initial state
 - Related contributions: G837
- Coding results (AI-HE,RA-HE,LB-HE)
 - Cross-checked by Qualcomm in G867

Test	Y (%)	U (%)	V (%)	Enc (%)	Dec (%)
AI-HE	0.0	0.1	0.0	99	98
RA-HE	0.0	0.0	0.0	99	98
LB-HE	0.0	0.1	0.1	100	98

CABAC context initialization in HM4

```
preCtxState = Clip3( 1, 126, ( ( m * Clip3( 0, 51, SliceQPy ) ) >> 4 ) + n )
if( preCtxState <= 63 ) {
    pStateIdx = 63 - preCtxState
    valMPS = 0
} else {
    pStateIdx = preCtxState - 64
    valMPS = 1
}
```

- m indicates slope, [-60,75] in HM4
- n indicates y-intercept, [-73,169] in HM4

Proposed approach

```

m = tabCtxSlopes[ m_idx ]
n  = n_idx << 3
preCtxState = Clip3( 1, 126, ( ( m * ( Clip3( 0, 51, SliceQP ) - 26 ) + 8 ) >> 4 ) + n )
if( preCtxState <= 63 ) {
    pStateIdx = 63 - preCtxState
    valMPS = 0
} else {
    pStateIdx = preCtxState - 64
    valMPS = 1
}
    
```

Bit	7	6	5	4	3	2	1	0
Value	m_idx				n_idx			

- m specified by a 4 bit index, using a look-up table

m_idx	0	1	2	3	4	5	6	7
Value	-96	-64	-32	-24	-16	-8	-4	0
m_idx	8	9	10	11	12	13	14	15
Value	4	8	16	24	32	64	96	128

- n specified by a 4 bit value, corresponding to QP=26

Experimental Setup

- Implemented in HM4 reference software
- Follow common conditions for AI-HE, RA-HE, LB-HE
- Context initialization values obtained by quantizing the slope and quantizing the CABAC state at QP=26 of HM4 entries
 - No re-training was done

Results

	All Intra HE			Random Access HE			Low delay B HE		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	-0.2%	-0.2%			
Class B	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	-0.1%
Class C	0.0%	0.1%	0.0%	0.0%	-0.1%	0.1%	0.0%	0.2%	0.1%
Class D	0.0%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.5%	0.0%
Class E	0.0%	-0.1%	0.0%				0.0%	-0.2%	0.6%
Overall	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%
Enc Time[%]		99%			99%			100%	
Dec Time[%]		98%			98%			98%	

Some observations on context initialization tables in WD4

- Table 9-24 should have three additional context initialization entries.
- Column 1 of Table 9-25 appears not used in the HM4.0 reference software.
- Table 9-29 is should have 1 additional context initialization entry.
- Table 9-33 have entries that do not match the values used in the HM4.0 reference software.
- Table 9-35 should have 6 additional context initialization entries.
- Tables 9-41 to 9-43 have entries that do not match the values used in the HM4.0 reference software.
- The number of context initialization entries in Tables 9-44 and 9-45 do not match the description in Table 9-20, and the values in those tables are also different from values used in HM4.0 reference software.

Conclusions

- Proposed 8-bit context initialization for CABAC
 - Similar concept as in F268
- Remaining mode coding simplification
 - 0.0%/0.0%/0.0% Luma BD-Rate for AI-HE/RA-HE/LB-HE
- Recommend for adoption or further study in CE