

BoG on MV Coding and Throughput/Parsing Robustness

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Categories

- BoG Anchor
- Simplification of AMVP candidate list construction (SP)
- Unification of merge and AMVP candidate positions (UNI)
- Parsing throughput/robustness (ROB)
- Further study in a CE
- Further study

BoG Anchor

- Disabling inferred merge
- Disabling 4x4 inter partitions (switchable by SPS flag)
- The modified motion vector rounding from JCTVC-F142

Reference: HM3.0 with bugfix 146

-0.8 % BD rate in Random Access

-0.2 % BD rate in Low Delay

SP – Recommendation to adopt

- **JCTVC-F050** “CE9: Results of Experiment SP04” (MediaTek)
 - **SP04** is on removing the redundancy checking procedure during the derivation of top MVP in Inter mode.
- **JCTVC-F088** “CE9: Simplified AMVP design (SP06S1, SP06S2)” (TI and LGE)
 - **SP06S2** is on reducing the number of spatial MVP scaling from four to one.

Reference: BoG Anchor

0.0% BD rate on average

SP – Recommendation to adopt

- **JCTVC-F587** “Reduction of reference picture list checking for temporal motion vector prediction” (Samsung)
 - List containing POCs $<$ current POC is chosen to be used for temporal candidate
 - In HM3.0, checking is performed for every PU
 - Method 3 performs this check on slice level

UNI – Recommendation to adopt

- **JCTVC-F419** Unification of derivation process for merge mode and MVP” (JVC KENWOOD) **Proposal1**
 - Searches the same 5 spatial positions as AMVP
 - It was requested to test it choosing 4 spatial candidates as in JCTVC-F297 instead of 2 (proposed)

Reference: BoG Anchor

-0.1% BD rate on average

ROB – Recommendation to adopt

- **JCTVC-F470** “Parsing Robustness for Merge/AMVP” (Panasonic)
 - Use truncated unary codes of fixed maximum length 5 for Merge, 2 for AMVP
 - To avoid the parsing problem, following two adaptive switching methods are disabled
 - Adaptive context selection for `inter_pred_flag` and `ref_idx_lx` (CABAC)
 - `ctxIdx` is fixed to 0
 - Adaptive combined coding for `inter_pred_flag` and `ref_idx_lx` (CAVLC)
 - `use_combined_inter_pred_ref` is fixed to true in B slice

ROB – Recommendation to adopt

- **JCTVC-F470** “Parsing Robustness for Merge/AMVP” (Panasonic)
 - Add additional merge candidates if number of merge candidates < 5
 - combined bi-directional Merge candidate (candidate1)
maximum number is limited to 5
 - scaled bi-directional Merge candidate (candidate 2)
maximum number is limited to 1
→ It is limited that only candidate, which don't need scaling calculation, are added to Merge candidates list
 - zero vector Merge candidate (candidate 3)
maximum number is limited to 2

Reference: BoG Anchor

-0.1% Random Access -0.4% LowDelay HE -0.8% LowDelay LC

ROB – Recommendation to adopt

- **JCTVC-F470** “Parsing Robustness for Merge/AMVP” (Panasonic)
 - Add additional zero MV if number of AMVP candidates < 2

Reference: BoG Anchor

-0.1% Random Access -0.4% LowDelay HE -0.8% LowDelay LC

Further study in CE

CE on MV Coding (**CE9**)

- **JCTVC-F575** “Simplification of MVP Design for HEVC” (Motorola Mobility)
- **JCTVC-F105** “On MVP list pruning process” (LGE)
- **JCTVC-F373** “Merge based mvd transmission” (JVC KENWOOD)
- **JCTVC-F372** “Bi-derivative merge candidate” (JVC KENWOOD)

CE on robustness/throughput (**CE13**)

- **JCTVC-F052** “CE9: Results of Experiment ROB04” (MediaTek)
- **JCTVC-F068** “A study on HM3.0 parsing throughput issue” (TI)
- **JCTVC-F347** “A method of decoupling motion data reconstruction from entropy decoding” (TI, Panasonic, Broadcom, Samsung)
- **JCTVC-F083** “CE9: Evaluation results on disabling TMVP from AMVP list construction (ROB05)” (TI)
- **JCTVC-F474** “CE9: Description of experiments ROB01 and ROB02” (Canon)
- **JCTVC-F402** “MVP index parsing with fixed number of candidates” (Samsung)
- **JCTVC-F713** “CE9: Result about the combination of experiments ROB02 and ROB04” (Canon, MediaTek)

Further study in high level syntax AHG

Add a flag in the slice header to:

Disable temporal candidate for merge mode and AMVP

- **JCTVC-F427** “Consideration on Temporal Predictor” (Sony)
- **JCTVC-F051** “CE9: Results of Experiment ROB03” (MediaTek)
- **JCTVC-F052** “CE9: Results of Experiment ROB04” (MediaTek)
- **JCTVC-F474** “CE9: Description of experiments ROB01 and ROB02” (Canon)

Signal whether low delay coding is used

- **JCTVC-F587** “Reduction of reference picture list checking for temporal motion vector prediction” (Samsung)

Results

HM3.0 bugfix#146 vs. BoG Anchor

	Random access			Random access LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.7	-1.2	-0.8	-0.8	-0.7	-0.7
Class B	-0.6	-0.6	-0.6	-0.6	-0.3	-0.3
Class C	-0.9	-0.7	-0.6	-0.9	-0.5	-0.5
Class D	-1.0	-0.5	-0.5	-1.0	-0.4	-0.6
Class E						
All	-0.8	-0.7	-0.6	-0.8	-0.5	-0.5
Enc Time[%]	99%			103%		
Dec Time[%]	101%			106%		
	Low delay			Low delay LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.2	-0.1	-0.3	-0.2	-0.2	-0.2
Class C	-0.2	-0.1	-0.3	-0.3	0.0	-0.1
Class D	-0.1	-0.1	0.4	0.0	0.2	0.0
Class E	-0.2	-0.8	0.0	-0.2	0.1	0.6
All	-0.2	-0.3	-0.1	-0.2	0.0	0.0
Enc Time[%]	102%			102%		
Dec Time[%]	97%			98%		

BoG Anchor vs. SP

	Random access			Random access LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	0.0	0.2	-0.1	0.0	0.2	0.3
Class B	0.0	0.0	0.0	0.0	0.1	0.0
Class C	0.0	0.1	0.0	0.0	0.0	0.0
Class D	0.0	-0.1	-0.1	0.0	-0.1	0.1
Class E						
All	0.0	0.0	0.0	0.0	0.0	0.1
Enc Time[%]	104%			102%		
Dec Time[%]	107%			110%		
	Low delay			Low delay LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	0.0	-0.2	-0.3	0.0	0.0	0.1
Class C	0.0	-0.2	0.0	0.0	0.0	0.2
Class D	0.0	-0.1	0.0	0.0	0.0	0.0
Class E	0.0	0.5	-0.1	0.0	-0.2	-0.1
All	0.0	0.0	-0.1	0.0	0.0	0.0
Enc Time[%]	101%			100%		
Dec Time[%]	106%			106%		

BoG Anchor vs. SP + UNI

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	-0.1	-0.1	-0.4	-0.1	0.1	0.0
Class B	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
Class C	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Class D	0.0	0.0	-0.2	-0.1	-0.1	0.0
Class E						
Overall	-0.1	-0.1	-0.2	-0.1	0.0	-0.1
Enc Time[%]	68%			94%		
Dec Time[%]	#NUM!			#NUM!		
	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	-0.2	-0.2	-0.3	-0.2	0.1	-0.1
Class C	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1
Class D	-0.1	0.0	-0.3	-0.1	-0.2	0.3
Class E	-0.1	1.1	-0.1	-0.1	0.3	-0.4
Overall	-0.1	0.1	-0.2	-0.1	0.0	-0.1
Enc Time[%]	69%			98%		
Dec Time[%]	#NUM!			#NUM!		

BoG Anchor vs. SP + UNI + ROB

	Random access			Random access LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.2	-0.3	-0.6	-0.4	-0.1	-0.3
Class B	-0.1	-0.3	-0.3	-0.1	-0.2	-0.2
Class C	0.0	0.0	-0.3	-0.1	-0.2	-0.3
Class D	0.1	-0.1	-0.1	0.1	-0.2	0.0
Class E						
All	-0.1	-0.2	-0.3	-0.1	-0.2	-0.2
Enc Time[%]	119%			110%		
Dec Time[%]	103%			98%		
	Low delay			Low delay LC		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A						
Class B	-0.6	-1.4	-1.1	-1.3	-1.2	-1.1
Class C	-0.6	-1.0	-1.1	-0.9	-0.9	-0.9
Class D	-0.5	-0.6	-0.7	-0.6	-0.7	-0.6
Class E	0.4	0.3	-0.7	-0.1	-0.4	-0.4
All	-0.4	-0.7	-0.9	-0.8	-0.9	-0.8
Enc Time[%]	111%			109%		
Dec Time[%]	102%			103%		