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Qualcomm

CE9-related: Bilateral Matching with Constrained Motion Vector Storage

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Introduction

- Evaluate performance-wise impact on CE9.2.5/6 with constrained MV storage
- Take refined MV for MC and original MV for storage
- Prohibit using refined MV for spatial/temporal MV prediction and BS calculation

- Report Y BD-rate results relative to BMS (BMS-1.0 w/ BMS cfg.), VTM (BMS-1.0 w/ VTM cfg.), and DMVR (BMS-1.0 w/ VTM cfg. Plus DMVR enabled)
  - Modified CE9.2.5 vs. BMS: (Y) -0.6%, (U) -0.7%, (V) -0.6%, (Enc.) 103%, (Dec.) 113%
  - Modified CE9.2.6 vs. BMS: (Y) -0.3%, (U) -0.3%, (V) -0.3%, (Enc.) 100%, (Dec.) 103%
  - Modified CE9.2.5 vs. VTM: (Y) -3.6%, (U) -3.4%, (V) -3.5%, (Enc.) 118%, (Dec.) 165%
  - Modified CE9.2.6 vs. VTM: (Y) -3.0%, (U) -2.7%, (V) -2.8%, (Enc.) 109%, (Dec.) 142%

Proposed vs. CE9.2.5

- 1.7% (VTM) and 1.1% (BMS) of Y BD-rate collectable without constraint on MV storage
- 1-2% change in runtime

Constrained

	Random Access Main 10									
	Modified CE9.2.5 vs. VTM anchor					Modified CE9.2.5 vs. BMS anchor				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-3.62%	-3.10%	-3.41%	115%	158%	-0.58%	-0.66%	-0.71%	101%	109%
Class A2	-6.04%	-5.57%	-5.66%	118%	177%	-0.84%	-0.75%	-0.79%	104%	113%
Class B	-3.12%	-2.95%	-2.90%	119%	167%	-0.64%	-0.68%	-0.62%	105%	117%
Class C	-2.24%	-2.53%	-2.54%	119%	159%	-0.51%	-0.55%	-0.43%	101%	112%
Overall	-3.57%	-3.39%	-3.46%	118%	165%	-0.63%	-0.65%	-0.62%	103%	113%
Class D	-2.44%	-2.58%	-2.86%	121%	162%	-0.73%	-0.65%	-0.58%	102%	113%

Unconstrained

	Random Access Main 10									
	CE9.2.5 vs. VTM anchor					CE9.2.5 vs. BMS anchor				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-5.60%	-4.47%	-5.10%	112%	159%	-1.84%	-1.54%	-1.84%	100%	115%
Class A2	-8.86%	-7.87%	-7.96%	115%	180%	-2.65%	-2.22%	-2.31%	102%	112%
Class B	-4.62%	-3.97%	-4.04%	117%	158%	-1.57%	-1.42%	-1.36%	103%	110%
Class C	-3.18%	-3.39%	-3.47%	118%	165%	-1.29%	-1.23%	-1.27%	101%	113%
Overall	-5.28%	-4.70%	-4.88%	116%	164%	-1.76%	-1.55%	-1.62%	102%	112%
Class D	-3.36%	-3.25%	-3.40%	121%	167%	-1.55%	-1.39%	-1.22%	101%	112%

Proposed vs. CE9.2.6

- 1.7% (VTM) and 1.1% (BMS) of Y BD-rate collectable without constraint on MV storage
- 3% and 8% reduction of encoding and decoding time relative to VTM, respectively

Constrained

	Random Access Main 10									
	Modified CE9.2.6 vs. VTM anchor					Modified CE9.2.6 vs. BMS anchor				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-2.79%	-2.25%	-2.51%	107%	136%	-0.01%	-0.06%	-0.06%	100%	103%
Class A2	-4.89%	-4.46%	-4.58%	109%	148%	-0.27%	-0.20%	-0.23%	101%	103%
Class B	-2.80%	-2.46%	-2.48%	109%	142%	-0.45%	-0.46%	-0.41%	100%	102%
Class C	-1.93%	-2.13%	-2.17%	111%	144%	-0.31%	-0.25%	-0.25%	100%	103%
Overall	-2.98%	-2.73%	-2.82%	109%	142%	-0.29%	-0.27%	-0.26%	100%	103%
Class D	-2.23%	-2.18%	-2.38%	113%	147%	-0.60%	-0.50%	-0.44%	100%	103%

Unconstrained

	Random Access Main 10									
	CE9.2.6 vs. VTM anchor					CE9.2.6 vs. BMS anchor				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-4.88%	-3.73%	-4.21%	108%	141%	-1.32%	-0.91%	-1.15%	99%	108%
Class A2	-8.07%	-7.13%	-7.30%	110%	159%	-2.10%	-1.63%	-1.83%	100%	107%
Class B	-4.30%	-3.56%	-3.66%	114%	152%	-1.35%	-1.13%	-1.12%	101%	108%
Class C	-2.77%	-2.95%	-3.00%	113%	150%	-0.99%	-0.93%	-0.94%	100%	107%
Overall	-4.76%	-4.15%	-4.32%	112%	150%	-1.40%	-1.13%	-1.22%	100%	108%
Class D	-3.05%	-3.01%	-3.24%	115%	153%	-1.32%	-1.15%	-1.11%	99%	106%

Concluding Remarks

- Report 1.7% and 1.1% Y BD-rate collectable when using unconstrained MV storage
- Observe subtle runtime variation from CE9.2.5 and 3-8% runtime reduction in CE9.2.6

- Similar proposals demonstrating various granularities of MV storage constraints
  - JVET-K0295: immediately previous CU
  - JVET-K0347: current CTU
  - JVET-K0041: current CTU row
  - JVET-K0217: current frame
  - Etc.

- Thank **Huawei** for crosscheck (JVET-K0463)

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Thank you!

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