

JVET-00580

CE4-related: Additional tests for prediction refinement with optical flow for affine mode (CE4-2.1) with 4x8 sub-block size

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Introduction

- CE4-2.1: prediction refinement with optical flow for affine mode
 - CE4-2.1a: 4x4 for uni and bi-prediction
 - CE4-2.1b: 4x4 for uni-prediction, 8x8 with 6-tap filter for bi-prediction
 - CE4-2.1c: 4x4 for uni-prediction, 8x8 with 8-tap filter for bi-prediction
- Proposal
 - Use 4x4 for uni-prediction, and 4x8 for bi-prediction
 - Same computation complexity as 8x8
 - The refinement is more accurate because the optical flow (delta MV) is smaller due to smaller sub-block size

$$\begin{cases} \Delta v_x(x, y) = c * x + d * y \\ \Delta v_y(x, y) = e * x + f * y \end{cases}$$

- Test1: 4x4 for uni-prediction, 4x8 with 6-tap filter for bi-prediction
- Test2: 4x4 for uni-prediction, 4x8 with 8-tap filter for bi-prediction

Simulations

- Test1: 4x8 with 6-tap interpolation filter for bi

	Random Access Main 10					Low delay B Main10				
	Over VTM 5.0					Over VTM 5.0				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-0.13%	-0.15%	0.05%	102%	101%	-	-	-	-	-
Class A2	-0.76%	0.30%	0.21%	102%	101%	-	-	-	-	-
Class B	-0.56%	-0.18%	-0.14%	102%	101%	-0.32%	-0.11%	-0.04%	102%	100%
Class C	-0.25%	-0.21%	-0.20%	102%	101%	-0.26%	-0.05%	-0.13%	102%	103%
Class E	-	-	-	-	-	-0.26%	0.13%	-0.11%	103%	101%
Overall	-0.43%	-0.08%	-0.04%	102%	101%	-0.29%	-0.03%	-0.09%	103%	101%
Class D	-0.48%	0.01%	0.01%	101%	100%	-0.48%	-0.67%	0.08%	102%	101%
Class F	-0.76%	-0.32%	-0.29%	102%	101%	-1.17%	-1.01%	-1.54%	102%	100%

- Test2: 4x8 with 8-tap interpolation filter for bi

	Random Access Main 10					Low delay B Main10				
	Over VTM 5.0					Over VTM 5.0				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-0.14%	-0.22%	0.07%	101%	101%	-	-	-	-	-
Class A2	-0.81%	0.30%	0.19%	101%	101%	-	-	-	-	-
Class B	-0.62%	-0.22%	-0.23%	101%	101%	-0.38%	-0.07%	-0.10%	102%	100%
Class C	-0.35%	-0.16%	-0.26%	101%	102%	-0.37%	-0.20%	0.06%	102%	102%
Class E	-	-	-	-	-	-0.27%	0.32%	-0.78%	102%	101%
Overall	-0.49%	-0.10%	-0.09%	101%	101%	-0.35%	-0.02%	-0.22%	102%	101%
Class D	-0.63%	-0.20%	-0.04%	101%	101%	-0.87%	-0.64%	-0.25%	101%	100%
Class F	-0.78%	-0.32%	-0.39%	101%	101%	-1.22%	-1.45%	-1.43%	101%	101%

Simulations

- Complexity comparison

Tests	Settings for affine bi-prediction	BD rate relative to VTM-5.0 RA-Y; LB-Y	Multiplications per 4x4 block (uni/bi)	Additions per 4x4 block (uni/bi)
VTM-5.0	4x4, 6 tap	0%; 0%	400/800	350/700
CE4-2.1a	4x4, 6 tap	-0.48%; -0.32%	432/864	430/860
CE4-2.1b	8x8, 6 tap	-0.40%; -0.27%	432/744	430/760
CE4-2.1c	8x8, 8 tap	-0.46%; -0.35%	432/976	430/984
Test 1	4x8, 6 tap	-0.43%; -0.29%	432/744	430/760
Test 2	4x8, 8 tap	-0.49%; -0.35%	432/976	430/984

Conclusions

- 4x8 sub-block size for bi-prediction gets a better trade-off compared to 8x8 sub-block size
 - Better performance with same complexity compared to 8x8

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