

JVET-00385

Non-CE9: An applying condition considering temporal correlation for DMVR

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■ Problem statement

- The current DMVR doesn't have any applying condition considering temporal correlation among a L0/L1 reference block and a current block.

■ Proposal

- An additional condition to DMVR early termination
 - If SAD with initial MVs is larger than a threshold, DMVR is terminated.

■ Experimental results

- For CTC sequences: 0.01% loss in comparison with VTM5.0
- For Non-CTC sequences (used in JVET-N0828): Max. coding gain is -0.09% in comparison with VTM5.0

- DMVR refines MVs by minimizing SAD between a L0 and a L1 reference block.
- It is based on the assumption that temporal correlation among the L0, the L1 ref. block and the current block is high.
- However, the current DMVR doesn't have any applying condition for considering low temporal correlation blocks.
- It was reported that DMVR brings coding loss for some of the non-CTC sequences in JVET-N0828.
- Those sequences has low temporal correlation scene (e.g. with sprays, cross-fade).

- It is proposed that an applying condition considering temporal correlation.
 - To prevent applying DMVR to low temporal correlation blocks
- We introduced an additional condition to DVMR early termination.
 - If SAD with a initial MVs is larger than the threshold (400 per pixel) DMVR is terminated.

```
minCost = xDMVRCost(clpRngs.comp[COMPONENT_Y].bd, addrL0, m_biLinearBufStride, addrL1, m_biLinearBufStride, dx, dy);
    if (minCost < ((4 * dx * (dy >> 1/*for alternate line*/))) // Original ET condition
    {
        notZeroCost = false;
        break;
    }
#ifdef DMVR_ET_COST // Additional ET condition by this proposal
    if (minCost > DMVR_INITIALET_TH * dx * (dy >> 1)) // DMVR_INITIALET_TH = 400
    {
        break;
    }
#endif
```

■ Anchor: VTM-5.0

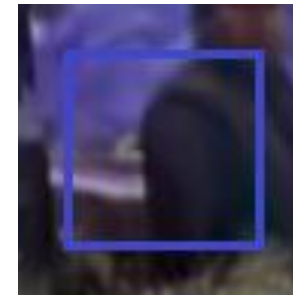
	Random access Main10				
	Over VTM-5.0				
	Y	U	V	EncT	DecT
Class A1	0.02%	-0.16%	-0.01%	100%	100%
Class A2	0.01%	0.04%	0.01%	100%	100%
Class B	0.03%	0.03%	0.06%	100%	100%
Class C	0.00%	0.02%	-0.04%	100%	101%
Class E					
Overall	0.01%	-0.01%	0.01%	100%	100%
Class D	0.01%	0.02%	0.02%	100%	100%
Class F	0.03%	0.06%	0.05%	100%	100%

■ The BD-rates change are very small for CTC sequences.

- An example of a block in which DMVR is terminated by the proposed method.
 - Correlation between the L0 ref block and the L1 ref block is low due to cross-fade.
 - DMVR cannot refine MVs correctly at those blocks.



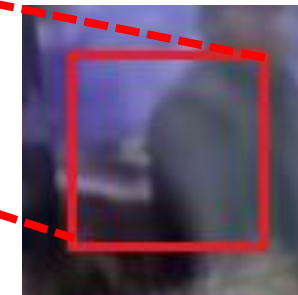
MarketPlace (POC:520)



L0 ref block
(POC:512)



L1 ref block
(POC:528)



Current block
(POC:520)

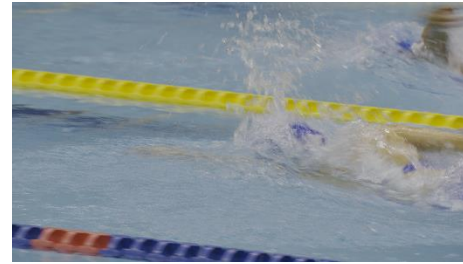
■ Experimental results for non-CTC sequences used in JVET-N0828



c05_Fireworks_barrage



c07_Drama_sea



c10_SwimRace_crawl



c14_Volleyball_follow



c15_Paddock_fixed

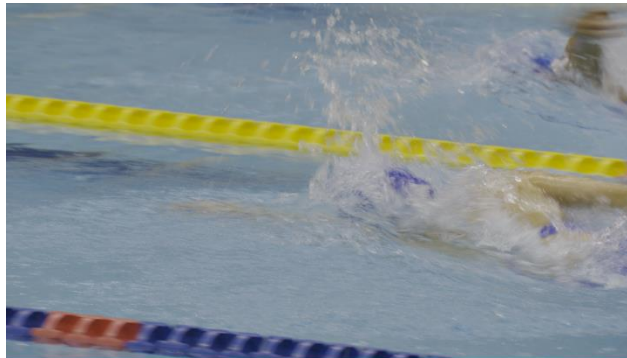
■ 1. DMVR tool ON test (anchor : DMVR off) for VTM-4.0 and VTM-5.0

- Coding efficiencies of DMVR are improved in VTM-5.0 for the non-CTC sequences.
- It mainly comes from a new applying condition considering weights of bi-prediction.

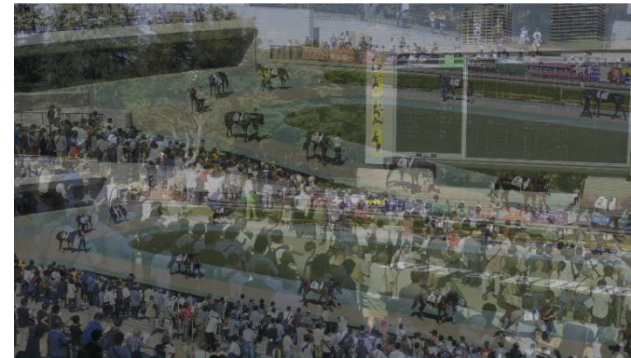
	Random access Main10				
	Over VTM-4.0 DMVRoff				
	Y	U	V	EncT	DecT
c05_Fireworks_barrage	0.31%	-0.46%	-0.86%	102%	116%
c07_Drama_sea	0.01%	-0.61%	-0.37%	102%	110%
c10_SwimRace_crawl	0.12%	-0.14%	-0.31%	101%	105%
c14_Volleyball_follow	0.05%	-0.33%	-0.41%	102%	118%
c15_Paddock_fixed	0.40%	0.04%	0.53%	103%	108%
Overall	0.18%	-0.30%	-0.28%	102%	111%

	Random access Main10				
	Over VTM-5.0 DMVRoff				
	Y	U	V	EncT	DecT
c05_Fireworks_barrage	-0.08%	-0.45%	-0.36%	101%	107%
c07_Drama_sea	-0.21%	-0.71%	-0.35%	101%	108%
c10_SwimRace_crawl	0.03%	-0.07%	0.09%	100%	101%
c14_Volleyball_follow	-0.60%	-0.58%	-0.57%	101%	105%
c15_Paddock_fixed	0.14%	-0.12%	0.07%	101%	102%
Overall	-0.14%	-0.38%	-0.23%	101%	105%

- 2. DMVR tool ON test (anchor : DMVR off) for VTM-5.0 and the proposed method.
 - DMVR still derive coding losses for sequences c10 and c15.
 - Y BD-rates are improved -0.04% for c10 and -0.09% for c15 by the proposed method.



c10_SwimRace_crawl
(with sprays)



c15_Paddock_fixed
(cross-fade)

	Random access Main10				
	Over VTM-5.0 DMVRoff				
	Y	U	V	EncT	DecT
c05_Fireworks_barrage	-0.08%	-0.45%	-0.36%	101%	107%
c07_Drama_sea	-0.21%	-0.71%	-0.35%	101%	108%
c10_SwimRace_crawl	0.03%	-0.07%	0.09%	100%	101%
c14_Volleyball_follow	-0.60%	-0.58%	-0.57%	101%	105%
c15_Paddock_fixed	0.14%	-0.12%	0.07%	101%	102%
Overall	-0.14%	-0.38%	-0.23%	101%	105%

	Random access Main10				
	Over VTM-5.0 DMVRoff				
	Y	U	V	EncT	DecT
c05_Fireworks_barrage	-0.07%	-0.32%	-0.19%	101%	108%
c07_Drama_sea	-0.13%	-0.54%	-0.68%	101%	107%
c10_SwimRace_crawl	-0.01%	-0.07%	-0.07%	100%	100%
c14_Volleyball_follow	-0.61%	-0.85%	-0.76%	100%	105%
c15_Paddock_fixed	0.05%	-0.21%	-0.07%	101%	101%
Overall	-0.15%	-0.40%	-0.35%	101%	104%

■ Proposal

- An additional condition to DMVR early termination
 - If SAD with the initial MV is larger than the threshold, DMVR is terminated.

■ Experimental results

- For CTC sequences: 0.01% loss in comparison with VTM5.0
- For Non-CTC sequences (used in JVET-N0828): Max. coding gain is -0.09% in comparison with VTM5.0

■ Proposal is recommended to adopt VVC and VTM-6.

■ Thank NHK for cross-checking.