

MEDIATEK

CE2-related: Temporal BV merge mode on CE2 Test-1 and Test-7

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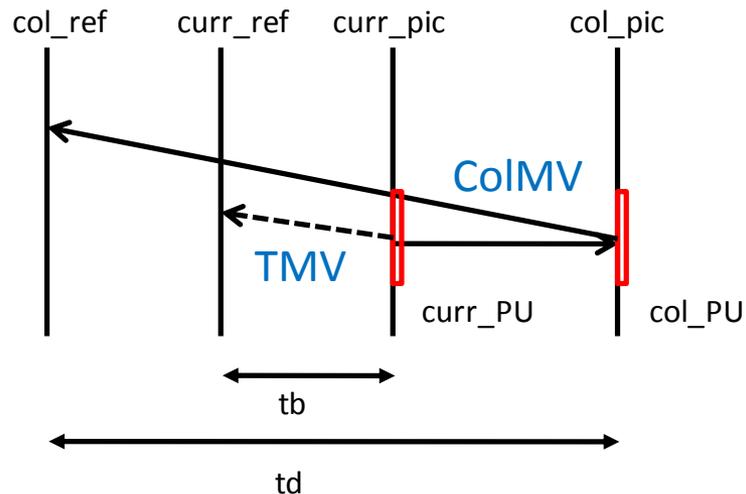
Overview Summary

- Proposed to include the BVs in temporal merge mode derivation on top of CE2 Test-1 and Test-7
 - In CE2 Test-1 and Test-7, the reconstructed current picture is mark as long-term reference picture
 - The BV (the MV that points to the reconstructed picture of the co-located picture) is not valid in temporal merge mode derivation

Text & graphics with motion Lossy BD-rate	RA-RGB	RA-YUV	RA-RGB	RA-YUV
CE2 Test 1 + Proposed vs CE2 Test 1	-0.6%	-0.6%	-0.7%	-0.7%
CE2 Test 7 + Proposed vs CE2 Test 7	-0.6%	-0.6%	-0.6%	-0.7%

Temporal Merge Candidate Derivation in HEVC

- In HEVC temporal merge mode derivation, a scaled motion vector is derived from co-located PU
 - $TMV = ColMV \times (tb/td)$
 - $ref_Idx = 0$
- If the col_ref is long-term reference picture and the $curr_ref$ is short-term reference picture, the temporal merge candidate is not available



Intra Block Copy and Inter Signalling Unification in CE2 Test-1 and Test-7

- The IntraBC mode is signalled reusing inter signalling by adding the reconstructed current picture as the last reference picture in LIST_0
 - The reconstructed current picture is marked as long-term picture
 - If co-located PU is IntraBC coded block, col_ref is long-term reference picture
- The BV (the MV that points to the reconstructed picture of the co-located picture) of the co-located IntraBC coded PU cannot be used to derive the temporal merge candidate
 - The curr_ref is short-term reference picture in RA and LB in current CTC
 - The curr_ref is short-term reference picture and col_ref is long-term reference picture

Proposed Method for Temporal BV Merge Mode

- The the BVs are proposed to be utilized in temporal merge candidate derivation
 - If the MV of the co-located block is BV (points to the reconstructed picture of the co-located picture), the BV is used as the temporal merge candidate
 - The ref_idx points to the current reconstructed picture

Modification in Spec

- Only change one item with adding two comparators

8.5.3.2.9 Derivation process for collocated motion vectors

The variables `mvLXCol` and `availableFlagLXCol` are derived as follows:

...

and `mvLXCol` and `availableFlagLXCol` are derived as follows:

-If `curr_pic_as_ref_enabled_flag` is 1 and `colPocDiff` is equal to 0, `mvLXCol` is set equal to `mvCol` and `refIdxLX` is set equal to the the current picture.

-**Otherwise** if `LongTermRefPic(currPic, currPb, refIdxLX, LX)` is not equal to `LongTermRefPic(ColPic, colPb, refIdxCol, listCol)`, both components of `mvLXCol` are set equal to 0 and `availableFlagLXCol` is set equal to 0.

-Otherwise, the variable `availableFlagLXCol` is set equal to 1, `refPicListCol[refIdxCol]` is set to be the picture with reference index `refIdxCol` in the reference picture list `listCol` of the slice containing prediction block `currPb` in the collocated picture specified by `ColPic`, and the following applies

Encoder Modification

- In the proposed method, it might generate the temporal merge candidates that List_0 MV is a BV, and List_1 MV is a normal MV
 - {List_0_BV, List_1_MV}
 - This kind of merge candidates is disabled in CE2 Test-1 and Test-7 encoder searching
- In this contribution, the encoder modified to be able to search this kind of merge candidates

Lossy Coding Result on Top of CE2 Test 1 and Test-7

- Anchor: SCM-3.0
 - Test: CE2 Test-1 or Test-7 + encoder modification + proposed method
- Thanks ITRI for cross-checking**

On top of CE2 Test-1	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-2.8%	-4.6%	-4.5%	-3.0%	-4.4%	-4.4%
RGB, mixed content, 1440p & 1080p	-0.9%	-2.4%	-2.6%	-1.3%	-2.8%	-3.0%
RGB, Animation, 720p	0.0%	0.0%	-0.1%	-0.1%	-0.2%	-0.2%
RGB, camera captured, 1080p	-0.2%	-0.1%	-0.2%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-2.9%	-4.6%	-4.9%	-3.1%	-4.5%	-4.4%
YUV, mixed content, 1440p & 1080p	-1.2%	-3.0%	-3.1%	-1.7%	-4.2%	-4.4%
YUV, Animation, 720p	-0.1%	-0.4%	0.0%	0.0%	0.0%	-0.1%
YUV, camera captured, 1080p	-0.2%	-0.1%	-0.2%	0.0%	0.1%	0.1%

On top of CE2 Test-7	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-3.1%	-5.0%	-4.9%	-3.0%	-4.5%	-4.5%
RGB, mixed content, 1440p & 1080p	-1.2%	-2.6%	-2.7%	-1.6%	-2.9%	-3.2%
RGB, Animation, 720p	0.0%	0.0%	-0.1%	0.0%	-0.1%	-0.1%
RGB, camera captured, 1080p	-0.2%	-0.1%	-0.1%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-3.4%	-5.1%	-5.3%	-3.2%	-4.7%	-5.0%
YUV, mixed content, 1440p & 1080p	-1.6%	-3.4%	-3.6%	-1.9%	-4.0%	-4.5%
YUV, Animation, 720p	-0.2%	-0.6%	-0.3%	0.1%	-0.4%	-0.5%
YUV, camera captured, 1080p	-0.2%	-0.1%	-0.4%	0.0%	0.1%	0.0%

Lossy Coding Result on Top of CE2 Test 1 and Test-7

- Anchor: CE2 Test-1 or Test-7
- Test: CE2 Test-1 or Test-7 + encoder modification + proposed method

On top of CE2 Test-1	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.6%	-0.6%	-0.6%	-0.7%	-0.6%	-0.7%
RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.2%	-0.4%	-0.3%	-0.5%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
YUV, text & graphics with motion, 1080p & 720p	-0.6%	-0.6%	-0.6%	-0.7%	-0.6%	-0.4%
YUV, mixed content, 1440p & 1080p	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.2%	-0.3%
YUV, camera captured, 1080p	0.0%	0.0%	-0.1%	0.0%	0.1%	-0.1%

On top of CE2 Test-7	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.6%	-0.6%	-0.6%	-0.6%	-0.5%	-0.6%
RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%
RGB, Animation, 720p	0.0%	0.0%	0.1%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.1%	-0.1%	-0.1%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.6%	-0.6%	-0.7%	-0.7%	-0.7%	-0.7%
YUV, mixed content, 1440p & 1080p	-0.2%	-0.1%	-0.2%	-0.3%	0.0%	-0.2%
YUV, Animation, 720p	0.0%	-0.1%	0.0%	0.1%	-0.2%	-0.4%
YUV, camera captured, 1080p	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%

Lossy Coding Result on Top of CE2 Test 1 and Test-7

- Anchor: CE2 Test-1 or Test-7 + encoder modification
- Test: CE2 Test-1 or Test-7 + encoder modification + proposed method

On top of CE2 Test-1	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.5%
RGB, mixed content, 1440p & 1080p	0.0%	0.0%	-0.1%	-0.1%	0.0%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.4%	-0.4%	-0.5%	-0.5%	-0.5%	-0.4%
YUV, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	-0.2%	-0.2%	-0.1%
YUV, Animation, 720p	0.0%	-0.1%	0.0%	-0.1%	0.0%	0.1%
YUV, camera captured, 1080p	0.0%	-0.1%	-0.1%	0.0%	0.1%	0.1%

On top of CE2 Test-7	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.4%	-0.3%	-0.4%	-0.4%	-0.4%	-0.5%
RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.2%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.4%	-0.4%	-0.4%	-0.5%	-0.5%	-0.6%
YUV, mixed content, 1440p & 1080p	-0.1%	0.0%	0.0%	-0.2%	-0.1%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.2%	-0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%

Lossy Coding Result of Encoder Modification

- Anchor: CE2 Test-1 or Test-7
- Test: CE2 Test-1 or Test-7 + encoder modification

On top of CE2 Test-1	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.2%
RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	-0.2%	-0.3%	-0.3%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.1%	-0.2%	-0.2%	-0.2%	-0.1%	0.1%
YUV, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.2%	-0.1%	-0.1%	-0.2%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.1%	-0.1%	-0.3%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	-0.2%

On top of CE2 Test-7	Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.2%	-0.2%	-0.2%	-0.2%	-0.1%	-0.1%
RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
RGB, Animation, 720p	0.0%	0.1%	0.0%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	-0.1%	-0.1%	0.0%	-0.1%	0.0%	-0.1%
YUV, text & graphics with motion, 1080p & 720p	-0.2%	-0.2%	-0.2%	-0.2%	-0.1%	-0.1%
YUV, mixed content, 1440p & 1080p	-0.2%	-0.1%	-0.3%	-0.1%	0.0%	-0.3%
YUV, Animation, 720p	0.0%	-0.1%	0.0%	0.1%	0.1%	-0.3%
YUV, camera captured, 1080p	0.0%	-0.1%	0.0%	0.0%	0.1%	0.1%

Conclusion

- Proposed to include the BVs in temporal merge mode derivation on top of CE2 Test-1 and Test-7
 - If the MV of the co-located block is BV, the BV is used as the temporal merge candidate
 - The ref_idx points to the current reconstructed picture

Text & graphics with motion Lossy BD-rate	RA-RGB	RA-YUV	RA-RGB	RA-YUV
CE2 Test 1 + Proposed vs CE2 Test 1	-0.6%	-0.6%	-0.7%	-0.7%
CE2 Test 7 + Proposed vs CE2 Test 7	-0.6%	-0.6%	-0.6%	-0.7%