

Non-CE9: Reordering of merge candidates

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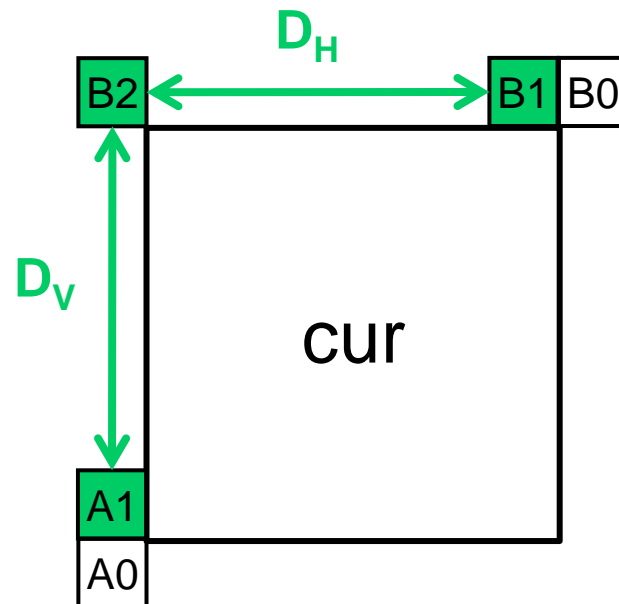
JCTVC-G396

Proposed method 1.

Merge list reordering for **square** PUs

Proposed method 1

- Applies only to **2Nx2N PUs**
- Merge list order of HM
 - A1, B1, B0, A0, B2
- Swap A1 and B1 order if $D_v < D_H$
 - **B1, A1**, B0, A0, B2



Proposed method 1

- D_V or D_H is the sum of the motion difference between A1/A1 and B2 for both lists

If B slice,

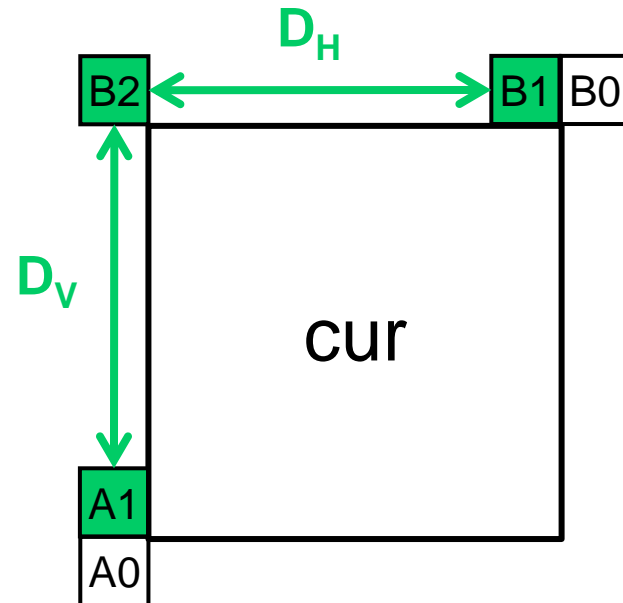
$$D_V = \text{DistL0}_V + \text{DistL1}_V$$

$$D_H = \text{DistL0}_H + \text{DistL1}_H$$

If P slice,

$$D_V = \text{DistL0}_V$$

$$D_H = \text{DistL0}_H$$



,where DistLX_V or DistLX_H is the sum of the motion difference for x, y components

$$\text{DistLX}_V = \text{Abs}(\text{mvLXA1}[0] - \text{mvLXB2}[0]) + \text{Abs}(\text{mvLXA1}[1] - \text{mvLXB2}[1])$$

$$\text{DistLX}_H = \text{Abs}(\text{mvLXB1}[0] - \text{mvLXB2}[0]) + \text{Abs}(\text{mvLXB1}[1] - \text{mvLXB2}[1])$$

Results for proposed method 1

- Anchor : HM4.0 MrgEncFix
 - Tested : HM4.0 MrgEncFix + Proposed method 1
- **Average 0.1% BD rate reduction**
 - **Enc/Dec time is same as the anchor**
 - Cross-verified by MediaTek

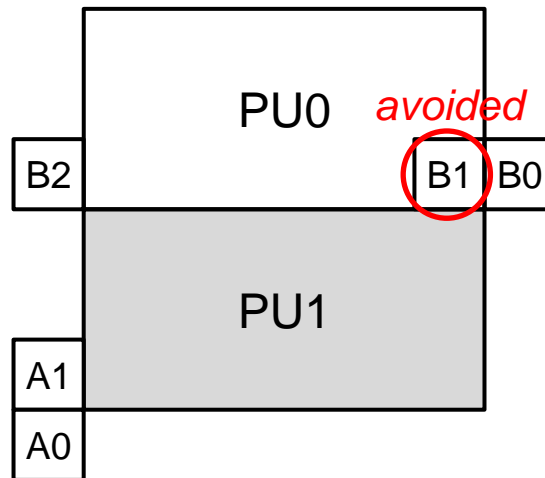
	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
BD rate Y	-0.1%	0.0%	-0.2%	-0.1%	-0.1%
EncT	100%	100%	100%	100%	100%
DecT	98%	101%	100%	101%	100%

Proposed method 2.

Merge list reordering for **rectangular** PUs

Proposed method 2

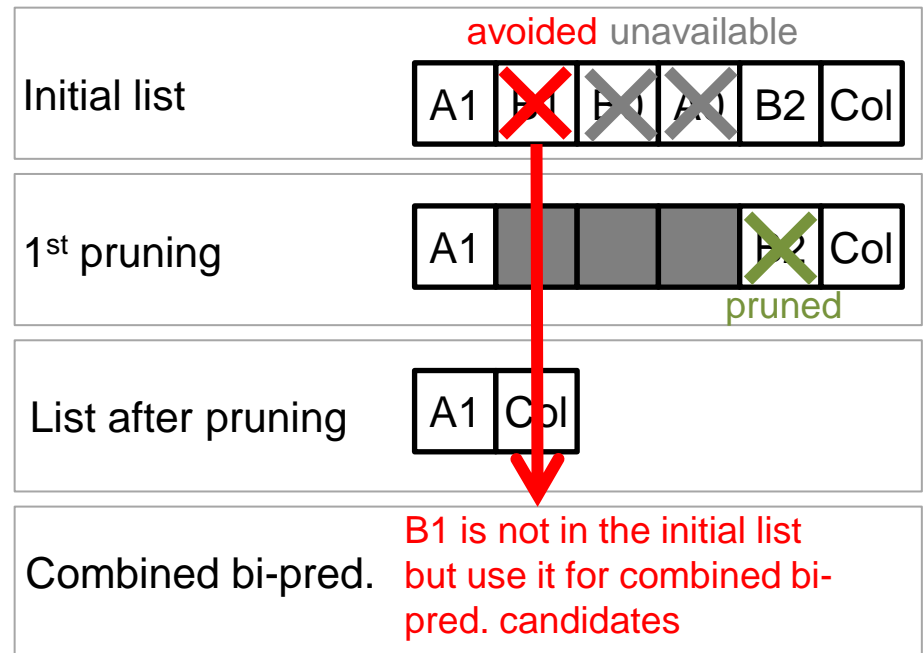
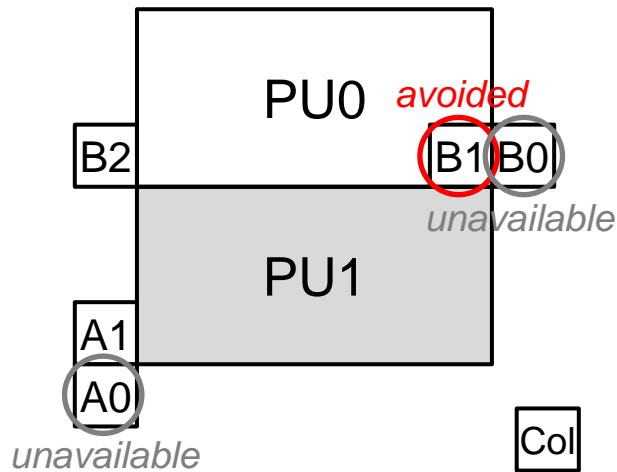
- Avoiding check operation in the second PU of rectangular ($2N \times N$, $N \times 2N$, AMP) partitions
 - If a MVP candidate has same motion with the first PU, the candidate is avoided to be added to the list
 - Due to this process, **the MVP candidate which belongs to the first PU cannot be added to the list**. This candidate shall not exist in the initial list



Proposed method 2

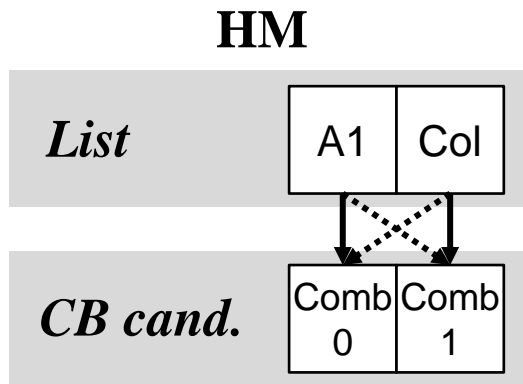
- Proposed method

- Use the MVP candidate which belongs to the first PU for creating the combined bi-pred. (CB) candidates even though it is not in the initial list

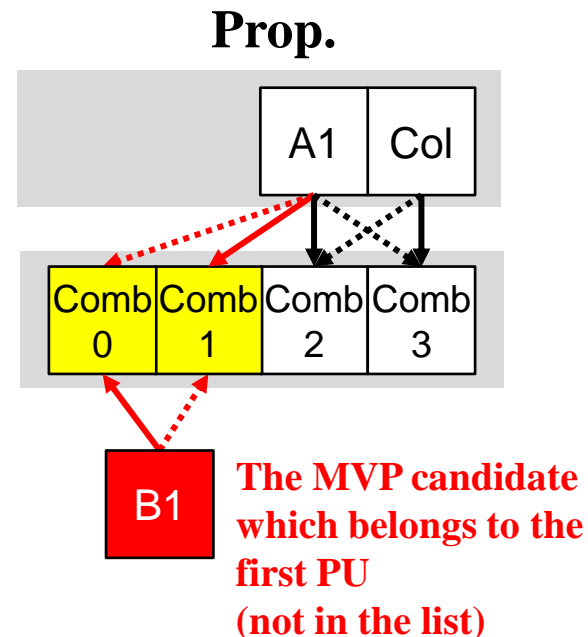


Proposed method 2

- The candidate which belongs to the first PU (not exist in the initial list) is combined **only with the first entry of the list**
 - Two CB candidates are created
 - $Comb0 = mvL0 \text{ of the removed cand.} + mvL1 \text{ of the first entry}$
 - $Comb1 = mvL1 \text{ of the removed cand.} + mvL0 \text{ of the first entry}$



→ $mvL0$
...→ $mvL1$



Proposed method 2

- The maximum number for the combined bi-pred. candidates is same as HM
- The only difference to the current HM is that different entries are used if the current PU is the second PU of rectangular partitions ($2N \times N$, $N \times 2N$, and AMVP partitions)

If second PU of rectangular partitions ($2N \times N$, $N \times 2N$, AMP partitions),

➤ **Entry 0 to 4 can be used**

Otherwise,

➤ **Entry 2 to 6 can be used (Same as the current HM)**

comblidx	0	1	2	3	4	5	6	7	8	9	10	11	12	13
l0CandIdx	X	0	0	1	0	2	1	2	0	3	1	3	2	3
l1CandIdx	0	X	1	0	2	0	2	1	3	0	3	1	3	2

X : The MVP candidate which belongs to the first PU (not exist in the initial list)

Results for proposed method 2

- Anchor : HM4.0 MrgEncFix
 - Tested : HM4.0 MrgEncFix + Proposed method 2
- **Average 0.1% BD rate reduction**
 - **Enc/Dec time is almost same as the anchor**
 - Cross verified by MediaTek

	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
BD rate Y	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%
EncT	100%	101%	100%	100%	100%
DecT	100%	101%	100%	101%	101%

Additional test results

Additional tests

- At this meeting, several contributions propose to remove the avoiding check operation
- The proposed method 2 is closely related to this removal so the scheme is tested with this simplification (JCTVC-G681 Step1+Step2) to measure the performance of the proposed method 2 under this environment
- This simplification includes
 - Remove avoiding check operation
 - Remove the trivial merge candidate (the candidate which belongs to the first PU when decoding second PU of rectangular partitions ($2N \times N$, $N \times 2N$, AMP))

Additional tests

- **Test 1. Simplification** (Cross-verified by Samsung)

- anchor : HM4.0 MrgEncFix
- Tested : HM4.0 MrgEncFix + Simplification

- **Test 2. Proposed method 2 relative to the simplification** (Cross-verified by Qualcomm)

- anchor : Simplification
- Tested : Simplification + Proposed method 2

- **Test 3. Combination of proposed method 2 and proposed method 1 relative to the simplification** (Cross-verified by Samsung)

- anchor : Simplification
- Tested : Simplification + Proposed method 2 + Proposed method 1

Results for the additional tests

- Performance of 'Simplification of JCTVC-G681' relative to HM4.0 MrgEncFix
 - No impact on coding efficiency

	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
BD rate Y	0.0%	0.0%	0.1%	0.0%	0.0%
EncT	100%	101%	100%	100%	100%
DecT	100%	100%	101%	101%	101%

Results for the additional tests

- **Performance of the proposed methods relative to ‘Simplification of JCTVC-G681’**
 - Prop2
 - -0.1% gain with 100% Enc/Dec time
 - Combination of Prop1 and Prop2
 - -0.2% gain with 100% Enc/Dec time

BD rate Y (%)	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
Prop2	0.0%	-0.1%	-0.1%	-0.1%	-0.1%
Prop1 + Prop2	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%

EncT (%)	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
Prop2	100%	100%	100%	100%	100%
Prop1 + Prop2	100%	100%	100%	100%	100%

DecT (%)	RA-HE	RA-LC	LB-HE	LB-LC	Avg.
Prop2	100%	100%	100%	99%	100%
Prop1 + Prop2	100%	100%	100%	100%	100%

Conclusion

- Two reordering methods for merge list are proposed
 - Method 1 : reordering for 2Nx2N partitions of square shape
 - average -0.1% gain without Enc/Dec time increase
 - Method 2 : reordering for second PU of rectangular partitions
 - average -0.1% gain without Enc/Dec time increase
- Additional test with 'Simplification'
 - vs Simplification of JCTVC-G681
 - Method 2 : average -0.1% gain with 100% Enc/Dec time
 - Method 1 + Method 2 : average -0.2% gain with 100% Enc/Dec time
- Recommend to adopt the proposed methods since each method provides additional 0.1% gain without increasing both encoding and decoding time