JCT3V-E0126: CE3.h: Merge candidates derivation from vector shifting

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Summary

- This is a harmonized follow-up of proposals JCT3V-D0178 and JCT3V-D0109
    - An additional candidate is derived and inserted into the candidate list.
    - It is firstly derived as done in D0109, if it is unavailable, then it is derived by shifting a disparity motion vector as done in D0178.

- Proposed method provides an improved coding gain of 0.2% in both CTC and BVSP off cases.

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Introduction

- Merge candidate list construction in 3D-HEVC
  1. Inter-view predicted motion candidate (IPMC)
  2. Spatial merging candidates A_1, B_1 and B_0
  3. Inter-view disparity motion vector candidate
  4. BVSP merging candidate
  5. Spatial merging candidates A_0 and B_2
  6. Temporal merging candidate
  7. Other merging candidates
     - Combined bi-predictive merging candidates
     - Zero motion vector merging candidates

Proposed scheme

- Proposed to add an additional candidate to the merge list to improve coding efficiency

- Generation of an additional candidate
  - IPMC is derived with the DV shifted by ((PuWidth/2*4 + 4), (PuHeight/2*4 + 4))
  - If IPMC is unavailable, DSMV is generated as follows
    - Find the first available spatial neighbor that has disparity motion vector (DMV) in list 0
      - If available, DSMV is generated by horizontally adding the DMV by 4
      - When BVSP is enabled, vertical component of DSMV is set to 0
    - Otherwise, DSMV is generated by horizontally adding the DV by 4

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New merge candidate list

- Newly inserted candidate is marked in red
  1. Inter-view predicted motion candidate (IPMC)
  2. Spatial merging candidates A_1, B_1 and B_0
  3. Inter-view disparity motion vector candidate
  4. BVSP merging candidate
  5. Spatial merging candidates A_0 and B_2
  6. Additional merging candidate
     - If the additional candidate is derived to be an IPMC, it is inserted only if it is different from the IPMC in step 1
     - If the additional candidate is derived to be a DSMV, it is inserted without pruning
  7. Temporal merging candidate
  8. Other merging candidates
     - Combined bi-predictive merging candidates
     - Zero motion vector merging candidates

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Experimental results

- Platform: HTM7.0r1
- Test conditions: CTC

Coding gain w.r.t. anchor for 3-view case (in CTC)

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.0%	-0.3%	-0.3%	-0.2%	-0.2%	-0.2%	98.7%	105.0%	99.8%
Kendo	0.0%	-0.2%	-0.6%	-0.2%	-0.2%	-0.2%	100.2%	106.1%	101.0%
Newspaper_CC	0.0%	-0.2%	-0.4%	-0.1%	-0.1%	-0.4%	100.7%	100.4%	100.2%
GT_Fly	0.0%	0.3%	-0.1%	-0.1%	0.0%	0.0%	100.2%	104.0%	98.8%
Poznan_Hall2	0.0%	-0.4%	-0.3%	-0.2%	-0.2%	-0.2%	100.4%	101.1%	103.7%
Poznan_Street	0.0%	-0.1%	0.1%	-0.1%	-0.1%	-0.1%	100.3%	103.6%	103.9%
Undo_Dancer	0.0%	-0.3%	-0.2%	-0.1%	-0.2%	-0.1%	101.8%	97.7%	99.8%
1024x768	0.0%	-0.2%	-0.4%	-0.2%	-0.2%	-0.3%	99.9%	103.9%	100.3%
1920x1088	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	100.7%	101.6%	101.6%
average	**0.0%**	**-0.2%**	**-0.3%**	**-0.1%**	**-0.1%**	**-0.2%**	**100.3%**	**102.6%**	**101.0%**

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Experimental results

- Platform: HTM7.0r1

- Test conditions: CTC with BVSP off

Coding gain w.r.t. anchor for 3-view case (BVSP off)

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.0%	-0.2%	-0.5%	-0.2%	-0.3%	-0.2%	102.4%	98.8%	103.5%
Kendo	0.0%	-0.3%	-0.6%	-0.3%	-0.3%	-0.3%	103.1%	104.9%	104.9%
Newspaper_CC	0.0%	-0.5%	-0.4%	-0.2%	-0.3%	-0.2%	103.5%	102.8%	103.0%
GT_Fly	0.0%	-0.3%	-0.3%	-0.2%	-0.2%	-0.1%	102.5%	99.0%	104.1%
Poznan_Hall2	0.0%	-0.2%	-0.1%	-0.1%	-0.1%	-0.2%	103.5%	95.5%	97.5%
Poznan_Street	0.0%	-0.5%	-0.2%	-0.2%	-0.2%	-0.1%	100.4%	101.1%	102.3%
Undo_Dancer	0.0%	-0.3%	-0.2%	-0.2%	-0.2%	0.1%	102.5%	103.1%	100.5%
1024x768	0.0%	-0.3%	-0.5%	-0.3%	-0.3%	-0.2%	103.0%	102.2%	103.8%
1920x1088	0.0%	-0.3%	-0.2%	-0.2%	-0.2%	-0.1%	102.2%	99.7%	101.1%
average	**0.0%**	**-0.3%**	**-0.3%**	**-0.2%**	**-0.2%**	**-0.2%**	**102.5%**	**100.8%**	**102.3%**

- Thanks to the Sharp for the cross-check (JCT3V-E0252)

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Conclusions

- In the proposed method,
    - An additional candidate is generated with the shifted DV or with the shifted DMV of the spatial neighbors.
    - The coding efficiency is improved by 0.2% in both BVSP on and off cases.

Thank you!