

[JVET-P0669]

AHG6: Wrap-around motion vector prediction at the picture boundary

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Introduction

- ❖ The spatial and temporal candidates out of the picture boundary, such as B2, B1, A1, A0 and C0 in Fig 3, are excluded from the motion vector predictor candidate list



Figure 3. Example of unavailable candidates

- ❖ In SbTMVP mode, the point at where the motion vector of left neighbor block in reference picture is out of left or right boundary, then the point is clipping in the picture boundary.

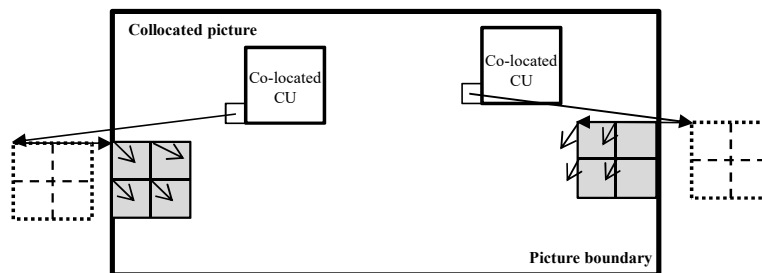
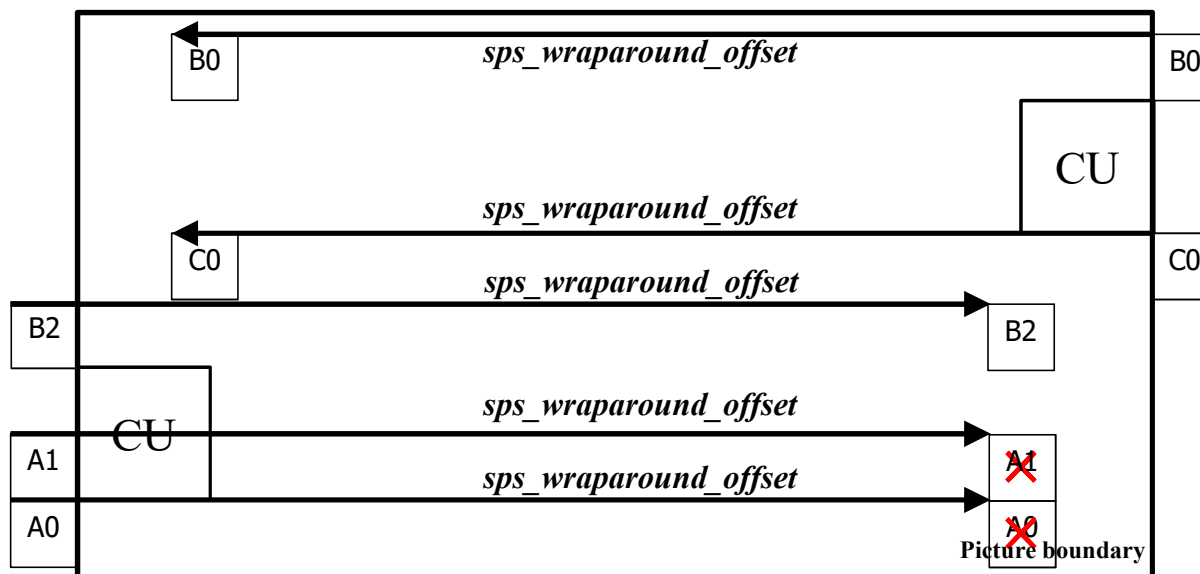


Figure 4. Example of unavailable candidates

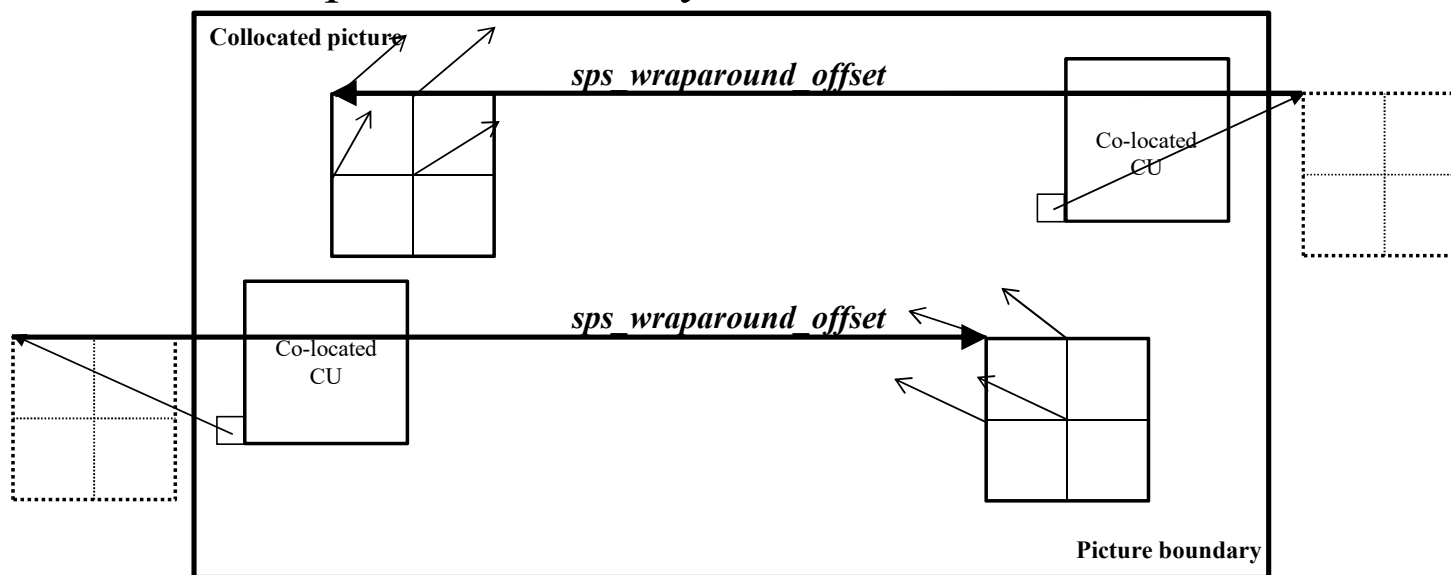
Proposed Method

- ❖ If the spatial and temporal candidates out of the picture boundary, then adding or subtracting *sps_ref_wraparound_offset* from the position of the out-of-boundary candidate in the horizontal direction
- ❖ In the figure below, A0 and A1 are not used for the proposed method
 - Because motion vectors, ‘wrap-around A0’ and ‘wrap-around A1’, are unavailable



Proposed Method

- ❖ If the point at where the motion vector of left neighbor block in reference picture is out of boundary, then adding or subtracting *sps_ref_wraparound_offset* from the out of boundary point in the horizontal direction, not clipping the picture boundary
- ❖ The proposed methods, are simply applicable, same as Wrap-around MC, just adding or subtracting offset when the position of motion vector candidate or the point of motion vector is out of picture boundary



Simulation Results

❖ RD performance of VTM6.0 with 360Lib-9.1 in RA configuration

- Simulation results show that the wrap-around motion vector prediction at the picture boundary yields -0.02%, -0.04% and -0.12% BD-rate gain in end-to-end WS-PSNR with no complexity

Random Access						
Reference: VTM-6.0		Over VTM-6.0				
Tested: Proposed		Y	U	V	EncT	DecT
S1	SkateboardInLot	-0.06%	-0.20%	-0.41%	100%	100%
	ChairliftRide	0.00%	0.04%	0.03%	100%	99%
	KiteFlite	-0.02%	0.00%	0.07%	100%	100%
	Harbor	-0.01%	-0.05%	-0.13%	100%	100%
	Trolley	-0.03%	0.00%	-0.02%	100%	100%
	GasLamp	-0.01%	-0.01%	0.00%	101%	99%
S2	Balboa	0.00%	-0.02%	-0.41%	100%	100%
	Broadway	-0.01%	-0.04%	-0.01%	101%	100%
	Landing2	0.00%	-0.03%	-0.15%	100%	100%
	BranCastle2	-0.02%	-0.09%	-0.12%	100%	100%
Overall		-0.02%	-0.04%	-0.12%	100%	100%

Conclusion

- ❖ This contribution proposes a wrap-around motion vector prediction at the picture boundary to improve the coding efficiency of 360 video
- ❖ In VVC, Wrap-around MC is already adopted, the proposed methods in this contribution are very simply applicable, same as Wrap-around MC
- ❖ Simulation results show that the proposed method yields BD-rate gain of -0.02%, -0.04%, and -0.12% for three color components on average over VTM6.0 with 360Lib-9.1