

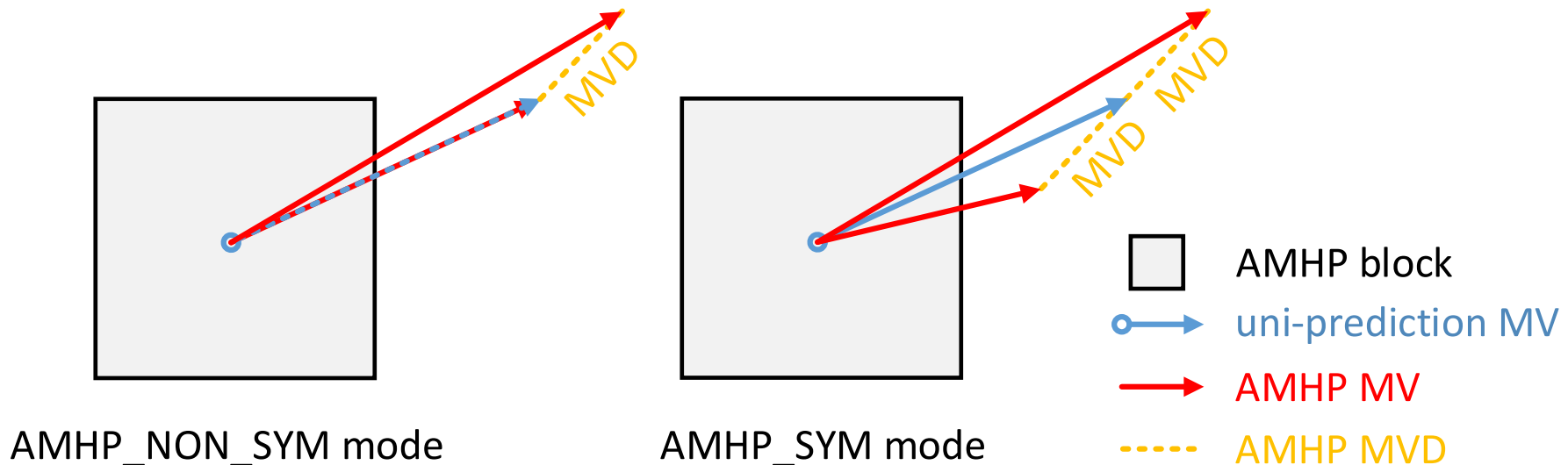


Non-CE4: Advanced Multi-hypothesis Inter Prediction for bandwidth reduction in B frame

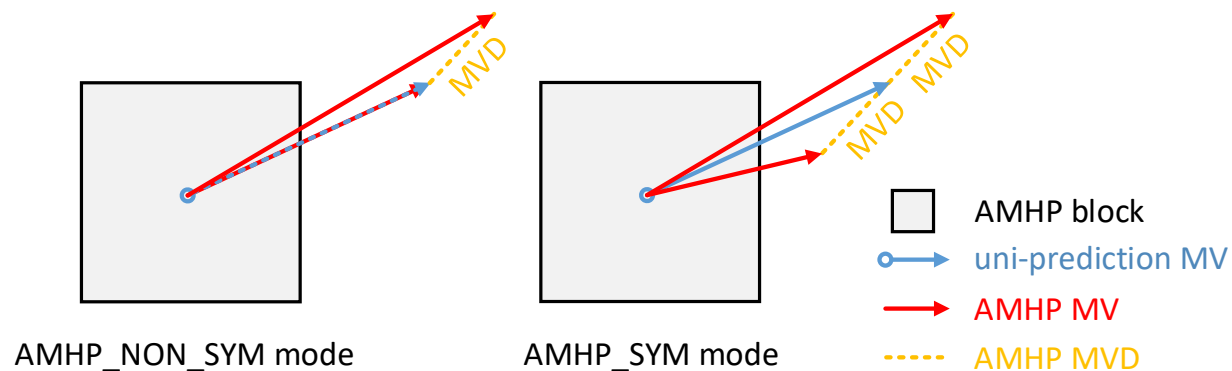
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2019/3/18

- Proposed Method
- Bandwidth Analysis
- Experimental Results
- Conclusion

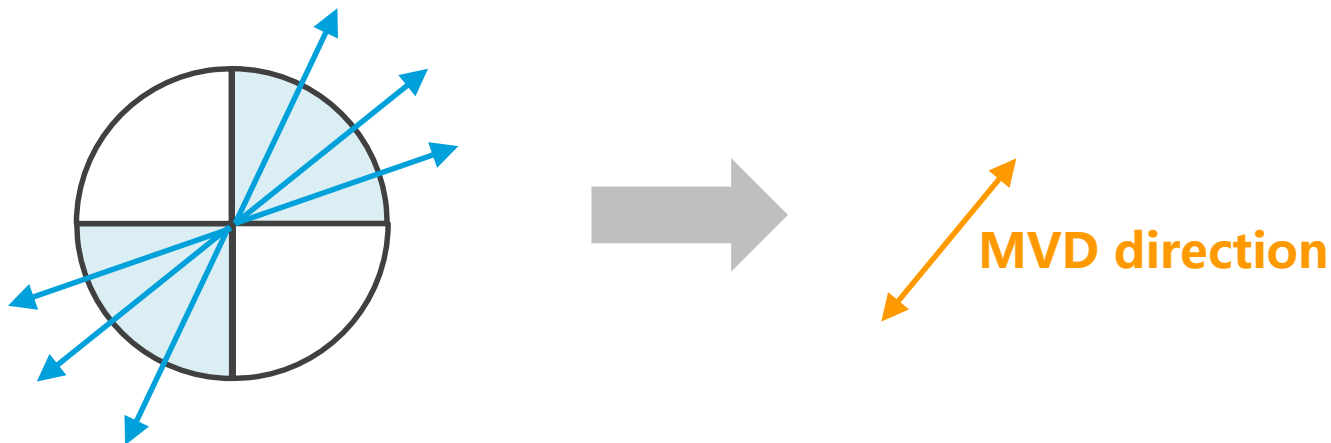
- Advance multi-hypothesis inter prediction (AMHP)
 - For **uni-prediction** of AMVP mode
 - Only **one extra MV** refer to the same reference frame
 - Two modes
 - Non-symmetric mode
 - symmetric mode



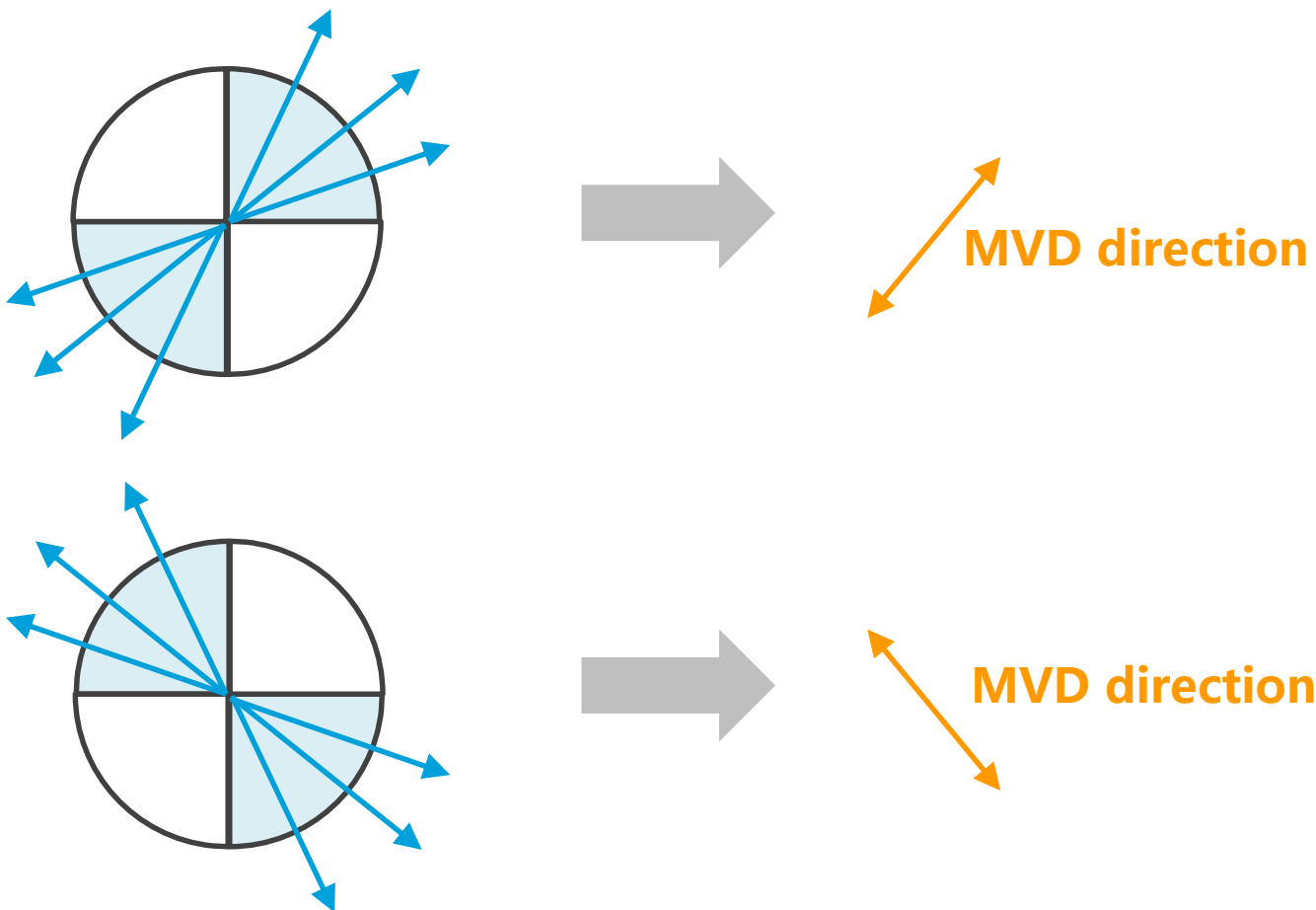
- Advance multi-hypothesis inter prediction (AMHP)



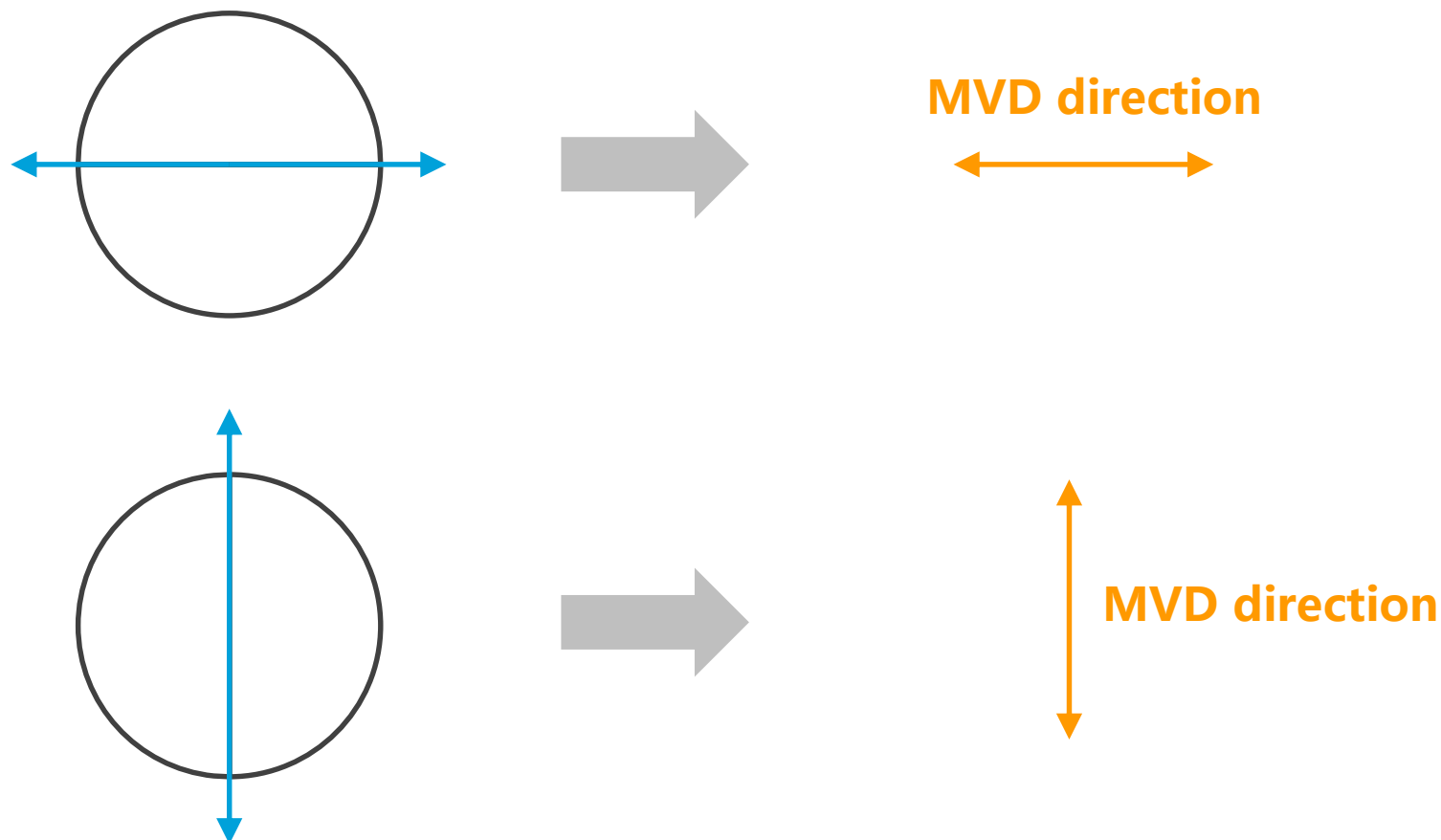
- MVD direction is determined by uni-prediction MV's direction



- Advance multi-hypothesis inter prediction (AMHP)
 - MVD direction is determined by uni-prediction MV's direction

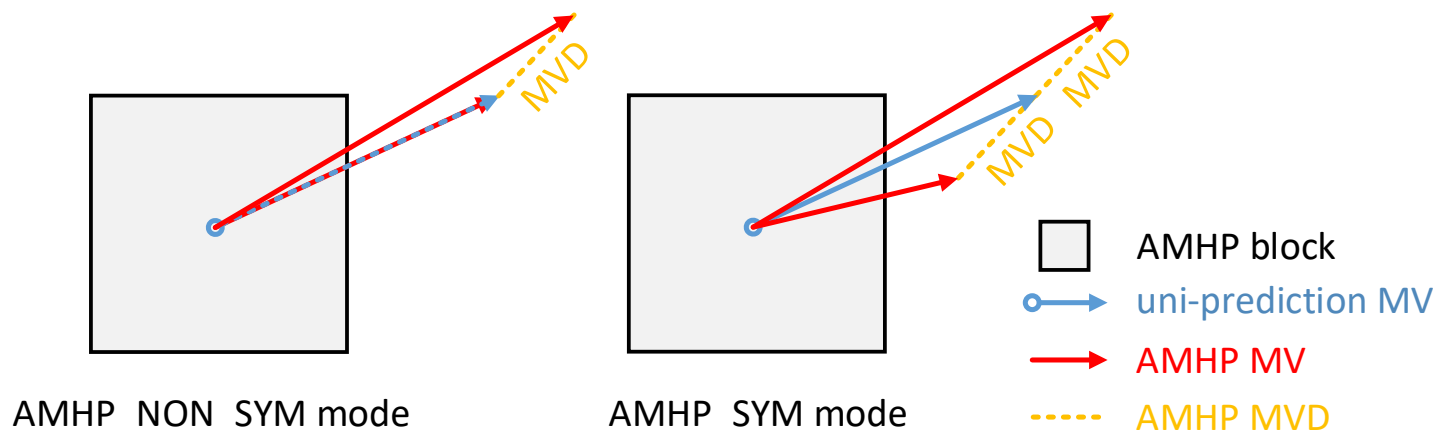


- Advance multi-hypothesis inter prediction (AMHP)
 - MVD direction is determined by uni-prediction MV's direction



- Advance multi-hypothesis inter prediction (AMHP)
 - MVD direction is determined by uni-prediction MV's direction
 - MVD value is determined by amhp_idx

amhp_idx	0	1	2	3	4	5
AMHP mode	Non-sym mode				Sym mode	
MVD value	1/4-pel	1/16-pel	1/4-pel	1/16-pel	1/4-pel	1/2-pel



- Be referenced by other mode
 - AMVP mode:
 - Regard AMHP as a **uni-prediction** block
 - Use **average MV** for MVP list construction
 - Other mode(Merge, HMVP, MMVD):
 - Regard AMHP as a **bi-prediction** block
 - Use two AMHP MV for candidate list construction

- Advance multi-hypothesis inter prediction (AMHP)
 - Only in **B frame**
 - AMHP get the prediction block from the same reference
 - AMHP decrease the bandwidth cost.
 - from 10.31 to 9

block size		bandwidth		
width	height	uni-prediction	bi-prediction	AMHP
4	4	7.56	-	9
4	8	5.16	Disable (10.31)	6
8	4	5.16	Disable (10.31)	6
8	8	3.52	7.03	-
4	16	3.95	7.91	-
16	4	3.95	7.91	-

	Random access Main10				
	Over VTM-4.0 4x8 8x4 bi off				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B					
Class C					
Class E					
Overall					
Class D					
Class F					

	Low delay B Main10				
	Over VTM-4.0 4x8 8x4 bi off				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B					
Class C					
Class E					
Overall					
Class D					
Class F					

	Random access Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1	0.01%	0.10%	0.09%	100%	101%
Class A2	0.06%	0.19%	0.25%	101%	99%
Class B	0.04%	0.09%	0.17%	101%	101%
Class C	0.13%	0.11%	0.14%	101%	103%
Class E					
Overall	0.06%	0.12%	0.16%	101%	101%
Class D	0.18%	0.27%	0.18%	101%	105%
Class F	0.05%	0.13%	0.07%	101%	103%

	Low delay B Main10				
	Over VTM-4.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.03%	-0.19%	-0.06%	100%	102%
Class C	0.09%	0.57%	0.23%	101%	103%
Class E	0.07%	0.07%	-0.28%	101%	104%
Overall	0.06%	0.13%	-0.02%	101%	103%
Class D	0.22%	0.53%	0.18%	100%	102%
Class F	0.05%	0.04%	-0.07%	101%	102%

Thank MediaTek for the cross-checking

- AMHP is a multi-hypothesis prediction for uni-prediction of AMVP mode.
 - Same reference
 - MV difference no more than 1 pixel
- Bandwidth reduction from 10.31 to 9 (B frame)
 - Disable bi-prediction: 8x4 4x8
 - Enable AMHP : 4x4 8x4 4x8
- Experimental results reportedly show
 - 0.06% 0.12% 0.16% Enc 101% Dec 101% compared to VTM-RA
 - 0.06% 0.13% -0.02% Enc 101% Dec 103% compared to VTM-LDB
- Based on the above results, it is suggested to further study it in CE

THANKS !

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