

JVET-K0102

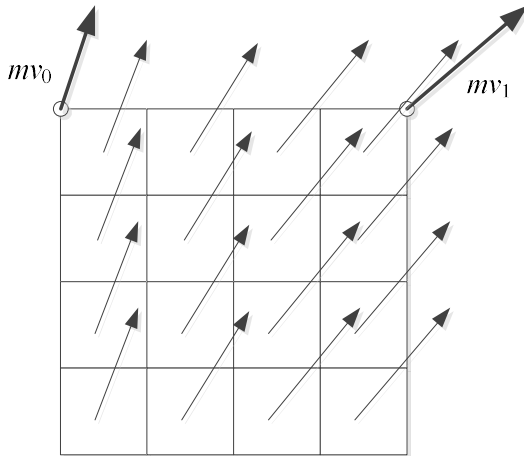
CE4-related: Interweaved Prediction for Affine Motion Compensation

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Problems of Affine Prediction in BMS

- ❑ With affine motion compensation, a coding-block is divided into sub-blocks as small as 4×4, each of which is assigned with an individual motion vector (MV) derived by the affine mode
 - ❑ MV is derived from mv_0 and mv_1 at the two control points
- ❑ AMC faces a dilemma on the size of sub-blocks.
 - ❑ Smaller sub-blocks result in a better coding performance but a higher complexity

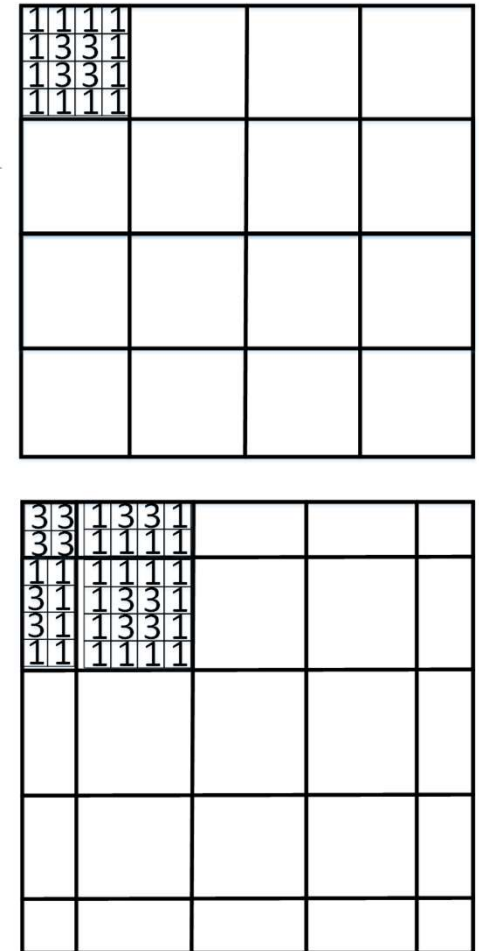
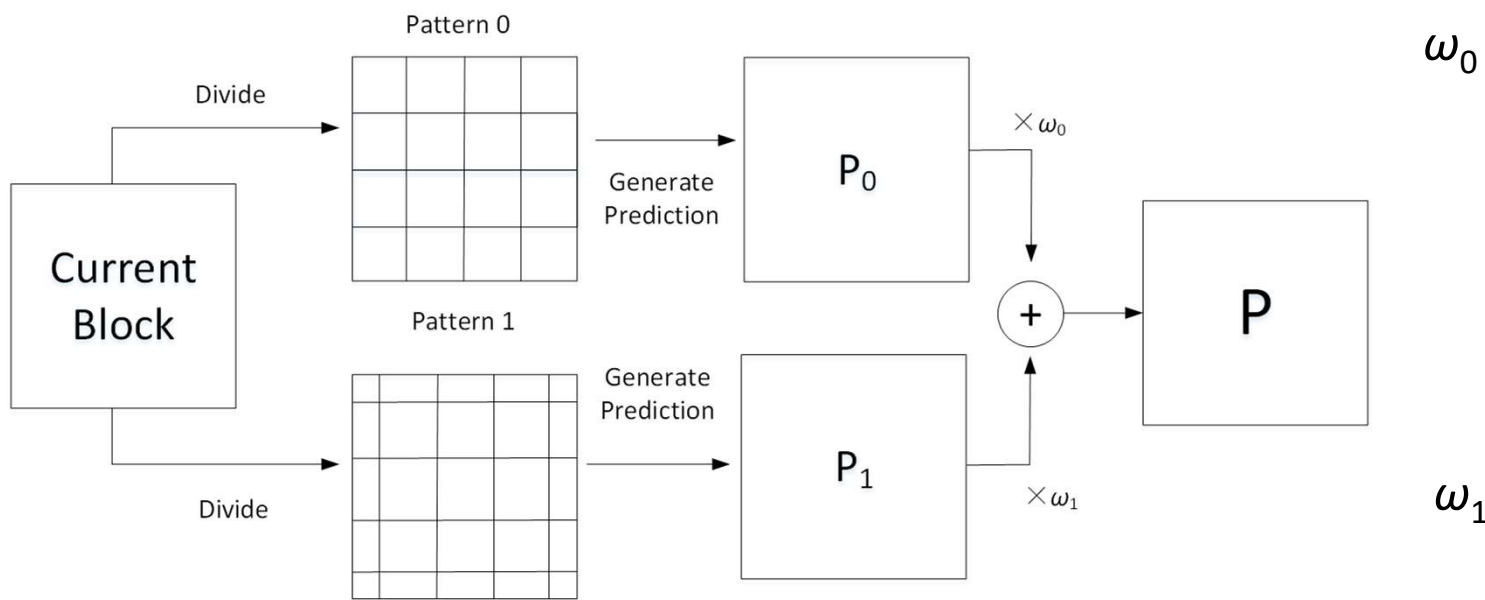


$$\begin{cases} mv^h(x, y) = \frac{(mv_1^h - mv_0^h)}{w}x - \frac{(mv_1^v - mv_0^v)}{w}y + mv_0^h \\ mv^v(x, y) = \frac{(mv_1^v - mv_0^v)}{w}x + \frac{(mv_1^h - mv_0^h)}{w}y + mv_0^v \end{cases}$$

Proposed

- ❑ Affine motion compensation is done in a interleaved way
 - ❑ A coding block is divided into sub-blocks with two different dividing patterns
 - ❑ The first dividing pattern is the same as that in BMS-1.1, while the second is the first with a 2×2 offset
 - ❑ Two auxiliary predictions are generated by AMC with the two dividing patterns.
 - ❑ The MV for each sub-block in a dividing pattern is derived from mv_0 and mv_1
 - ❑ The final prediction is calculated as a weighted-sum of the two auxiliary predictions
 - ❑ An auxiliary prediction sample located at the center of a sub-block is associated with a weighting value 3
 - ❑ An auxiliary prediction sample located at the boundary of a sub-block is associated with a weighting value 1
- $$\begin{cases} P = (P_0 + P_1) \gg 1, & \text{if } \omega_0 = \omega_1 \\ P = (\omega_0 P_0 + \omega_1 P_1) \gg 2 & \text{Otherwise} \end{cases}$$
- ❑ Interweaved prediction is only applied on the luma-component for with uni-prediction

Proposed: An Example



Experimental Results

□ RA

		Over BMS-1.1				
		Y	U	V	EncT	DecT
	Class A1	-0.05%	0.01%	0.08%	103%	103%
	Class A2	-0.44%	-0.01%	-0.09%	102%	101%
	Class B	-0.46%	-0.29%	-0.19%	103%	100%
	Class C	-0.15%	-0.10%	-0.03%	102%	100%
	Class E					
	Overall	-0.29%	-0.12%	-0.07%	102%	101%
	Class D	-0.31%	-0.15%	-0.18%	101%	101%

		Over BMS-1.1-Affine Only				
		Y	U	V	EncT	DecT
	Class A1	-0.15%	-0.15%	-0.06%	109%	105%
	Class A2	-0.57%	-0.14%	-0.18%	108%	104%
	Class B	-0.59%	-0.40%	-0.35%	108%	104%
	Class C	-0.27%	-0.09%	-0.09%	108%	105%
	Class E					
	Overall	-0.41%	-0.21%	-0.19%	108%	105%
	Class D	-0.43%	-0.27%	-0.08%	102%	101%

Experimental Results (Cont.)

- Interaction between the interweaved prediction and other affine enhanced methods.
 - Interweaved prediction is implemented on Qualcomm's enhanced affine solution (CE4.1.3.d)
 - Affine MVP construction, Affine MVD prediction, CU level 4-para/6-para switching + slice level 4-para/6-para switching

	Over CE4.1.3.d (RA)				
	Y	U	V	EncT	DecT
Class A1	-0.09%	-0.05%	-0.05%	103%	104%
Class A2	-0.77%	-0.05%	0.03%	104%	106%
Class B	-0.47%	-0.24%	-0.25%	104%	102%
Class C	-0.23%	-0.06%	-0.01%	103%	102%
Class E					
Overall	-0.39%	-0.11%	-0.09%	103%	103%
Class D	-0.37%	-0.25%	-0.19%	103%	103%

CatRobot	-1.42%
Cactus	-1.69%

- Compared to BMS-1.0 (RA)

CE4.1.3.d			→	CE4.1.3.d+Interweaved Prediction		
-0.79%	-0.65%	-0.65%		-1.18%	-0.77%	-0.74%

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Summary

- ❑ Interweaved Prediction is proposed for affine motion compensation
 - ❑ An affine-coded block is predicted by the affine model with two different dividing patterns, and then weighted sum the two predictions
- ❑ 0.29%/0.41% RA coding gain for tool-off/tool on tests
- ❑ 0.39% RA coding gain over CE4.1.3.d
- ❑ Recommend to be adopted into BMS