CREATING THE LIVING NETWORK™

JVET-D0102
EE3: Generalized Bi-prediction

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Introduction

- Study generalized bi-prediction (Gbi, JVET-C0047) for inter coding with extra configurations of weighting values in addition to 1/2

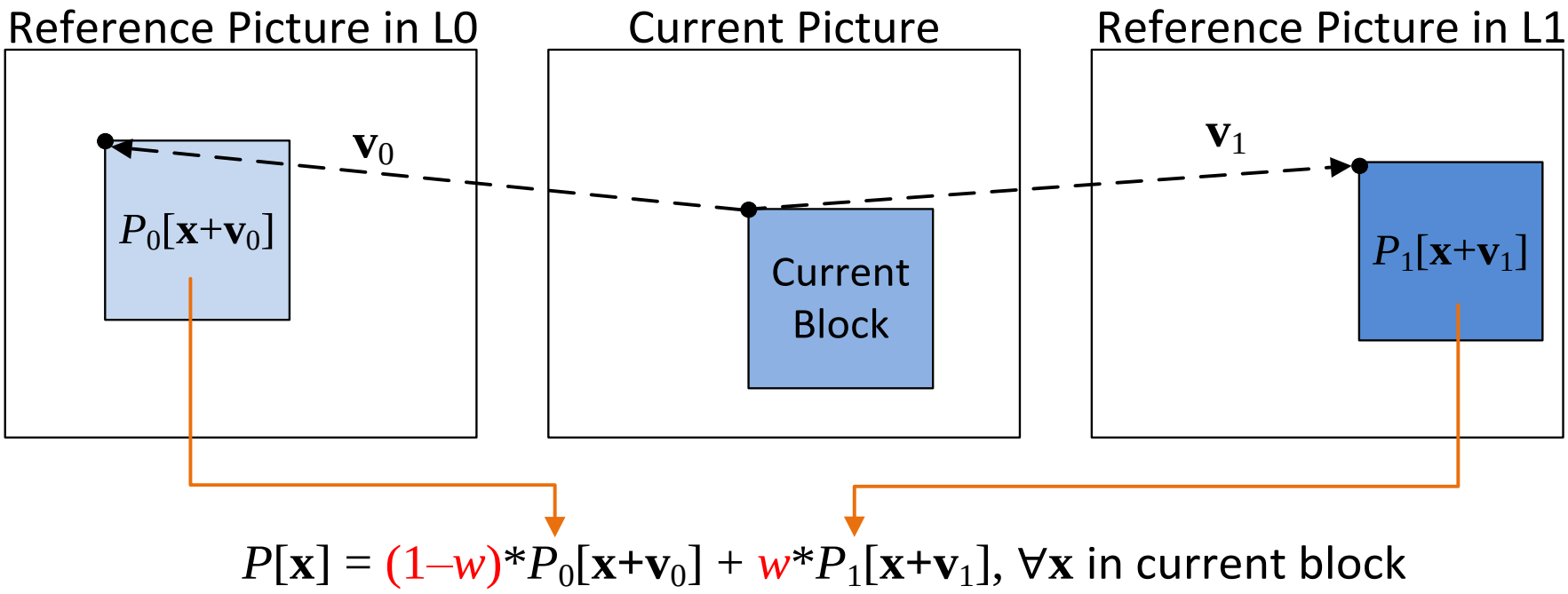
$$\text{Conventional:} \quad P[\mathbf{x}] = (1/2) * P_0[\mathbf{x}+\mathbf{v}_0] + (1/2) * P_1[\mathbf{x}+\mathbf{v}_1]$$

$$\text{GBi:} \quad P[\mathbf{x}] = (1-w) * P_0[\mathbf{x}+\mathbf{v}_0] + w * P_1[\mathbf{x}+\mathbf{v}_1]$$

- Conduct three EE tests using different settings of candidate weights
  - Test 1: { 3/8, 1/2, 5/8 }
  - Test 2: { 1/4, 3/8, 1/2, 5/8, 3/4 }
  - Test 3: { -1/4, 1/4, 3/8, 1/2, 5/8, 3/4, 5/4 }
- Report Y BD rate and runtime relative to JEM-3.0
  - Test 1: (RA) 0.6%, (LD) 0.4%, (EncT) 126%, (DecT) 99%
  - Test 2: (RA) 0.7%, (LD) 0.5%, (EncT) 154%, (DecT) 99%
  - Test 3: (RA) 0.8%, (LD) 0.9%, (EncT) 186%, (DecT) 99%

Generalized Bi-prediction (GBi)

- Extend bi-prediction weight to unequal values which need not be 1/2 and can go below 0 or beyond 1
- Support 6 weight pairs (1-w and w) at most for three EE tests

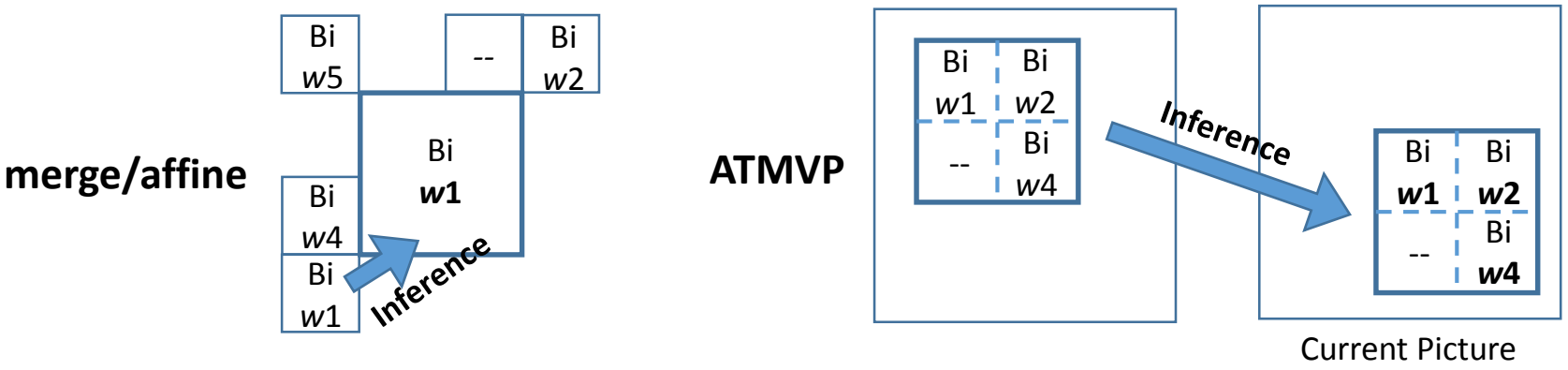


$$P[\mathbf{x}] = (1-w)*P_0[\mathbf{x}+\mathbf{v}_0] + w*P_1[\mathbf{x}+\mathbf{v}_1], \forall \mathbf{x} \text{ in current block}$$

Assignment of Weighting Values

- Apply signaled *w* to bi-prediction QTBT leaf node that needs signaling MVDs (inter/affine)

- Infer *w* from selected merge/ATMVP/affine candidate



- Set 1/2 as a default value for other bi-prediction QTBT leaf nodes
- Apply weight values also to BIO and OBMC

Coding of Weighting Values

- Signal *w* for bi-prediction QTBT leaf node when MVDs exist
- Represent *w* using index coded adaptively according to mvd_l1_zero_flag

Index	Weight value *w*	Binarization Schemes	
		Scheme #1 mvd_l1_zero_flag = 0	**Scheme #2** mvd_l1_zero_flag = 1
Test 1			
0	3/8	00	00
1	1/2	1	01
2	5/8	01	1
Test 2			
0	1/4	0000	0000
1	3/8	001	0001
2	1/2	1	01
3	5/8	01	1
4	3/4	0001	001
Test 3			
0	-1/4	000000	000000
1	1/4	00001	000001
2	3/8	001	0001
3	1/2	1	01
4	5/8	01	1
5	3/4	0001	001
6	5/4	000001	00001

Coding Performance Results: Test 1 vs. Test 2

- 0.3-0.9% Y BD-rate saving from 3 weight pairs (Test 1)
- +0.1% Y BD-rate saving when adding 2 more weight pairs (Test 2)
- No impact at the decoder

Test 1	Random Access Main 10					Low Delay B Main 10				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-0.3	-0.9	-0.7	120%	95%					
Class A2	-0.9	-1.1	-1.0	130%	97%					
Class B	-0.7	-0.5	-0.8	119%	97%	-0.5	-0.6	-0.6	130%	97%
Class C	-0.5	-0.4	-0.5	121%	100%	-0.3	-0.3	-0.5	123%	100%
Class D	-0.6	-0.3	-0.2	123%	101%	-0.5	-0.4	-0.7	125%	101%
Class E						-0.5	-1.6	-1.6	152%	100%
Overall (Ref)	-0.6	-0.6	-0.6	122%	98%	-0.4	-0.7	-0.8	131%	99%
Class F										
Test 2	**Y**	**U**	**V**	**EncT**	**DecT**	**Y**	**U**	**V**	**EncT**	**DecT**
Class A1	-0.4	-1.1	-0.8	141%	101%					
Class A2	-1.2	-1.4	-1.3	167%	98%					
Class B	-0.8	-0.7	-1.0	142%	97%	-0.7	-0.8	-0.7	161%	96%
Class C	-0.6	-0.5	-0.5	142%	101%	-0.4	-0.4	-0.4	146%	99%
Class D	-0.6	-0.6	-0.2	146%	103%	-0.6	-0.4	-1.2	152%	102%
Class E						-0.5	-1.4	-1.4	200%	97%
Overall (Ref)	-0.7	-0.8	-0.8	147%	100%	-0.5	-0.7	-0.9	161%	98%
Class F										

Coding Performance Results: Test 2 vs. Test 3

- +0.1% gain using 2 more weight pairs on top of Test 2 in RA
- Twice as much as the coding gain of Test 2 in LD
- Over 1% gain on average for Class A2,B,E sequences
- Significant improvement on Class F sequences (3.5% for SlideShow, 2.5% for BasketballDrillText) in LD

Test 2	Random Access Main 10					Low Delay B Main 10				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	-0.4	-1.1	-0.8	141%	101%					
Class A2	-1.2	-1.4	-1.3	167%	98%					
Class B	-0.8	-0.7	-1.0	142%	97%	-0.7	-0.8	-0.7	161%	96%
Class C	-0.6	-0.5	-0.5	142%	101%	-0.4	-0.4	-0.4	146%	99%
Class D	-0.6	-0.6	-0.2	146%	103%	-0.6	-0.4	-1.2	152%	102%
Class E						-0.5	-1.4	-1.4	200%	97%
Overall (Ref)	-0.7	-0.8	-0.8	147%	100%	-0.5	-0.7	-0.9	161%	98%
Class F	-0.6	-1.0	-0.9			-0.5	-0.4	-1.1		
Test 3	**Y**	**U**	**V**	**EncT**	**DecT**	**Y**	**U**	**V**	**EncT**	**DecT**
Class A1	-0.7	-0.6	-1.0	179%	99%					
Class A2	-1.1	-1.4	-1.4	197%	100%					
Class B	-0.9	-0.9	-1.1	167%	98%	-1.0	-1.2	-1.1	199%	99%
Class C	-0.7	-0.5	-0.5	164%	102%	-0.8	-0.4	-0.6	174%	102%
Class D	-0.6	-0.3	-0.2	170%	104%	-0.7	-0.7	-1.2	179%	99%
Class E						-1.1	-2.3	-2.0	257%	100%
Overall (Ref)	-0.8	-0.7	-0.8	175%	99%	-0.9	-1.1	-1.2	197%	100%
Class F	-0.7	-1.0	-0.8			-1.8	-1.3	-1.6		

Concluding Remarks

- Study GBi with 3 different settings of candidate weights
- Introduce only 1 weight index at parsing stage and no extra burden in prediction and reconstruction processes
- Report +1% gain for 4K and Class F sequences and observe doubled coding gain with negative weights
- Recommend integrating GBi into next JEM software

- Thank **Sharp** and **Samsung** for crosscheck (JVET-D0136, D0141)