

Bi-Intra Prediction using slope information

CHANWON SEO



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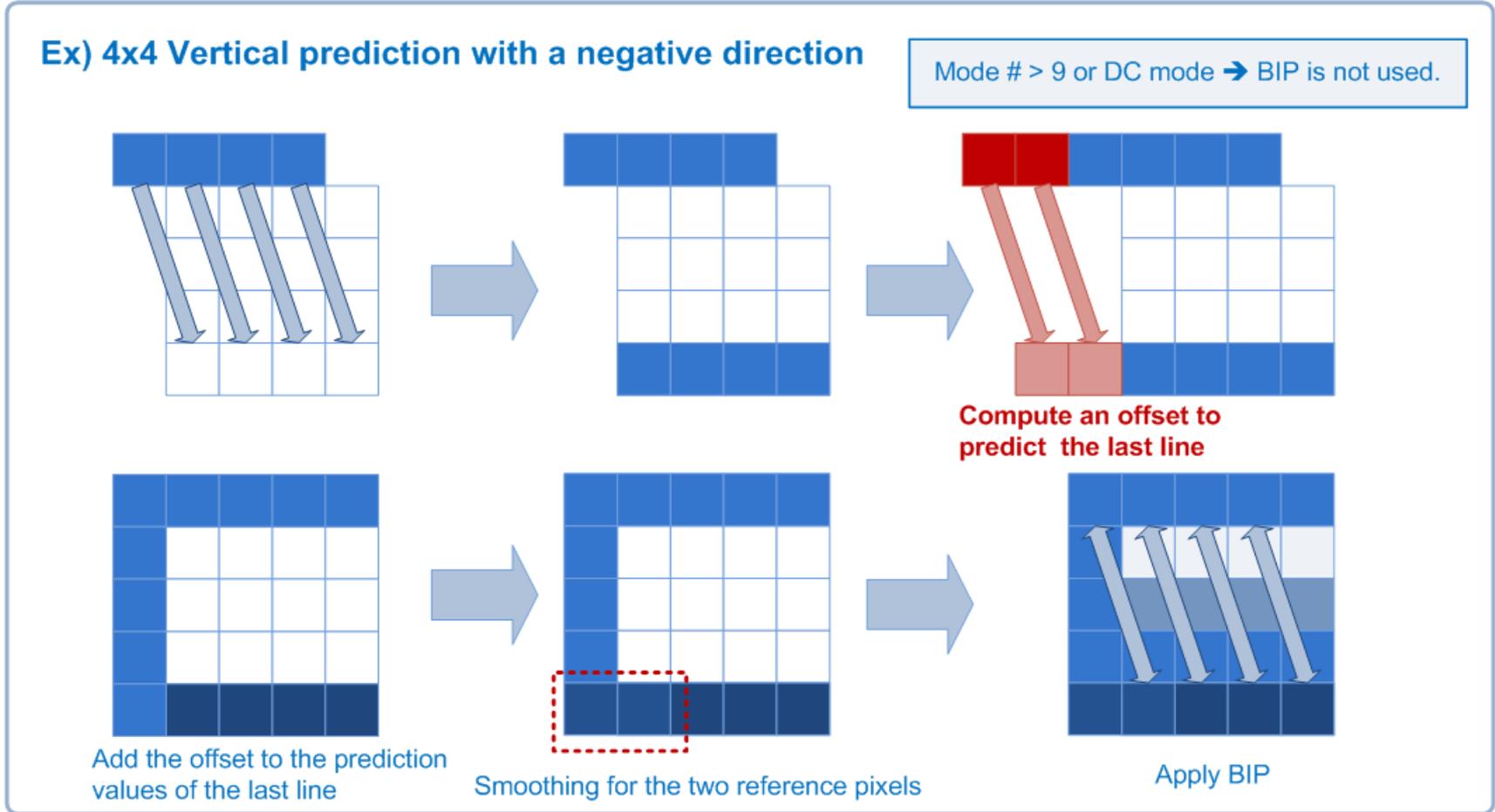
- **Bi-Intra Prediction (BIP)**
- **Simulation results**
- **Conclusions**



Bi-Intra Prediction (BIP) [1/4]



Algorithm of Bi-Intra Prediction



Bi-Intra Prediction (BIP) [2/4]



- The offset is unreliable when the absolute value of that is too large.
- Clipping for large offset
 - $\text{Offset} = \text{Clip}(-20 \ll B_{\text{inc}}, 20 \ll B_{\text{inc}}, \text{Offset})$
- Template size to calculate the offset
 - $\text{Block_size}/2$

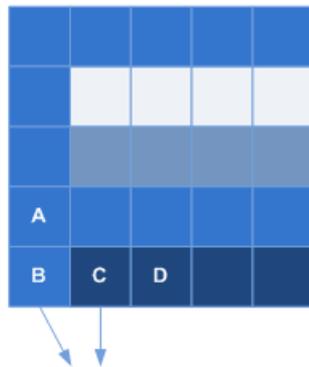


Bi-Intra Prediction (BIP) [3/4]



- Reference pixel smoothing

Reference pixel smoothing



Smoothing filter

$$B' = (A + 2*B + C) / 4$$

$$C' = (B + 2*C + D) / 4$$

Performance of prediction would be degraded when the difference between B and C is large.

Bi-Intra Prediction (BIP) [4/4]



- **The flag for BIP is embedded within the quantized transform coefficients.**
 - Uni-intra prediction using UIP
 - Sum of absolute values of quantized coefficients is even. (0, 2, 4...)
 - Bi-intra prediction using offset and reference smoothing
 - Sum of absolute values of quantized coefficients is odd. (1, 3, 5...)
 - Uni- or bi-prediction is selected based on R-D optimization.



Simulations [1/2]



■ Simulation conditions

➤ Intra only

- Low complexity
- High Efficiency

➤ Test sequences

- Class A (2560x1600)
- Class B (1920x1080)
- Class C (832x480)
- Class D (416x240)
- Class E (1280x720)

➤ Test Conditions

- Common conditions defined by JCTVC-D600

➤ Anchor

- HM2.0



Simulations [2/2]



■ Summary

➤ Using 32 bits executable files

	Intra			Intra LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.3	-0.5	-0.5	-0.6	-0.8	-0.8
Class B	-0.3	-0.6	-0.6	-0.7	-1.0	-0.9
Class C	-0.4	-0.9	-0.9	-0.6	-1.1	-1.0
Class D	-0.5	-1.0	-0.9	-0.8	-1.0	-1.1
Class E	-0.4	-1.0	-0.8	-0.7	-1.2	-1.2
All	-0.4	-0.8	-0.7	-0.7	-1.0	-1.0
Enc Time[%]	139%			122%		
Dec Time[%]	101%			104%		

➤ Using 64 bits executable files

	Intra			Intra LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.3	-0.5	-0.5			
Class B	-0.3	-0.6	-0.6			
Class C	-0.4	-0.9	-0.9			
Class D	-0.5	-1.0	-0.9			
Class E	-0.4	-1.0	-0.8			
All	-0.4	-0.8	-0.7			
Enc Time[%]	155%					
Dec Time[%]	100%					

➤ The results were checked by Huawei and Sharp. (JCTVC-E290, JCTVC-E161).



Conclusions



- **BIP improves coding efficiency of intra prediction in HM.**

- **It is required to optimize the signaling method of BIP.**
 - It is highly related to entropy coding of transform coefficients.
 - There is not enough time to optimize the method.
 - The optimization will improve the coding efficiency and reduce the encoding complexities.

- **BIP can be combined with any directional intra prediction method.**
 - It is required to study more to investigate combinations with the other prediction methods.