

JCTVC-F172

An improved intra vertical and horizontal prediction

Akira Minezawa, Kazuo Sugimoto,
Shun-ichi Sekiguchi

Mitsubishi Electric Corporation

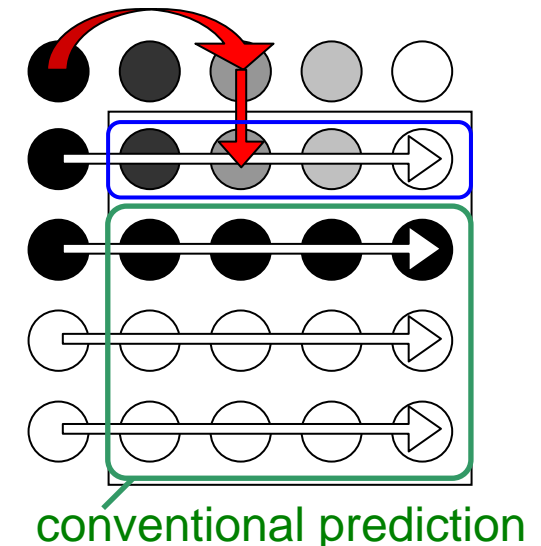
Overall Summary

- Propose an improved technique for intra vertical and horizontal prediction
 - luminance change along the prediction direction is reflected to the normal HM prediction samples
 - 0.3% BD-rate gain for AI/HE and AI/LC
 - ENC/DEC times increase are up to 1% for AI/HE and AI/LC

- The simplified proposed scheme
 - luminance change along the prediction direction is reflected only to one line
 - 0.3% BD-rate gain for AI/HE and AI/LC
 - ENC/DEC times increase are 0% for AI/HE and AI/LC

- Crosscheck
 - JCTVC-F146 (Fujitsu)

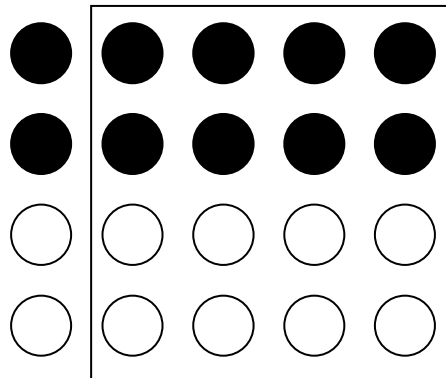
- Propose the simplified scheme to be adopted to HM-4



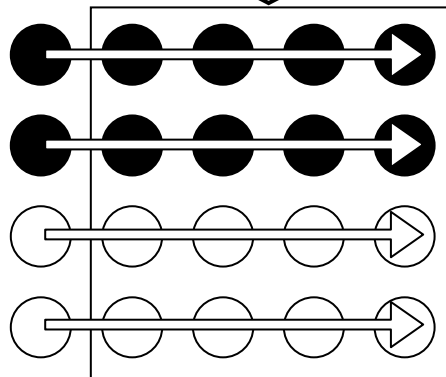
Conventional prediction

Example 1

Original image



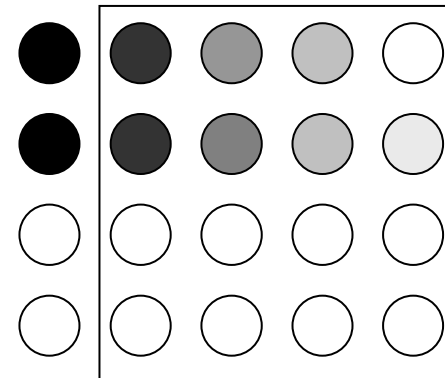
Small distortion



Prediction image

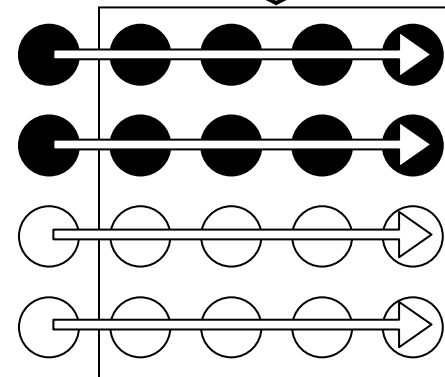
Example 2

Original image



Prediction block

Large distortion



Prediction image

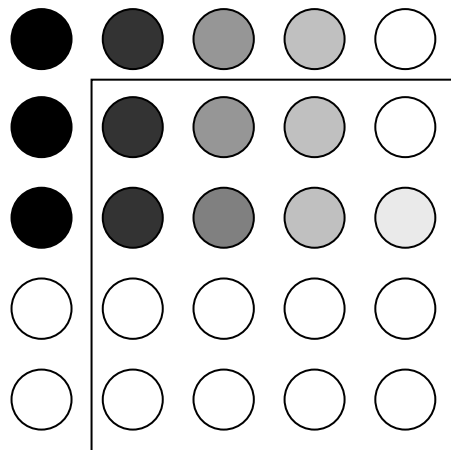
→ Prediction direction

Proposed scheme

Horizontal prediction:

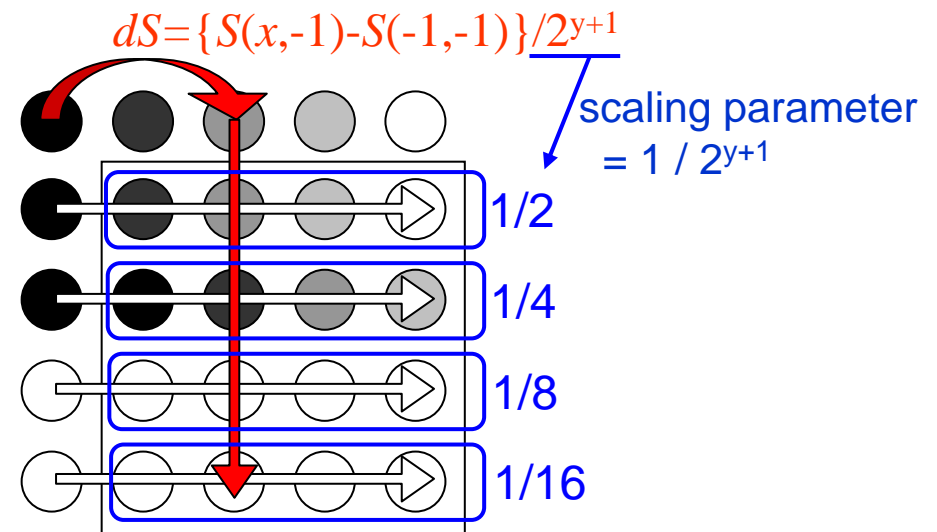
$$S'(x, y) = S(-1, y) + (S(x, -1) - S(-1, -1)) / 2^{y+1}$$

• Original image



Prediction block

• Prediction image



→ Prediction direction

Simulation Results (1)

- Anchor: HM3.0 Intra Only default conditions
- Tested: Proposed scheme implemented on HM3.0
 - Application to 4x4 and 8x8 luma prediction blocks

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3
Class B	-0.3	-0.2	-0.1	-0.3	-0.2	-0.2
Class C	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
Class D	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2
Class E	-0.4	-0.3	-0.4	-0.4	-0.2	-0.4
Overall	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
Enc Time[%]	100%			101%		
Dec Time[%]	100%			101%		

- Application to 4x4, 8x8 and 16x16 luma prediction blocks

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5
Class B	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
Class C	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4
Class D	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3
Class E	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5
Overall	-0.3	-0.4	-0.4	-0.3	-0.4	-0.4
Enc Time[%]	100%			101%		
Dec Time[%]	100%			101%		

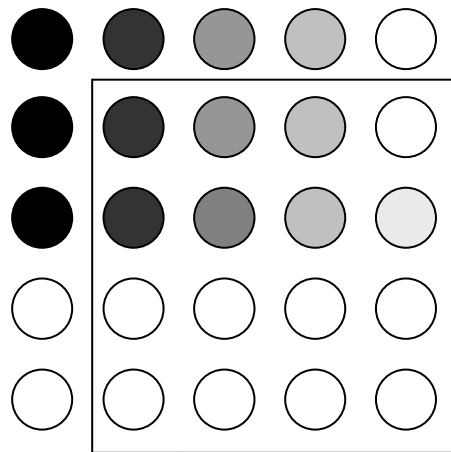
0.3% gain with up to 1% additional execution time compared to the anchor

Simplification of the proposed scheme

Horizontal prediction:

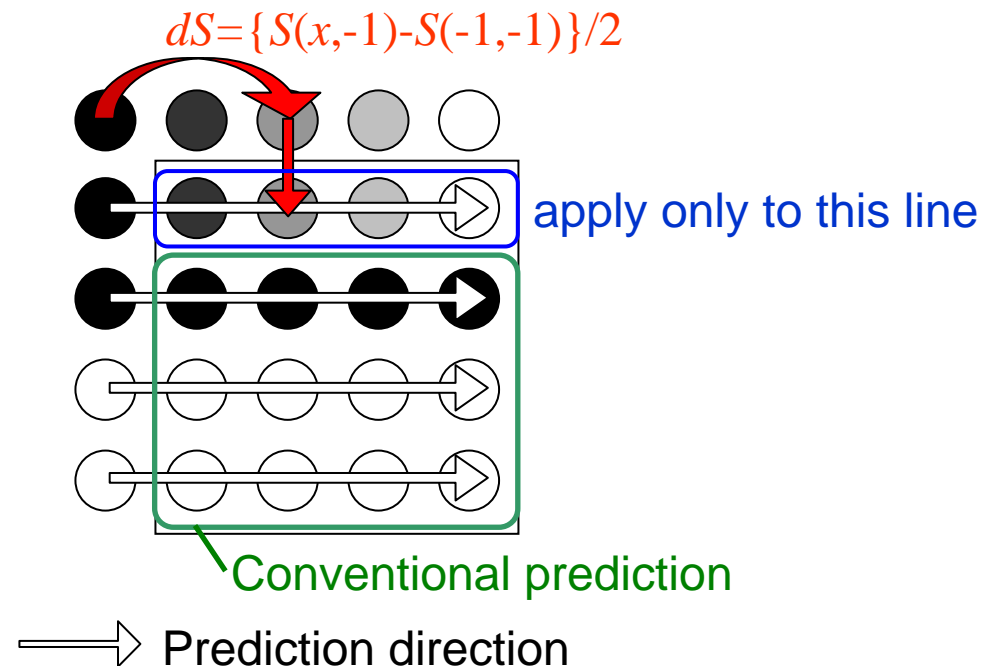
$$S'(x, y) = \begin{cases} S(-1, y) + (S(x, -1) - S(-1, -1)) / 2 & (y = 0) \\ S(-1, y) & (y \geq 1) \end{cases}$$

• Original image



Prediction block

• Prediction image



Simulation Results (2)

- Anchor: HM3.0 Intra Only default conditions
- Tested: Simplified proposed scheme implemented on HM3.0
 - Application to 4x4 and 8x8 luma prediction blocks

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0.3	-0.2	-0.1	-0.2	-0.2	-0.2
Class B	-0.2	-0.1	-0.1	-0.3	-0.2	-0.2
Class C	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
Class D	-0.3	-0.2	-0.3	-0.3	-0.2	-0.2
Class E	-0.4	-0.3	-0.3	-0.4	-0.2	-0.3
Overall	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

- Application to 4x4, 8x8 and 16x16 luma prediction blocks

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0.3	-0.2	-0.2	-0.3	-0.3	-0.3
Class B	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2
Class C	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Class D	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
Class E	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4
Overall	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Enc Time[%]	100%			100%		
Dec Time[%]	99%			100%		

0.3% gain with 0% additional execution time compared to the anchor

Conclusions

- The proposed scheme
 - 0.3% BD-rate improvement
 - ENC/DEC times increase are 0% and 1% for HE and LC
- The simplified proposed scheme
 - 0.3% BD-rate improvement
 - ENC/DEC times increase are negligible
- Propose the simplified scheme to be adopted to HM-4