



JCTVC-B027

Performance report of Iterative Adjustment Intra Prediction (IAIP)

K.Iguchi, A.Ichigaya, Y.Shishikui
NHK

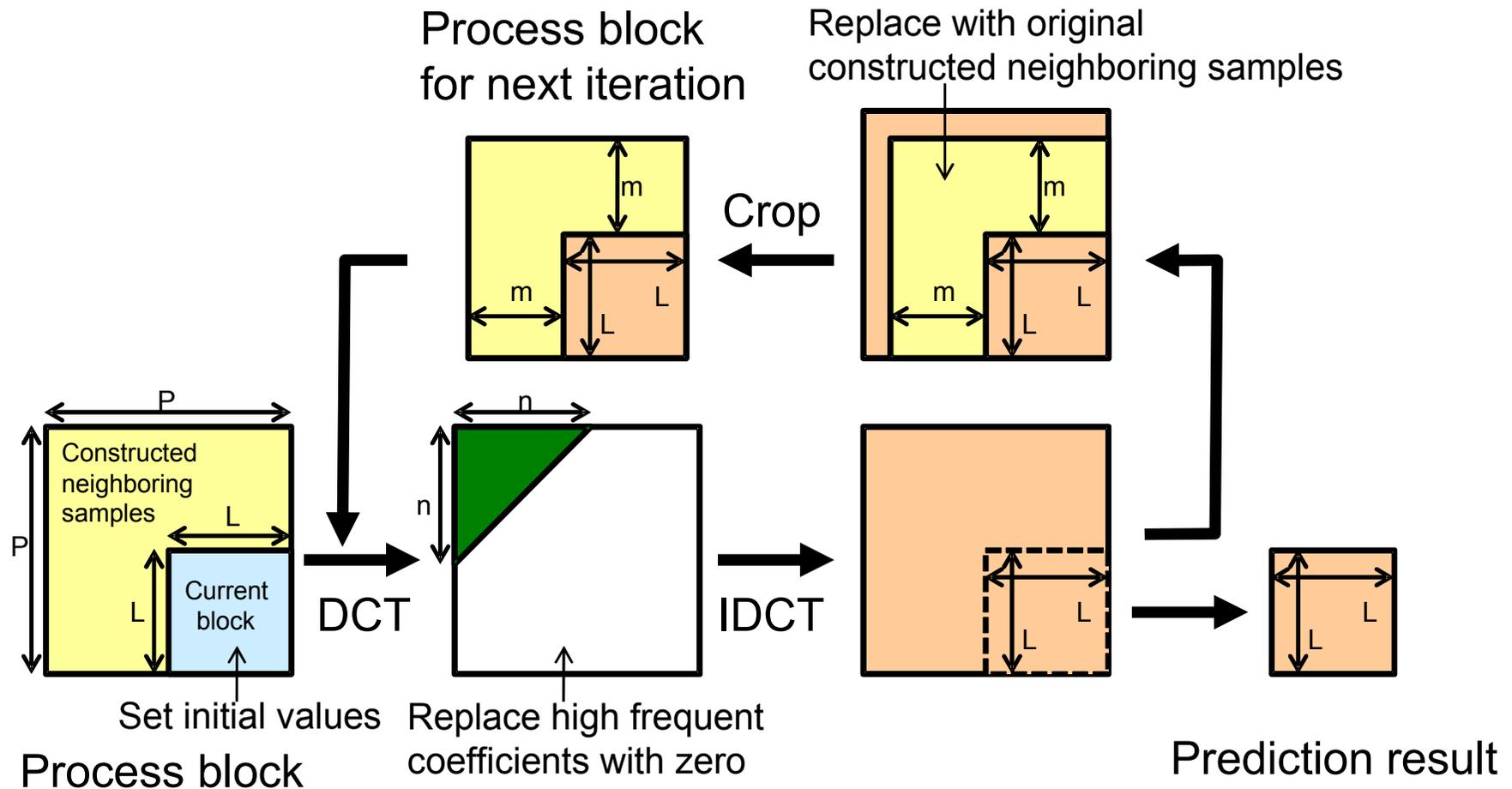
S.Sekiguchi, A.Minezawa
Mitsubishi Electric Corporation



Introduction

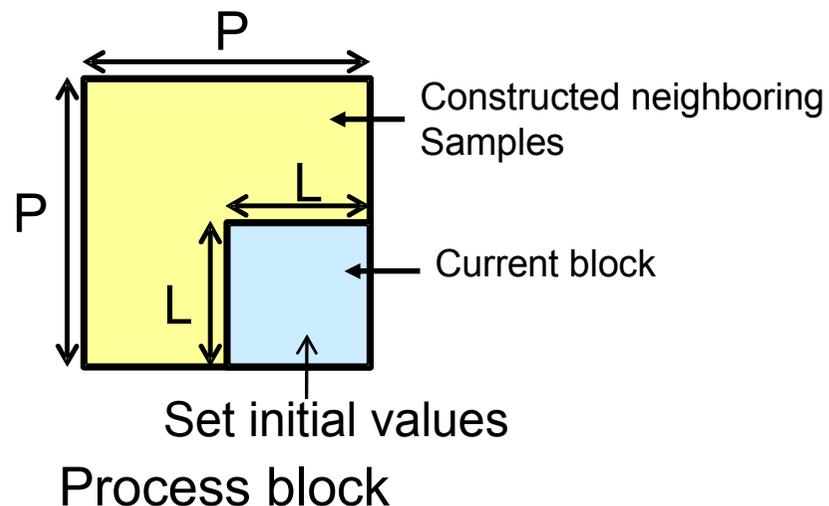
- Iterative Adjustment Intra Prediction (IAIP) is a new intra prediction mode proposed in JCTVC-A122.
- IAIP can reflect comprehensive signal fluctuation into the prediction results.
- This report describes the detail of IAIP and its performance

Overview of IAIP process



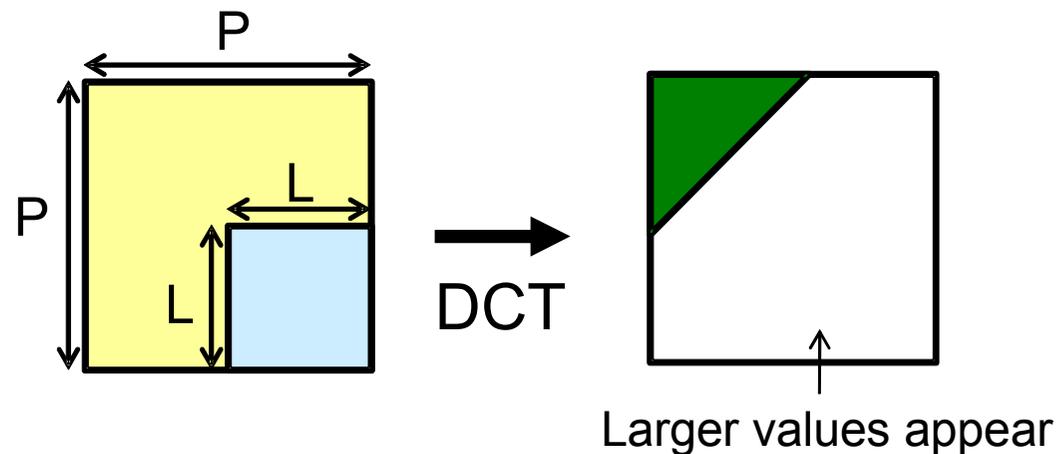
Process of IAIP

- The $P \times P$ process block contains the $L \times L$ current block and constructed neighboring area as reference.
- An initial P value is set to be $2L$.
- DC value of neighboring samples is set as initial prediction values at current block.



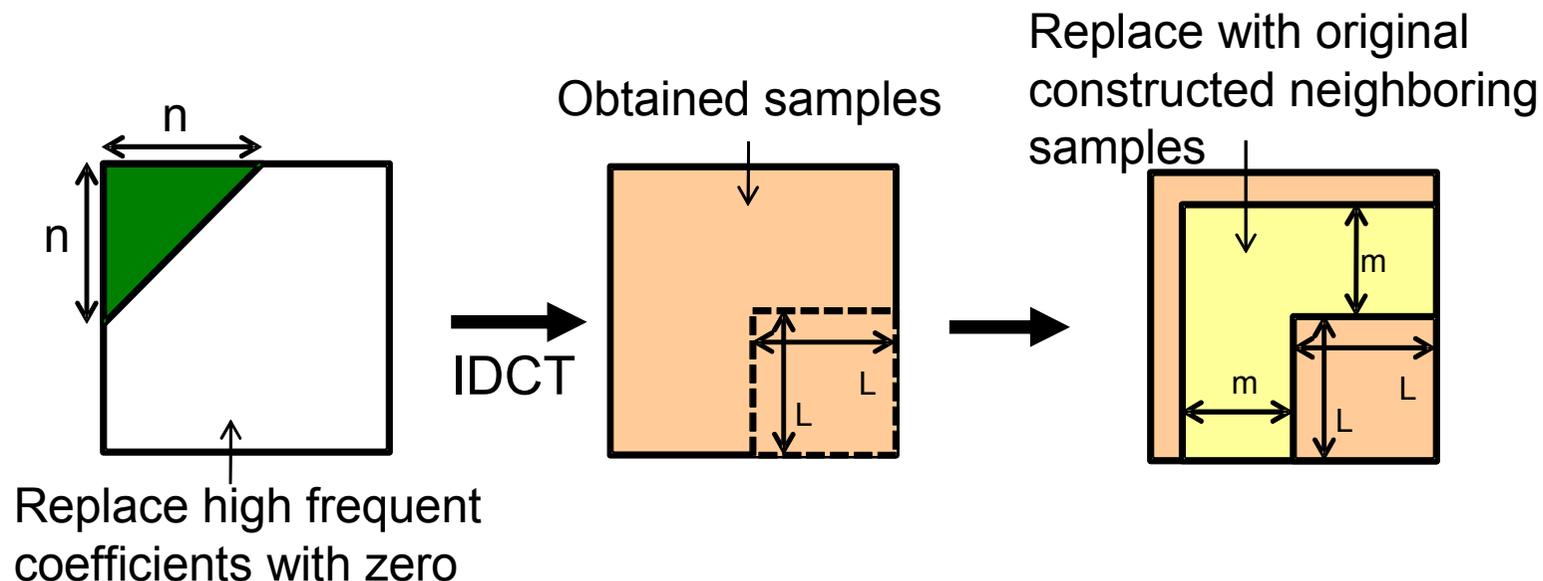
Process of IAIP (cont.)

- DCT is applied to the process block.
- Higher frequency coefficients of DCT appear because of discontinuity between the current block and neighboring area.



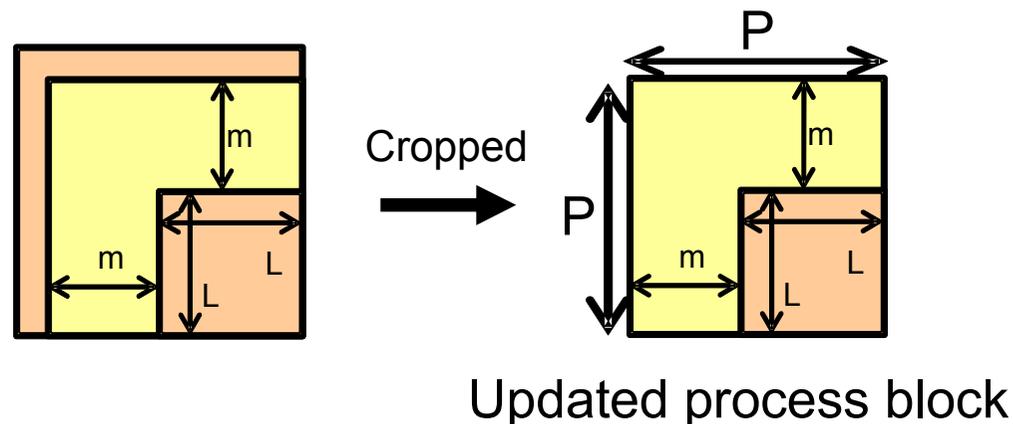
Process of IAIP (cont.)

- Higher frequency coefficients are replaced with 0 to make the border smooth.
- IDCT is applied to the process block.
- The obtained samples at neighboring area are replaced with original constructed values.



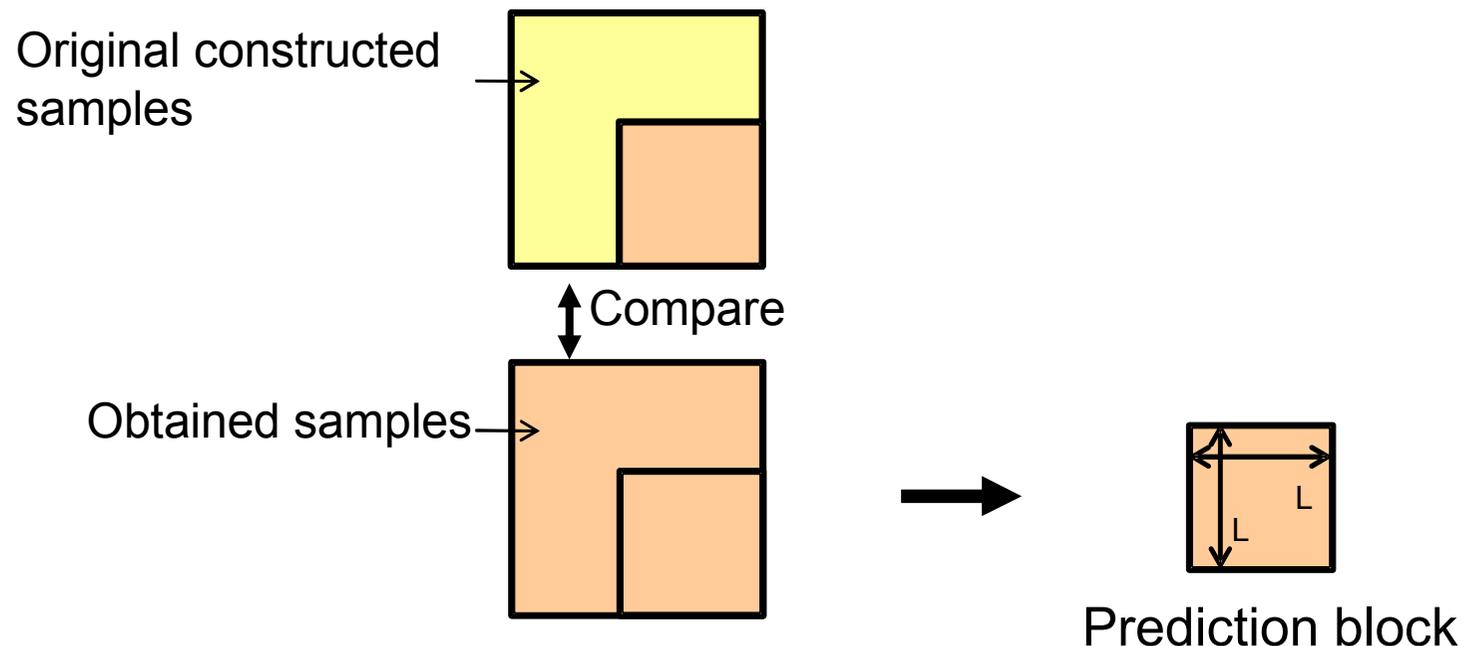
Process of IAIP (cont.)

- Next process block size, P , is decreased to $m+L$ ($m < L$).
- The new process block moves to DCT process
- By repeating this process, characteristics of neighboring samples can effectively be incorporated into the prediction samples.



Process of IAIP (cont.)

- If the obtained and original samples at neighboring area are almost same or the number of iteration is larger than maximum, fix the prediction signals.





The performance of IAIP

Condition of experiments

- JM 16.2 as the base software.
- No syntax change.
- In semantics, DC prediction mode is replaced with IAIP.
- IAIP is applied to both Y and C components.
- All test sequences specified in the CfP and SHV test sequences are used.
- Intra only coding
- QP=25, 30, 35, 40

The performance of IAIP

- The result of high resolution sequences
 - Class SHV: Steam locomotive train, Nebuta
 - Class A: Traffic, People on street
 - Class B: Kimono1, Park scene, Cactus, Basket drive, BQ terrace

	BD-PSNR [dB]			BD_RATE [%]		
	Y	U	V	Y	U	V
Steam locomotive train	0.02	0.32	0.38	-0.74	-18.47	-18.58
Nebuta festival	0.08	-0.01	0.00	-1.25	0.31	0.11
Traffic	0.06	0.02	0.05	-1.21	-0.66	-1.86
PeopleOnStreet	0.04	0.04	0.08	-0.71	-1.31	-2.75
Kimono1	0.07	0.07	0.10	-1.86	-2.91	-3.83
ParkScene	0.05	0.03	0.06	-1.17	-1.22	-2.72
Cactus	0.03	0.01	0.00	-0.89	-0.66	-0.11
BasketballDrive	0.02	0.03	0.02	-0.76	-1.27	-0.53
BQTerrace	0.01	0.02	0.07	-0.26	-0.67	-3.45
Average				-0.98	-2.99	-3.75



The performance of IAIP

- The result of low resolution sequences
 - Class C: Basketball drill, BQ mall, Party scene, Race horses
 - Class D: Basketball pass, BQ square, Blowing Bubbles, Race horses
 - Class E: Vidyo1, Vidyo3, Vidyo4

	BD-PSNR [dB]			BD_RATE [%]		
	Y	U	V	Y	U	V
BasketballDrill	-0.01	-0.05	-0.11	0.26	1.20	2.34
BQMall	0.05	0.00	0.01	-0.88	-0.04	-0.27
PartyScene	0.04	-0.02	-0.03	-0.54	0.53	0.63
RaceHorses	0.02	-0.03	-0.02	-0.35	0.77	0.64
BasketballPass	0.05	-0.03	-0.03	-0.88	0.55	0.62
BQSquare	0.01	0.00	-0.04	-0.08	-0.32	0.90
BlowingBubbles	0.04	-0.04	-0.04	-0.56	0.79	0.96
RaceHorses	0.02	-0.07	-0.07	-0.37	1.64	1.76
vidyo1	0.04	0.11	0.11	-0.73	-3.54	-2.86
vidyo3	0.02	0.19	0.13	-0.33	-5.82	-3.32
vidyo4	0.03	0.16	0.16	-0.63	-4.78	-4.25
Average				-0.46	-0.82	-0.26



Conclusion

- IAIP outperformed JM especially with high resolution sequences
- There may be some blocks where DC pred. works well which was replaced with IAIP.
- Therefore there is room of further performance improvement to use both DC pred. and IAIP with relevant syntax modifications.
- We propose to include IAIP into TMuC as the new intra prediction mode.