

Extended deblocking-filter process for large block boundary

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Overview

- An extension of deblocking filter process for 16x16 or larger TU boundary is proposed.
 - 16x16 or larger TU boundary detection (strong filtering mode is enabled and the size of both neighboring TU is 16x16 or larger)
 - The number of filtered samples is extended to **14** for the detected large TU boundary
 - For low bitrate condition with large QP, subjective quality is improved with slight degradation of BD-rate gain.
- Recommend to include the proposal to the next version of JEM or to study it in the exploration experiments (EEs).
- Recommend to conduct a viewing test by experts during this JVET meeting.

Motivation

- High resolution (4K and 8K) video will be more popular in the future.
- Brightness of consumer display is increasing, and a small illuminance difference between neighboring large blocks becomes more easily to be perceived.

Observation

- Blocking artifact becomes more easily to be perceived in human visual system when a large block (over 16x16) is used for a smooth region, especially on low bitrate coding condition.



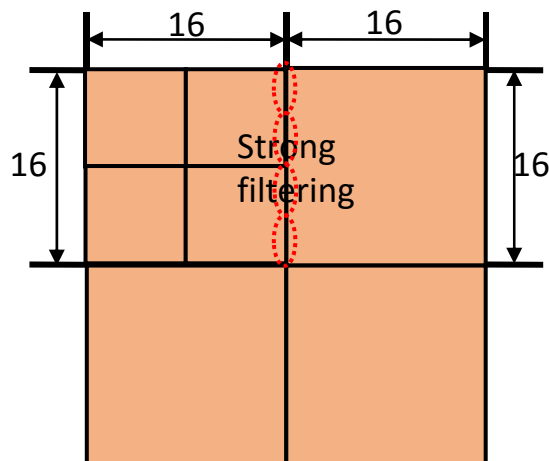
We propose an extension of deblocking filter process for 16x16 or larger TU boundary

Proposal (1)

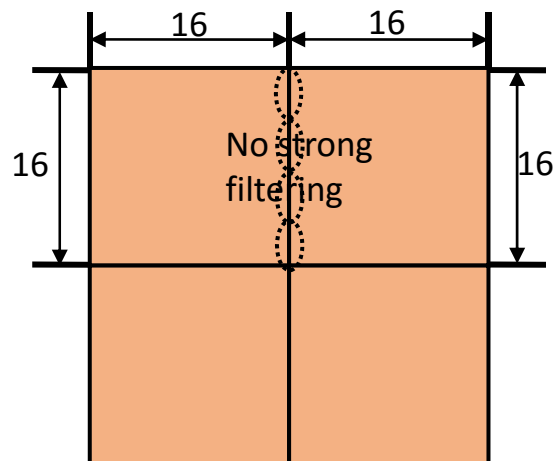
- Boundary detection of 16x16 or larger TU

When the following conditions are truth, the proposed deblocking filter is applied

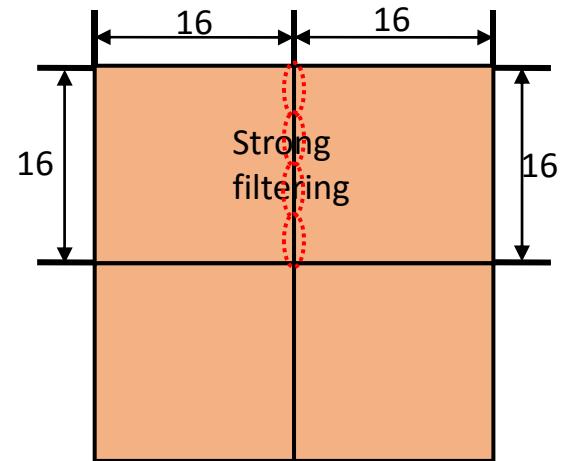
- Boundary is located between two 16x16 (or larger) TU;
- Strong filtering mode is enabled



DO NOT apply



DO NOT apply



Apply

Proposal (2)

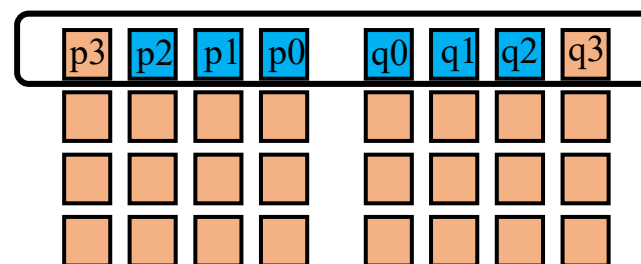
- Extension of the filtered samples on edge filtering process

The JEM2.0 filter coefficients of p3-p0 and q0-q3 for p0, p1, and p2 samples are as follows.

$$p2 = 2, 3, 1, 1, 1, 0, 0, 0$$

$$p1 = 0, 2, 2, 2, 2, 2, 0, 0 \quad \text{max 5 taps}$$

$$p0 = 0, 1, 2, 2, 2, 1, 0, 0$$



The proposed filter coefficients of p7-p0, and q0-q7 for p0-p6 samples are as follows.

$$p6 = 3, 5, 2, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0$$

$$p5 = 1, 2, 5, 2, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0$$

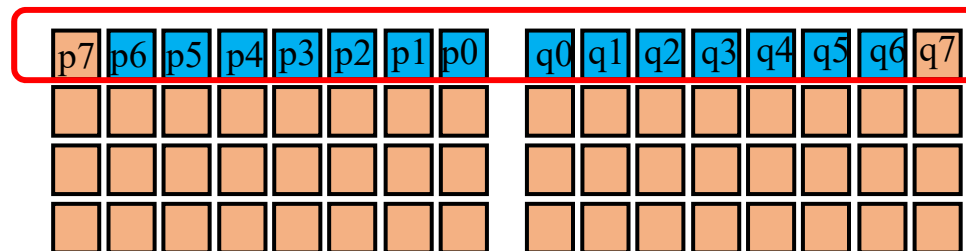
$$p4 = 0, 1, 3, 3, 3, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0$$

$$p3 = 0, 1, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 0, 0, 0, 0$$

$$p2 = 0, 0, 1, 2, 2, 2, 2, 2, 2, 1, 1, 1, 0, 0, 0, 0$$

$$p1 = 0, 0, 1, 1, 2, 2, 2, 2, 2, 2, 1, 1, 0, 0, 0, 0$$

$$p0 = 0, 0, 0, 1, 2, 2, 2, 2, 2, 2, 2, 1, 0, 0, 0, 0$$



max 11 taps

Experimental results (objective)

- The proposed method is implemented on top of JEM 2.0, and the test condition follows the JVET common test condition.
- The summary of BD-rate

	All Intra Main10			Random Access Main 10			Low delay B Main10		
	Y	U	V	Y	U	V	Y	U	V
Class A1	0.36%	-0.01%	0.02%	0.91%	0.01%	-0.08%			
Class A2	0.25%	-0.02%	-0.07%	1.29%	-0.06%	0.03%			
Class B	0.17%	0.00%	-0.01%	0.89%	0.04%	0.10%	2.20%	0.05%	0.74%
Class C	0.08%	0.00%	0.01%	0.56%	0.02%	0.04%	1.82%	-0.06%	-0.22%
Class D	0.04%	-0.01%	0.00%	0.29%	-0.07%	-0.17%	0.92%	-0.08%	-0.49%
Class E	0.13%	0.00%	0.01%				8.37%	2.08%	1.23%
Overall	0.17%	0.00%	-0.01%	0.79%	-0.01%	-0.01%	2.94%	0.37%	0.28%

Experimental results (subjective)



Decoded images by the **JEM 2.0** (Random Access, QP42, #7 frame)

Experimental results (subjective)



Decoded images by the **proposal** (Random Access, QP42, #7 frame)

Conclusion

- An extension of deblocking filter process for large TU boundary was proposed
For low bitrate condition with large QP, subjective quality is improved with slight degradation of BD-rate gain
- Recommend to include the proposal to the next version of JEM or to study it in the exploration experiments (EEs).
- Recommend to conduct a viewing test by experts during the JVET meeting.

Decision

- Organize a viewing test during the meeting to confirm the result, further study in QTBT is encouraged if subjective improvement is verified.