

JCTVC-J0186:

# On Deblocking Filter and DC Component of Quantization Matrices

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# Agenda

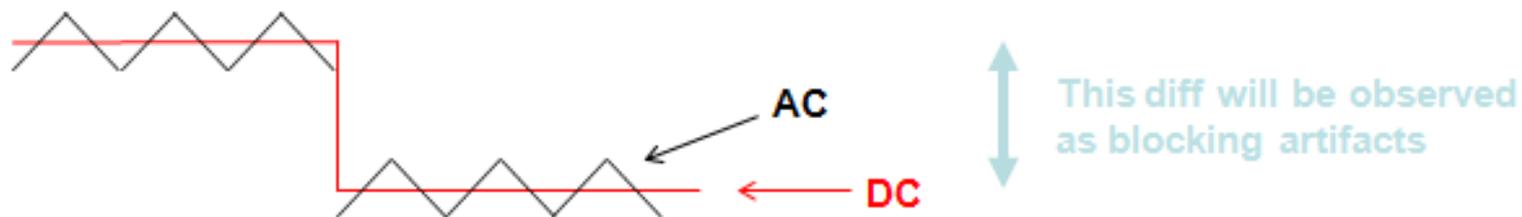
- Introduction / Problem Statement
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## Introduction / Problem Statement [1/]

- When quantization matrices are applied, QPs in a bitstream and the ones actually used for encoding / decoding differ.
- However, the formers are used for deblocking filtering with the current HEVC specification.
  - If QP adjusted by QM are lower the one in a bitstream, deblocking filter will be applied more than necessary, and texture will be blurred.

## Introduction / Problem Statement [2/]

- To correct this gap, it was proposed by JCTVC-10280 that the value of all QM components be taken into account for deblocking at the 9th JCTVC meeting in Geneve.
- The author partly supports this idea, but
  - taking all QM components into account requires increase in complexity
  - higher frequency components do not affect blocking artefacts



# Proposed Method

$QP_{trans}/QS_{trans}$  : QP and QS within a bitstream

$QP_{real}/QS_{real}$  : QP and QS adjusted by the DC component of QM

DC: DC component value of QM (1 ~ 255)

$$\frac{QS_{real}}{QS_{trans}} = \frac{DC}{16} = 2^{\frac{QP_{real} - QP_{trans}}{6}}$$

$$QP_{real} = QP_{trans} + 6 * \log_2 \frac{DC}{16}$$

**LUT**  
**(no need to calc.)**

Same as JCTVC-I0280

After adjustment of QPP & QPQ,  $(QPP+QPQ+1) \gg 1$  is calculated for tc&beta extraction

# Simulation Condition

- Test -1:
  - CTC with QM file “symmetry7” (included in JCTVC-I0101)
  - AI-HE, AI\_MAIN, RA\_HE, RA\_MAIN, LB\_HE, LB\_MAIN
  - Class A to F sequences
  - The author would like to thank Canon for crosschecking (JCTVC-J0419).
- Test -2: (to see visual quality difference)
  - Sequence: D.BlowingBubbles
  - Condition: Lowdelay\_B.Main
  - BaseQP: 37
  - ScalingList: Modified-symmetry7 (DC for Intra16x16&32x32 are set to 12, not to 16)

# Simulation Result [1/]

**Test -1**

Although a slight difference in coding efficiency is observed, not so much difference in subjective quality is observed.



With “symmetry7” DCs for larger transforms are 16.  
In HEVC larger transforms are More likely to be selected to remove overhead.

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.2%	0.2%	0.0%	-0.1%	-0.9%	-1.0%
Class B	0.1%	0.2%	0.1%	-0.1%	-0.4%	-0.3%
Class C	0.1%	-0.1%	0.0%	-0.1%	-0.7%	-0.6%
Class D	0.1%	-0.1%	0.0%	0.0%	-0.6%	-0.6%
Class E	0.5%	0.6%	0.8%	0.1%	-0.2%	0.0%
<b>Overall</b>	0.2%	0.2%	0.2%	-0.1%	-0.6%	-0.5%
	0.2%	0.1%	0.2%	-0.1%	-0.6%	-0.5%
Class F	0.1%	-0.1%	0.0%	0.0%	-0.6%	-0.7%
Enc Time[%]	100%			99%		
Dec Time[%]	99%			99%		

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.2%	-0.5%	-0.4%	0.0%	-1.1%	-1.4%
Class B	0.2%	-0.2%	-0.2%	0.0%	-0.4%	-0.4%
Class C	0.2%	-0.5%	-0.4%	0.0%	-0.7%	-0.5%
Class D	0.2%	-0.6%	-0.6%	0.1%	-0.8%	-0.5%
Class E						
<b>Overall</b>	0.2%	-0.4%	-0.4%	0.0%	-0.7%	-0.7%
	0.2%	-0.4%	-0.4%	0.0%	-0.7%	-0.7%
Class F	0.1%	-0.5%	-0.3%	0.0%	-0.8%	-0.8%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.2%	0.0%	-0.2%	0.1%	-0.1%	-0.1%
Class C	0.2%	0.1%	0.1%	0.2%	-0.1%	-0.1%
Class D	0.1%	-0.3%	-0.2%	0.1%	-0.2%	0.1%
Class E	0.3%	-0.4%	0.2%	0.1%	0.2%	-0.5%
<b>Overall</b>	0.2%	-0.1%	0.0%	0.1%	-0.1%	-0.1%
	0.2%	-0.1%	0.0%	0.1%	-0.1%	-0.1%
Class F	0.1%	-0.6%	-0.1%	0.0%	0.0%	0.0%
Enc Time[%]	99%			99%		
Dec Time[%]	101%			100%		

# Simulation Result [2/]

## Test -2: Anchor

A Girl's face is blurred because deblocking filter is applied stronger than necessary



# Simulation Result [3/]

Test -2: Tested



# Conclusion

- This contribution proposes QP adjustment with DC component of the quantization matrix before deblocking filtering.
  - Typically DC components of QM are smaller than 16 to prevent degradation of low frequency component.
  - In this case the proposed method prevents blurring of textures more than necessary with the areas like such as human face.
- It is recommended that this modification be adopted into HEVC DIS.

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