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| *Title:* | **CE12: SK Telecom/SKKU Harmonized Deblocking Filter with Additional Chroma Processing** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution contains results for the harmonized deblocking filter based on SKT/SKKU proposal (JCTVC-F258) [1] for luma filtering and Ericsson and MediaTek proposal (JCTVC-F118) [2] for chroma filtering, respectively. It is reported that the harmonized deblocking filter has BDBR reduction of 1.2% (HE\_IO), 1.2% (HE\_RA) and 1.7% (HE\_LD) compared to HM3.0 anchor.

# Introduction

Current HEVC deblocking filter in HM3.0 [3] has three constituting processes as follows:

* Boundary strength (bS) decision and clipping value (tc) control
* Filtering decision
* Filter type decision and execution

In the proposed harmonized deblocking filter, luma filtering process (which contains the boundary strength (bS) decision and clipping value (tc) control, filtering decision and filter type decision and execution) is performed by using SKT/SKKU proposal (JCTVC-F258) [1]. For chroma filtering, all parts of chroma deblocking process except independent chroma bS decision and clipping value control part are performed based on the Ericsson and MediaTek proposal (JCTVC-F118) [2]. The chroma bS decision and clipping value control are performed by STK/SKKU proposal (JCTVC-F258) [1].

# Algorithm description

As mentioned above, the proposed harmonized deblocking filter basically combines two deblocking filtering methods of luma and chroma as follows:

* Boundary strength (bS) decision and clipping value (tc) control

STK/SKKU proposal (JCTVC-F258) for luma [1]

STK/SKKU proposal (JCTVC-F258) for chroma [1]

* Filtering decision

STK/SKKU proposal (JCTVC-F258) for luma [1]

Ericsson and MediaTek proposal (JCTVC-F118) for chroma [2]

* Filter type decision and execution

STK/SKKU proposal (JCTVC-F258) for luma [1]

Ericsson and MediaTek proposal (JCTVC-F118) for chroma [2]

In the process of harmonizing deblocking processes of luma and chroma, the chroma filter execution process of Ericsson and MediaTek [2] is slightly modified. In the Ericsson and MediaTek proposal, chroma filter is executed with clipping offset value which is the same as the HM3.0 (that is, tc offset is set to 0 and 4 respectively for inter and intra block). To keep the effect of chroma bS decision in SKT/SKKU proposal, in the harmonized method, chroma filter is executed with modified clipping offset value whose detail can be found in [1]. For further description of individual technology, it is advised to investigate corresponding references.

# Experimental results

The harmonized deblocking filter is implemented on HM3.0 software and simulated under CE12 conditions [3]. Table 1 shows the summarized coding performance of the harmonized method compared to HM3.0 anchor. More detailed results are included in *JCTVC-F262.xls*.

Table 1. Experimental results of the harmonized deblocking filter compared to the HM3.0 anchor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | All Intra HE | | | All Intra LC | | |
| Y | U | V | Y | U | V |
| Class A | -1.7 | -1.5 | -1.2 | -1.1 | -2.3 | -2.1 |
| Class B | -1.3 | -1.4 | -1.6 | -1.1 | -2.6 | -2.7 |
| Class C | -1.0 | -2.5 | -2.5 | -1.0 | -3.4 | -3.9 |
| Class D | -0.9 | -2.2 | -2.4 | -0.9 | -3.5 | -3.8 |
| Class E | -1.3 | -0.4 | -0.6 | -1.0 | -2.2 | -3.0 |
| **Overall** | **-1.2** | **-1.7** | **-1.7** | **-1.0** | **-2.8** | **-3.1** |
| Enc Time[%] | 103% | | | 101% | | |
| Dec Time[%] | 101% | | | 103% | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Random Access HE | | | Random Access LC | | |
| Y | U | V | Y | U | V |
| Class A | -1.6 | -2.3 | -2.1 | -0.9 | -2.6 | -2.0 |
| Class B | -1.3 | -2.6 | -2.3 | -1.0 | -2.7 | -2.3 |
| Class C | -1.0 | -3.4 | -3.2 | -0.9 | -3.3 | -3.7 |
| Class D | -0.8 | -2.9 | -3.4 | -0.7 | -2.9 | -3.1 |
| Class E |  |  |  |  |  |  |
| **Overall** | **-1.2** | **-2.8** | **-2.7** | **-0.9** | **-2.8** | **-2.7** |
| Enc Time[%] | 110% | | | 102% | | |
| Dec Time[%] | 101% | | | 103% | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Low delay B HE | | | Low delay B LC | | |
| Y | U | V | Y | U | V |
| Class A |  |  |  |  |  |  |
| Class B | -1.7 | -2.7 | -2.4 | -1.0 | -2.4 | -2.4 |
| Class C | -1.3 | -2.8 | -2.8 | -0.9 | -2.3 | -3.1 |
| Class D | -1.1 | -1.9 | -2.1 | -0.8 | -1.7 | -2.1 |
| Class E | -2.9 | -2.9 | -3.6 | -1.5 | -6.6 | -6.1 |
| **Overall** | **-1.7** | **-2.6** | **-2.7** | **-1.0** | **-3.0** | **-3.2** |
| Enc Time[%] | 97% | | | 100% | | |
| Dec Time[%] | 101% | | | 103% | | |

# Concluding remarks

This contribution reports the results of the harmonized deblocking filter based on SKT/SKKU proposal (JCTVC-F258) [1] for luma filtering and Ericsson and MediaTek proposal (JCTVC-F118) [2] for chroma filtering. It is reported that the harmonized deblocking filter has BDBR reduction of 1.2% (HE\_IO), 1.2% (HE\_RA) and 1.7% (HE\_LD) compared to HM 3.0.

# References

[1] J. Yang, K. Won, B. Jeon and J. Lim, “CE12: SKT/SKKU Deblocking Filter,” JCTVC-F258, Torino, July 2011.

[2] A. Norkin, K. Andersson, R. Sjöberg, Q. Huang, J. An, X. Guo and S. Lei, “CE12: Ericsson's and MediaTek's deblocking filter,” JCTVC-F118, Torino, July 2011.

[3] A. Norkin, X. Guo, B. Jeon, M. Narroschke, “Description of CE12: deblocking filtering,” JCTVC-E712, Geneva, March 2011.

# Patent rights declaration(s)

**SK Telecom and Sungkyunkwan University may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**