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| *Title:* | **CE12 Subset 1: Cross-verification of Ericsson’s Proposal JCTVC-E276** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Crosscheck | | |
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| *Source:* | MediaTek Inc. | | |

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# Abstract

This contribution is a cross-verification of Ericsson’s deblocking filter proposed in document JCTVC-E276. The software contains several modifications compared to HM2.0. The cross-verification has been done successfully in terms of BR-rates and subjective viewing. It is reported that the BD-rates match those provided by Ericsson exactly. The subjective quality is reported to be similar to the anchor on average.

# Objective Evaluation

The simulation has been done based on the six configurations of common test condition in JCTVC-D600 [1]. The figures in Table 1 confirm the overall results and running time issues in Ericsson’s proposal in general. The encoding times are got from machines with similar types, and the decoding times are got from the same computer core without writing output files.

Table 1. Objective Results by Mediatek

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Intra | | | Intra\_LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -1.04% | 0.00% | 0.00% | -1.46% | 0.00% | 0.00% |
| Class B | -0.67% | 0.00% | 0.00% | -0.83% | 0.00% | 0.00% |
| Class C | -0.62% | 0.00% | 0.00% | -0.77% | 0.00% | 0.00% |
| Class D | -0.55% | -0.01% | -0.01% | -0.62% | 0.00% | 0.00% |
| Class E | -0.87% | 0.00% | 0.00% | -1.01% | 0.00% | 0.00% |
| All | -0.74% | 0.00% | 0.00% | -0.93% | 0.00% | 0.00% |
| Enc Time[%] | 99.84% | | | 103.04% | | |
| Dec Time[%] | 99.54% | | | 100.36% | | |
|  |  |  |  |  |  |  |
|  |  | RandomAccess |  |  | RandomAccess\_LoCo |  |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | -1.10% | -0.02% | 0.01% | -1.35% | 0.78% | 1.07% |
| Class B | -0.95% | -0.22% | -0.38% | -1.02% | -0.10% | -0.05% |
| Class C | -0.80% | -0.15% | -0.17% | -0.78% | 0.29% | 0.03% |
| Class D | -0.58% | -0.28% | -0.33% | -0.59% | -0.10% | -0.01% |
| Class E | #VALUE! | #VALUE! | #VALUE! | #VALUE! | #VALUE! | #VALUE! |
| All | -0.86% | -0.17% | -0.23% | -0.94% | 0.20% | 0.24% |
| Enc Time[%] | 100.15% | | | 98.88% | | |
| Dec Time[%] | 99.28% | | | 99.51% | | |
|  |  |  |  |  |  |  |
|  | LowDelay | | | LowDelay\_LoCo | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | #VALUE! | #VALUE! | #VALUE! | #VALUE! | #VALUE! | #VALUE! |
| Class B | -1.42% | -1.29% | -1.42% | -1.30% | -0.87% | -0.39% |
| Class C | -0.96% | -0.51% | -0.57% | -0.81% | 0.28% | -0.18% |
| Class D | -0.85% | -0.70% | -0.82% | -0.58% | 0.23% | 0.18% |
| Class E | -3.30% | -3.85% | -3.20% | -2.55% | -4.65% | -3.31% |
| All | -1.52% | -1.43% | -1.39% | -1.23% | -1.01% | -0.74% |
| Enc Time[%] | 100.15% | | | 101.91% | | |
| Dec Time[%] | 97.91% | | | 100.96% | | |

# Subjective Evaluation

For subjective evaluation, visual inspections report similar performance to HM2.0 in terms of blocking artifacts. In some cases, details were removed, especially for low bitrates.

# Source Code Investigation

## Modifications for Luma

The strong/weak filtering selection and strong filtering operations remain exactly the same as in HM2.0. The only changes for luma are in weak filtering. Tables for clipping values and thresholds remain the same. There are some modifications based on the tables:

1. A new delta value *d* is introduced for weak filtering of p0 and q0.
2. The clipping value *tc* is multiplied by 10 and then compared to abs(*d*) to determine whether weak filtering can be totally omitted for this line.
3. Beta values are divided by 6 and then compared to absolute differences on each side of a boundary in order to determine whether one more pixel should be filtered at that side. If yes, new delta values are used and half of *tc* is used as the clipping value.

## Modifications for Chroma

1. Boundary strengths for Cb and Cr are re-calculated.
2. Different filtering decisions.
3. Chroma weak filter uses different clipping values from luma weak filtering

# Conclusion

The software and experimental results of Ericsson’s contribution JCTVC-E276 were cross-verified. We got exactly the same BD-rates with the results provided by Ericsson.

# References

1. Frank Bossen, “Common test conditions and software reference configurations”, JCTVC-D600, JCT-VC meeting, Daegu, KR, Jan. 2011.
2. A. Norkin, K. Andersson and R. Sjoberg, “CE12.1: Ericsson deblocking filter,” JCTVC-E276,