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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  7th Meeting: Geneva, Switzerland, 21-30 July, 2011 | Document: JCTVC-G081  WG11 number: m21628 |

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| *Title:* | CE6: Cross-check report for Subtest CE6d on Intra prediction with secondary boundary (Test 7) | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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# Abstract

CE6d aims to investigate the coding performance and complexity for intra prediction with secondary boundary. This contribution presents the results and observations from the experiments performed by the Institute for Infocomm Research. The coding results obtained reportedly match what was provided by the proponents.

# Introduction

The intra prediction process sometimes generates discontinuities between the prediction samples and the reconstructed samples on the side reference. For instance, consider the directional intra prediction modes Ver+0 to Ver+8. While the top samples of the predicted block have strong correlation with the reconstructed samples above, the samples on the left (or secondary) boundary have little correlation with the reconstructed samples from the left. JCTVC-F122 [1], JCTVC-F172 [2], JCTVC-F358 [3], and JCTVC-F456 [4] try to minimize the discontinuities by utilising the pixels from the side reference in the prediction process. There are three approaches: gradient based smoothing, directional smoothing and diagonal smoothing.

In gradient based smoothing, the gradient information between the neighbouring reference samples along the intra prediction direction is used to improve the prediction samples. In directional smoothing, the reference samples on both ends of the intra predictional direction are used. In diagonal smoothing, diagonal 2 tap filters are applied to the secondary boundary to improve the prediction samples. In addition, smoothing can be applied to one to four lines beside the side reference. The purpose of CE6d is to study the trade-off between coding performance and complexity among the combination of various methods, as well as the number of lines to smooth.

# Simulation Results

The proposed modifications were made in HM 4. Tests were conducted using the two All-Intra configurations, i.e. high-efficiency and low complexity, following the common testing conditions [5].

Table 1 shows the results of Test 7, where diagonal smoothing for intra prediction modes Ver/Hor {-8 to -4, +4 to +8} is applied at the secondary boundary, i.e. on the one line beside the side reference, as in JCTVC-F456.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **All Intra HE** | | | **All Intra LC** | | |
|  | Y | U | V | Y | U | V |
| Class A | -0.3% | -0.3% | -0.3% | -0.3% | -0.3% | -0.4% |
| Class B | -0.2% | -0.2% | -0.1% | -0.2% | -0.2% | -0.2% |
| Class C | -0.2% | -0.2% | -0.2% | -0.2% | -0.3% | -0.2% |
| Class D | -0.3% | -0.2% | -0.3% | -0.3% | -0.3% | -0.3% |
| Class E | -0.3% | -0.3% | -0.3% | -0.2% | -0.3% | -0.3% |
| **Overall** | -0.3% | -0.2% | -0.2% | -0.2% | -0.3% | -0.3% |
|  | -0.3% | -0.2% | -0.2% | -0.2% | -0.3% | -0.3% |
| Enc Time[%] | 99% | | | 99% | | |
| Dec Time[%] | 100% | | | 100% | | |

Table 1. Cross-check results for Test 7.

# Conclusions

These CE6 cross-check experiments report results which are consistent with those provided by the proponents.

# References

1. M. Guo, X. Zhao, X. Guo and S. Lei, “Direction based Angular Intra Prediction”, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, JCTVC-F122, Torino, Italy, July 2011
2. Akira Minezawa, et.al., “An improved intra vertical and horizontal prediction”, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, JCTVC-F172, Torino, Italy, July 2011
3. Jinho Lee, et.al., “Mode dependent filtering for intra predicted sample”, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, JCTVC-F358, Torino, Italy, July 2011
4. Jani Lainema, et.al., “Directional intra prediction smoothing”, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, JCTVC-F456, Torino, Italy, July 2011
5. F. Bossen, “Common conditions and software reference configurations,” JCTVC-F900, Torino, Italy, Jul., 2011.