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| *Title:* | **SCE1 Category 2.4: Modifications of Prediction planar predictions in Difference Domain Intra Prediction** | | |
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# Abstract

The HEVC planar prediction is applied in the difference domain intra prediction in the merged SCE1 Category 2.2&2.6. Since the HEVC planar prediction was not originally designed for difference reference samples, this contribution modified the planar prediction so that it is a better match to the difference reference sample. The modified planar prediction, in addition to the difference domain intra prediction in SCE1 Category 2.2&2.6, resulted in 0.9% and 0.6% BD rate savings on average for all intra (AI) 2x and 1.5x. In contrast, the difference domain intra prediction in SCE1 Category 2.2&2.6 alone resulted in 0.8% and 0.6% BD rate savings on average for all intra (AI) 2x and 1.5x.

# Introduction

In JCTVC-L0135 [1] and JCTVC-L0222 [2], intra prediction based on residuals between base layer (BL) and enhancement layer (EL) signals were proposed. To improve intra prediction of residuals, JCTVC-L0140 [3] and JCTVC-L0215 [4] proposed to improve the planar prediction for difference reference samples.

The difference domain intra prediction from JCTVC-L0135 [1] and JCTVC-L0222 [2] is studied in the merged SCE1 Category 2.2 and 2.6 [5]. In SCE1 Category 2.2 & 2.6 [5], the planar prediction in difference domain is the same as the HEVC planar prediction but applied to difference reference samples. Since the HEVC planar prediction was not originally designed for difference reference samples, this contribution proposes a minor modification to the planar prediction so that it is a better match to difference reference sample.

In this contribution, the proposed intra planar prediction, in conjunction with the difference domain intra prediction in SCE1 Category 2.2&2.6 [5], has been tested under SHM-1.0 intraBL framework.

# Proposed technique

## Modified planar prediction

We propose to replace intra planar prediction block with textureRL prediction block plus modified planar prediction with difference reference samples. Figure 1 shows the flow chart of the proposed technique.



Figure 1. Flow chart of the proposed technique in section 2.1

In figure 2, the modified planar prediction with difference reference samples is depicted. Unlike the previous planar prediction, right-top and bottom-left reference samples are not employed. Instead, sample values at the bottom line are set equal to zero during vertical interpolation, and sample values at the rightmost line are set equal to zero during horizontal interpolation.



Figure 2. Modified planar prediction with difference reference samples

 (1)

 (2)

Equations (1) and (2) show how the prediction block is calculated in the proposed method. In these equations,  represents the final prediction values,  represents the values of textureRL prediction block,  represents the difference reference sample values,  represents the modified prediction sample values with difference reference samples, and represents the current block size.

# Results

The proposed method is implemented on SHM-1.0 intraBL framework and simulated under the common test conditions defined by JCTVC-L1009. In this contribution, we provide the performance when the modified planar prediction is applied with the difference domain intra prediction in the merged SCE1 Category 2.2&2.6 [5] proposals. Table 1 summarizes the results For AI-2x and AI-1.5x, the proposed tools reportedly shows 0.9% and 0.6% BD rate savings on average, respectively, compared with SHM-1.0 intraBL framework. The results are cross-checked by MediaTek in JCTVC-Mxxxx.

Table 1. Experimental results on modified planar prediction with difference domain intra prediction

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **AI HEVC 2x** | | | **AI HEVC 1.5x** | | |
|  | Y | U | V | Y | U | V |
| Class A | -0.7% | -0.3% | -0.4% |  |  |  |
| Class B | -1.1% | -0.4% | -0.4% | -0.6% | 0.0% | 0.0% |
| **Overall (Test vs Ref)** | -0.9% | -0.4% | -0.4% | -0.6% | 0.0% | 0.0% |
| **Overall (Test vs single layer)** | 11.3% | 13.2% | 12.9% | 9.6% | 10.3% | 9.7% |
| **EL only (Test vs Ref)** | -0.8% | -0.2% | -0.2% | -0.6% | 0.1% | 0.1% |
| Enc Time[%] | 165.2% | | | 157.5% | | |
| Dec Time[%] | 112.8% | | | 109.5% | | |
| Enc Mem[%] | #DIV/0! | | | #DIV/0! | | |
| BL Match | Matched | | | Matched | | |

# References

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