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| *Title:* | **SCE1: combined results of Test 4.2.2 and 4.2.6 on Difference Intra prediction** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This document reports SHVC SCE1 combined results of Test 4.2.2 and 4.2.6 on Difference domain Intra Prediction (DIP). DIP is a predictive coding tool which uses reconstructed pixels from spatial neighbors of current enhancement layer and co-located base layer to predict the current enhancement layer block. It is reported that an average of 0.7% (EL+BL), luma BD-rate reduction is obtained for AI Spatial scalability cases.

# Technical description

This test studies the Difference domain Intra Prediction (DIP) proposed in [1][2] to improve the coding efficiency of SHVC. In the DIP, as shown in Figure 1, the difference between the pixels of current neighbors and those of collocated BL neighbors are used to generate a difference prediction based on the intra prediction mode. The generated difference prediction signal is added to the collocated BL block signal to form the final prediction.

Due to the high frequency nature of the difference signals, HEVC mode dependent intra smoothing (MDIS) process is disabled in difference domain intra prediction mode. As a result of no MDIS filtering, the latency and complexity are reduced with gain in BD-Rate.

Further In the proposed method, reference, prediction and reconstruction values in difference domain are clipped from [-255,255] into [-128, 127]. By doing it, we can keep the range size the same with the original domain.

The difference domain Prediction mode is indicated by a flag *intra\_resi\_pred\_flag* at CU level.



Figure 1 Intra residual prediction

# Test Results

The proposed method is implemented on SHM-1.0 intraBL framework and experimentally verified under SHVC common test conditions defined by JCTVC-L1009 and the results are summarized in the following tables for AI 2x and 1.5x spatial scalability cases. Thanks to Samsung for crosschecking the tests.

**Table 1: Experimental results of Difference Domain Intra Prediction for AI configuration**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **AI HEVC 2x** | | | **AI HEVC 1.5x** | | |
|  | Y | U | V | Y | U | V |
| Class A | -0.6% | -0.4% | -0.4% |  |  |  |
| Class B | -1.0% | -0.5% | -0.6% | -0.6% | -0.1% | -0.1% |
| **Overall (Test vs Ref)** | -0.8% | -0.5% | -0.5% | -0.6% | -0.1% | -0.1% |
| **Overall (Test vs single layer)** | 11.4% | 13.1% | 12.8% | 9.6% | 10.2% | 9.6% |
| **EL only (Test vs Ref)** | -0.7% | -0.4% | -0.4% | -0.7% | 0.0% | -0.1% |
| Enc Time[%] | 165.2% | | | 156.4% | | |
| Dec Time[%] | 111.7% | | | 108.3% | | |
| Enc Mem[%] | #DIV/0! | | | #DIV/0! | | |
| BL Match | Matched | | | Matched | | |

# Conclusions

In this proposal, the performance of Difference domain Intra Prediction for SHVC is investigated. By utilizing base layer picture information in predicting enhancement layer picture for Intra Coded blocks, significant improvement in coding efficiency is achieved. It is suggested to adopt Difference domain Prediction into SHVC and reference software.

# References

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