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| *Title:* | **Non-TE3: Extension of Test 4.6.2.1 on Generalized Residual Prediction** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

Generalized residual prediction (GRP) is investigated in SHVC TE3. In this proposal, GRP is extended by including a new weighting mode. It is reported that 2.93% and 5.11% luma BD-rate reduction is obtained on average for RA, LD-P cases, respectively. It is also reported that 4.94% luma BD-rate reduction is achieved in supplementary LD-B test.

# Introduction

Generalized residual prediction (GRP) was proposed in [1][2] to improve the coding efficiency of SHVC. It uses previously coded base layer and enhancement layer pictures to predict the current enhancement layer picture. In SHVC TE 3, GRP with two and three weighting modes is investigated [3]. In this proposal, GRP is extended by including another weighting mode.

# Extended GRP

The framework of GRP is shown in Figure 1 where the case of uni-prediction is illustrated.

Let **B**e and **B**b denote the current block in enhancement layer and its up-sampled collocated base layer block, respectively. Let **P**e0 denote the temporal prediction for the block **B**e obtained by using the motion vector MVe0 (where subscript 0 refers to reference list 0). Similarly, **P**b0 represents the temporal prediction for the block **B**b obtained by using the same motion vector MVe0 on up-sampled base layer reference picture. Then, the GRP proposed in [3] for enhancement layer can be expressed as

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where *w* is a weighting factor, which takes the values 0, 0.5, or 1.

Sometimes the upsampled collocated base layer block shows better quality than enhancement layer block for prediction. In such cases, more weighting shall be given to for higher prediction efficiency. Therefore, a new weighting mode is proposed as

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Since the differential block is the same as that in difference domain inter prediction [4], the newly added weighting mode is called diff-0.5 while the original GRP weighting mode is called res-0.5. In total, there are four GRP weighting modes, i.e., (0, res-0.5, 1, diff-0.5) in this proposal. Other modules such as additional motion estimation in differential pictures are the same as those in [3].



**Figure 1 GRP in uni-prediction**

# Test Results

In this section, 4-weighting-mode GRP is experimentally verified under SHVC common test conditions defined by AHG10. Please note that the fast GRP mode selection method and additional motion estimation in [3] are enabled while 4-tap upsampling filter [3] is disabled. Thanks I2R for crosschecking the tests.

The simulation results are as follows. On average, 2.93% and 5.11% luma BD-rate reduction is achieved for RA cases and LD-P cases, respectively. Moreover, supplementary simulations show that 4.94% luma BD-rate reduction is obtained for LD-B cases, which indicates that the proposed method is quite efficient for both P and B pictures.



# Conclusions

In this proposal, generalized residual prediction investigated in TE3 is further extended by including a new weighting mode. Simulations show that 2.93%, 5.11%, and 4.94% luma BD-rate reduction is obtained on average for RA, LD-P, and LD-B cases, respectively.

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