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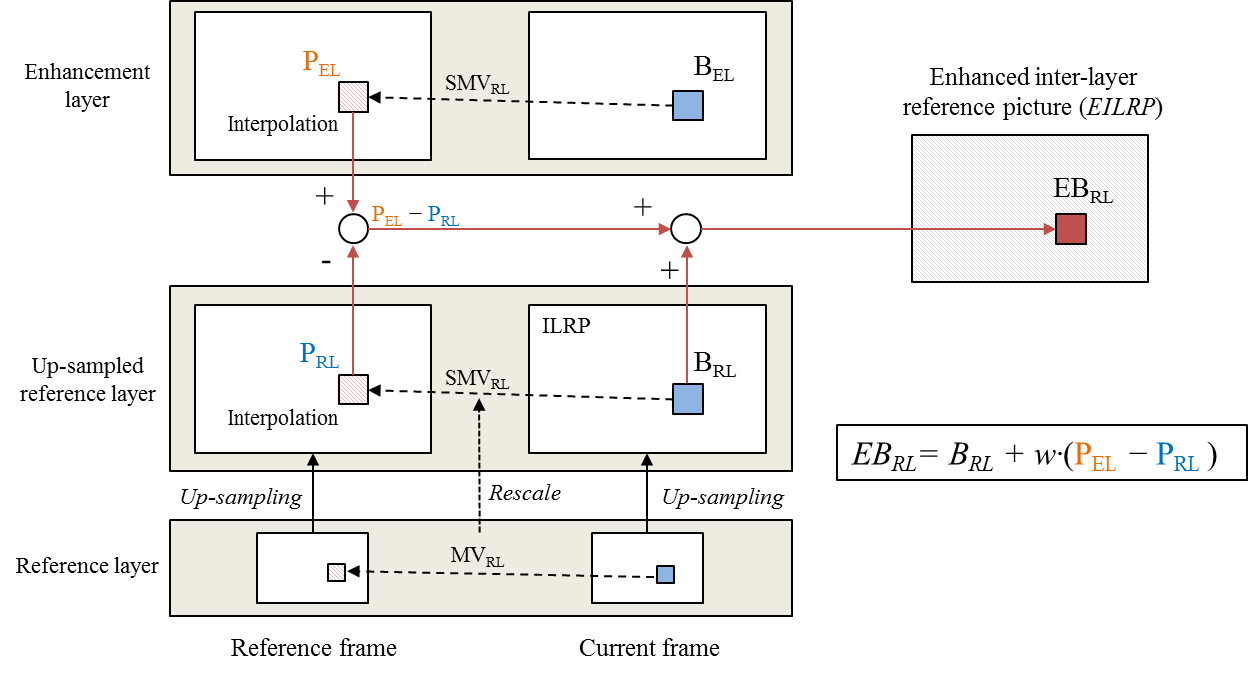
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| *Title:* | **Low-complexity generalized residual prediction for SHVC** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes a simplification of the inter-layer reference enhancement. In inter-layer reference enhancement, the high frequency component is generated with the temporal reference in enhancement layer (EL), the up-sampled reference layer (RL), and the up-scaled motion vector of the RL (SMVRL). If the SMVRL has fractional-pel accuracy, both the EL and the up-sampled RL must be interpolated to perform motion compensation (MC). In the proposed method, interpolation in high frequency component generation is skipped, as it is asserted that the interpolation does not have significant advantage on the prediction performance worthy for its complexity. Experiment on SHVC software (SHM-3.0.1) shows that the proposed method increases decoding time by at 5% and BD-rate gain 0.8% and 0.9% in 1.5x and 2x spatial scalability, respectively.

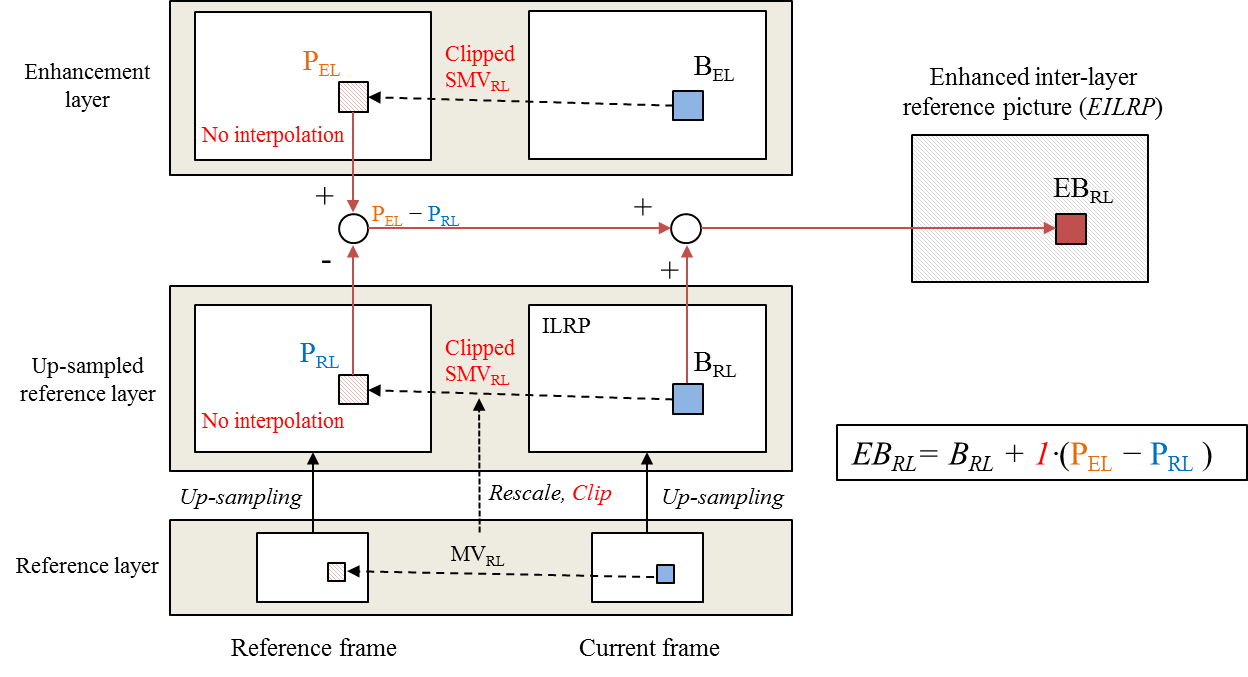
# Introduction



**Figure 1. Inter-layer reference enhancement**

Inter-layer reference enhancement is a technique to improve inter-layer prediction with the predicted residual signal. Figure 1 shows the framework of inter-layer reference enhancement. The inter-layer prediction of the enhancement layer (EL) is performed on the enhanced inter-layer reference picture (EILRP). EILRP is generated by adding the inter-layer prediction (ILRP) and the high frequency component (PEL-PRL). The high frequency component is generated with the temporal reference in EL, the up-sampled reference layer (RL), and the up-scaled motion vector of the RL (SMVRL). If the SMVRL has fractional-pel accuracy, both the EL and the up-sampled RL must be interpolated to perform motion compensation (MC). The process of inter-layer reference enhancement is computationally complex due to the recurrent interpolation.

# The Proposed Method

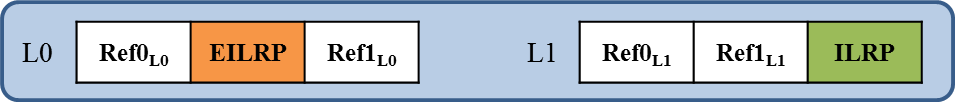


**Figure 2. The proposed simplified inter-layer reference enhancement**

Figure 2 depicts the proposed simplified inter-layer reference enhancement. The proposed method clips *SMVRL* to left-top integer-pel motion vector. In the proposed method, enhanced inter-layer pictures (*EILRP*) replace inter-layer pictures in the reference list of the EL. The motion vector clipping in the proposed method allows the complex interpolation in the up-sampled RL to be skipped.

## EILRP placement

As shown in Figure 3, EILRP is placed in L0 reference list replacing inter-layer reference picture. The proposed method clips *SMVRL* to left-top integer-pel motion vector. In the proposed method, enhanced inter-layer pictures (*EILRP*) replace inter-layer pictures in the reference

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**Figure 3. EILRP placement in the reference list**

# Performance test

## Test condition

Class B sequences with random access configuration in the common test condition is used. The test was conducted for 2x and x1.5 spatial scalability.

## Test result

Table 1 shows BD-rate, encoding time and decoding time of the proposed inter-layer reference enhancement in compared to SHM3.0.1. It shows that the proposed method has BD-rate gain of 0.9% and 0.8% in RA 2x and RA 1.5x, respectively. Encoding time does not increase on the proposed method, but decoding time increases by 5%.

**Table 1. SHM3.0.1 vs The proposed inter-layer reference enhancement**



# Patent rights declaration(s)

**Kwangwoon University may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**