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| *Title:* | **Results on Weighted Prediction in 3D Video Coding** | | |
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# Abstract

In this contribution it is proposed that WP (Weighted Prediction) be enabled both for the base and the dependent views with a provision that disables it for disparity-compensated prediction candidates. In addition, inheritance of weighted prediction parameters for a dependent view from the base view is proposed. A flag indicating whether WP parameters on the dependent view will be inherited from the independent view is introduced in the slice header.

# Introduction

Weighted Prediction (WP) is known for its benefits in coding fading in/out sequences [2][3] and part of the HEVC specification. However, WP is not enabled in the CTC of 3D-HEVC, hence it is applied to neither of the base or the dependent view currently.

In this contribution it is proposed that WP be enabled both for the base and the dependent views with a provision that disables it for disparity-compensated prediction candidates. In addition, inheritance of weighted prediction parameters for a dependent view from the base view is proposed. A flag indicating whether WP parameters on the dependent view will be inherited from the independent view is introduced in the slice header.

# Proposed Algorithm

## Disabling weighted prediction for inter-view coding (Test A)

The performance of the weighted prediction used in HM was tested with disabling weighted prediction for inter-view coding.

## Inheritance of weighted prediction parameter on dependent view(Test B)

Figure 2.1 shows the concept of the inheritance method. WP table is estimated on the independent view temporally as the same manner of HEVC. On the dependent views, WP table can be inherited from the WP table of the independent view. In this case, the slice header flag which indicate whether inheritance is used will be turned on.

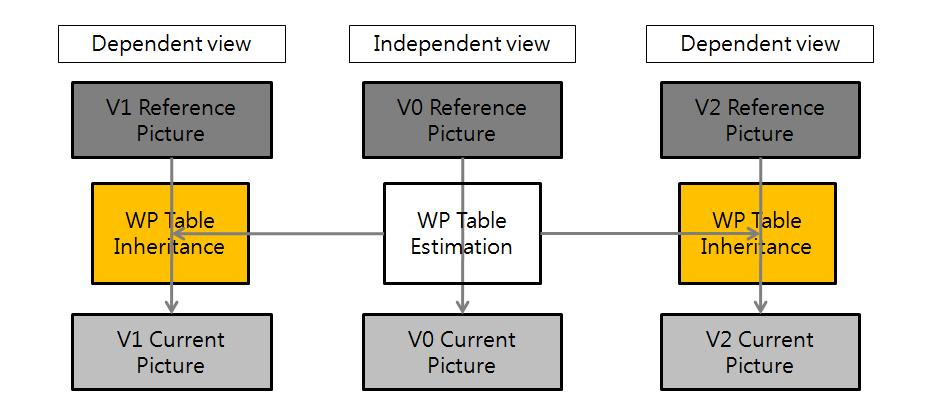


Figure 2.1 The concept of weighted prediction parameter inheritance on dependent view

# Test sequences

Fading in/out sequences are generated as the same manner of HEVC. In JCTVC-E041[2], there are an enclosed software that it can create linear fading sequences.

In this experiment, we use same conditions as in [2], [3]: a linear fade is applied to the first 2 seconds of the 3DV sequences and the experiments are done with the 2-second sequences. A linear fade-out is applied during the first half (0~1 second) and a linear fade-in is applied during the second half(1~2 second) (Figure 3.1). The fade strength is the range [0.25, 1]. In this experiments, only texture video are encoded.

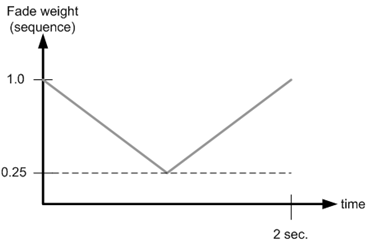


Figure 3.1 fading in/out strength

# Results

Table 4.1 shows the performance of the method that WP is disabled on inter-view coding. The anchor is HTM-4.0.1

Table 4.1 BDR performance of Test A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | video 0 | video 1 | video 2 | video only | enc time | dec time |
| Balloons | -36.0% | -19.5% | -17.5% | -29.6% | 158.0% | 100.0% |
| Kendo | -18.6% | -3.6% | -2.5% | -13.1% | 192.6% | 102.0% |
| Newspapercc | -33.0% | -22.5% | -23.9% | -29.3% | 140.7% | 93.7% |
| GhostTownFly | -29.6% | -2.5% | -5.0% | -24.8% | 162.1% | 105.0% |
| PoznanHall2 | -32.1% | -11.4% | -12.1% | -24.2% | 166.7% | 100.5% |
| PoznanStreet | -27.5% | -15.4% | -14.3% | -24.4% | 136.9% | 102.6% |
| UndoDancer | -37.2% | -19.9% | -23.8% | -33.2% | 156.2% | 102.1% |
| 1024x768 | -29.2% | -15.2% | -14.6% | -24.0% | 162.4% | 98.5% |
| 1920x1088 | -31.6% | -12.3% | -13.8% | -26.7% | 155.0% | 102.5% |
| average | -30.6% | -13.6% | -14.2% | -25.5% | 158.1% | 100.8% |

Table 4.2 shows the performance of the inheritance of weighted prediction parameter on dependent view. The anchor is HTM-4.0.1.

Table 4.2 BDR performance of Test B

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | video 0 | video 1 | video 2 | video only | enc time | dec time |
| Balloons | -36.0% | -26.3% | -25.1% | -32.0% | 161.1% | 101.5% |
| Kendo | -18.6% | -12.9% | -11.9% | -16.4% | 193.4% | 102.3% |
| Newspapercc | -33.0% | -28.2% | -29.2% | -31.3% | 143.9% | 94.8% |
| GhostTownFly | -29.6% | -11.6% | -12.2% | -26.2% | 164.0% | 104.0% |
| PoznanHall2 | -32.1% | -18.6% | -19.9% | -27.0% | 168.7% | 98.6% |
| PoznanStreet | -27.5% | -19.1% | -19.4% | -25.5% | 141.8% | 101.1% |
| UndoDancer | -37.2% | -23.8% | -26.7% | -33.9% | 158.4% | 102.2% |
| 1024x768 | -29.2% | -22.5% | -22.1% | -26.6% | 164.9% | 99.5% |
| 1920x1088 | -31.6% | -18.3% | -19.6% | -28.2% | 157.9% | 101.5% |
| **average** | **-30.6%** | **-20.1%** | **-20.7%** | **-27.5%** | 160.9% | 100.6% |

Table 4.3 shows the performance of Test B when the anchor is Test A.

Table 4.3 BDR performance of Test B with respect to Test A.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | video 0 | video 1 | video 2 | video only | enc time | dec time |
| Balloons | 0.0% | -8.2% | -9.1% | -3.4% | 102.0% | 101.5% |
| Kendo | 0.0% | -9.9% | -9.7% | -3.9% | 100.4% | 100.2% |
| Newspapercc | 0.0% | -7.3% | -6.8% | -2.8% | 102.3% | 101.2% |
| GhostTownFly | 0.0% | -9.2% | -8.1% | -1.9% | 101.2% | 99.0% |
| PoznanHall2 | 0.0% | -8.1% | -8.6% | -3.6% | 101.2% | 98.1% |
| PoznanStreet | 0.0% | -4.3% | -6.0% | -1.4% | 103.6% | 98.5% |
| UndoDancer | 0.0% | -4.7% | -3.6% | -1.1% | 101.4% | 100.1% |
| 1024x768 | 0.0% | -8.4% | -8.5% | -3.4% | 101.6% | 101.0% |
| 1920x1088 | 0.0% | -6.6% | -6.6% | -2.0% | 101.8% | 98.9% |
| **average** | **0.0%** | **-7.4%** | **-7.4%** | **-2.6%** | 101.7% | 99.8% |

# Working draft modifications

Table 5.1 shows the syntax change of the slice header for the inheritance of weighted prediction parameters.

Table5.1 Slice header Syntax modification for the inheritance of WP parameter

|  |  |
| --- | --- |
| slice\_header( ) { | Descriptor |
| **first\_slice\_in\_pic\_flag** | u(1) |
| **…** |  |
| if( !entropy\_slice\_flag ) { |  |
| **…** | **…** |
| if( ( weighted\_pred\_flag && slice\_type = = P) | |  ( weighted\_bipred\_idc && slice\_type = = B ) ) { |  |
| if( !base\_view && !is\_depth && ) { |  |
| **base\_pred\_weight\_table\_flag** | u(1) |
| if( base\_pred\_weight\_table\_flag == 0 ) |  |
| pred\_weight\_table( ) |  |
| } |  |
| else |  |
| pred\_weight\_table( ) |  |
| } |  |
| **…** |  |
| } |  |

**base\_pred\_weight\_table\_flag** equals to 1 specifies that for the current slice header, when decoding texture on dependent view slice, no more weighted prediction syntax elements are parsed after base\_pred\_weight\_table\_flag. base\_pred\_weight\_table\_flag equals to 0 specifies that when decoding texture on dependent view slice, weighted prediction syntax elements are parsed by the conventional HEVC method.

Table 5.2 shows the pseudo code of decoding WP parameters when **base\_pred\_weight\_table\_flag** equals to 1.

Table5.2 pseudo code of decoding WP parameters for the case of the inheritance

|  |
| --- |
| if (base\_pred\_weight\_table\_flag) |
| { |
| resetWPTable(); |
| for (i = 0; i<=num\_ref\_idx\_lX\_active\_minus1; i++) |
| { |
| for (j = 0; j<base\_num\_ref\_idx\_lX\_active\_minus1; j++) |
| { |
| if (PicOrderCnt ( RefLX[i] ) == PicOrderCnt ( BaseRefLX[j]) ) |
| { |
| copyWPTable(); // copy WP tables for all the colour components |
| } |
| } |
| } |
| } |

# Conclusion

This contribution proposed that WP be enabled both for the base and the dependent views with a provision that disables it for disparity-compensated prediction candidates. In addition, inheritance of weighted prediction parameters for a dependent view from the base view is proposed. A flag indicating whether WP parameters on the dependent view will be inherited from the independent view is introduced in the slice header. It is shown that inheritance of weighted prediction parameters further improves coding efficiency of dependent views for 3D fade sequences generated in the same manner as was done in the HEVC standardization process.

It is recommended that the proposed method of weighted prediction be adopted.

# Patent rights declaration(s)

**LG Electronics 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).**

# References

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