|  |  |
| --- | --- |
| **Joint Collaborative Team on 3D Video Coding Extension Development**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  5th Meeting: Vienna, AT, 27 July – 2 Aug. 2013 | Document: JCT3V-E0190 |

|  |  |  |  |
| --- | --- | --- | --- |
| *Title:* | **CE2.h related: reduced candidates of NBDV** | | |
| *Status:* | Input Document | | |
| *Purpose:* | Proposal | | |
| *Author(s) or Contact(s):* | Jiwook Jung Jin Heo  Sehoon Yea | Tel: Email: | +82-2-6912-6477 jiwook.jung@lge.com |
| *Source:* | LG Electronics | | |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Abstract

In the 4th JCT-3V meeting, the CU-based DV(disparity vector) derivation was adopted. Although the DV derivation process was simplified by this method, there are still too many NBDV(Neighboring Block Disparity Vector) candidates for DV derivation. In this contribution, the NBDV candidates are reduced removing the part of NBDV candidates, thereby the complexity of DV search can be reduced in worst case. Also, Default DV are improved using BVSP-LUT when NBDV is not available. It has BD-rate change -0.1% compared to HTM-7.0r1 on synthesized- total result with 100.9% encoding time, and 99.4% decoding time.

# Introduction

In the 4th JCT-3V meeting, the CU-based DV(disparity vector) derivation was adopted.[1] Although the DV derivation process was simplified by this method, there are still too many NBDV(Neighboring Block Disparity Vector) candidates for DV derivation.

Many DV candidates mean the complexity increment in the worst case of DV derivation process. In this contribution, reduced candidates of NBDV and a default DV as the replacement of the reduction are presented.

The partial temporal and spatial candidates of NBDV are removed to reduce the complexity of the DV derivation process. Also, DV-MCP which is used as DV in IVMP is removed. The removal of the DV-MCP has some coding loss. However, the replacement of default DV[2] can compensate the partial coding loss. It can be derived from the DLT(Depth Look-Up Table) of the independent view and B-VSP LUT.

# Proposed Method

## Method1. Reduction of temporal & spatial candidates

There are two temporal DV candidates for each temporal picture. They are located on the Center & Right-Bottom position co-located with the current block. The Right-Bottom position candidate is removed to reduce the number of candidates.

And, there are five spatial DV candidates nearby the current block. They are derived from Left, Above, Above-Right, Left-Below, Above-Left neighboring block. The DV candidates of Above-Right, Left-Below, Above-Left neighboring blocks removed.

Figure1(a). Removed temporal candidate Figure1(b). Removed spatial candidates

Figure1 shows the removed candidates of temporal and spatial NBDV candidates.

## Method2. Improvement of default DV

When NBDV is unavailable, default DV is inserted into DV process. Current default DV is depth oriented zero DV. The disparity vector is derived from the depth value of the co-location with the current block. However, co-location between views does not usually mean the same object. Especially, there is an offset disparity between views in the linear camera setup. Figure2 shows the inter-view offset between views.  
 

**offset**

Figure2. inter-view offset between views (Newspaper L: view1, R: view0)

Zero DV is replaced with depth oriented disparity from middle depth value. To improve virtual depth position, this improved method is applied. The middle depth value can derived from the following equation.

middle depth value = ((1<<BitDepth)-1) >>1

The disparity derivation from depth can be achieved by B-VSP LUT(Look Up Table ) or coded camera parameter.

# Experimental results

Three methods are integrated into HTM-7.0r1. Two cases of experiments are conducted to improve current NBDV process.

## Test1 (Method1)



## Test2 (Method1+Method2)



# Conclusion

Disparity vector is derived from NBDV process in 3D-HEVC. Many NBDV candidates mean the complexity increment in the worst case of DV derivation process.

In this contribution, reduced candidates of NBDV and a default DV as the replacement of the reduction are presented. It has BD-rate change 0.0% compared to HTM-7.0r1 on video only result with 100.9% encoding time, and 99.4% decoding time.

It is recommended that one of the proposed test is adopted into 3D-HEVC.

# Reference

1. J. Kang, Y. Chen*, etc.*, (Qualcomm), " CE2.h related: CU-based Disparity Vector Derivation in 3D-HEVC", Joint Collaborative Team on 3D Video Coding Extension Development (JCT-3V) of ITU-T VCEG and ISO/IEC MPEG JCT3V-D0181, Incheon, Korea, April, 2013
2. J. Jung, J. Heo*, etc.*, (LG), " CE2.h related Improved disparity vector derivation", Joint Collaborative Team on 3D Video Coding Extension Development (JCT-3V) of ITU-T VCEG and ISO/IEC MPEG JCT3V-D0095, Incheon, Korea, April, 2013

# 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).**