

# **JCT3V-F0144 – CE3 related: Additional Depth-based DV Candidate**

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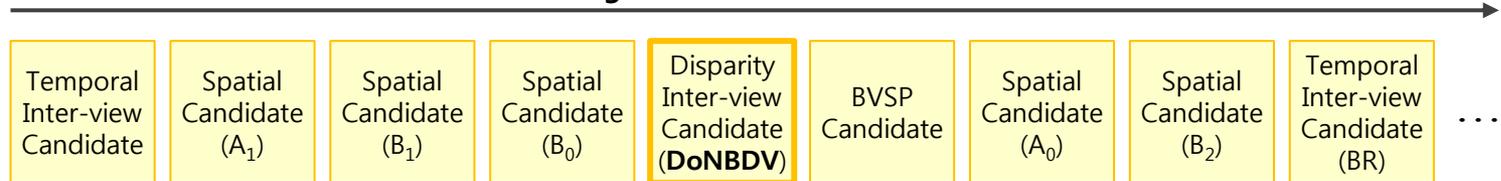
Multimedia Platform Lab.  
DMC R&D Center  
**Samsung Electronics**

# Introduction

## ❖ In merge candidate list construction for dependent views

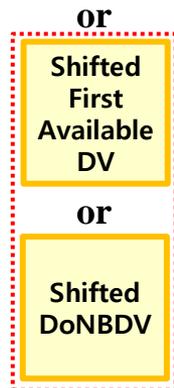
- There are 2 shifted DV merge candidates
  - These candidates are generated by adding 4 to the horizontal comp. of DV

Current Merge candidates construction order



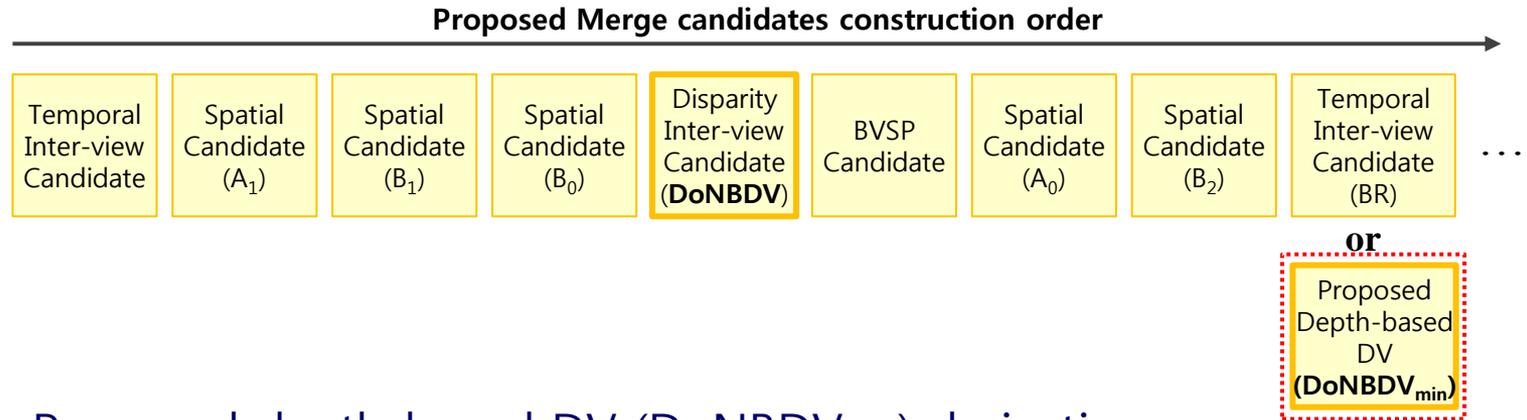
- Performance of shifted DV candidates (Disabled the shifted DVs vs. HTM 8.0)

|                | video 0     | video 1      | video 2     | video PSNR /<br>video bitrate | video PSNR /<br>total bitrate | synth PSNR /<br>total bitrate | enc time      | dec time      | ren time     |
|----------------|-------------|--------------|-------------|-------------------------------|-------------------------------|-------------------------------|---------------|---------------|--------------|
| Balloons       | 0.0%        | -0.2%        | -0.2%       | -0.1%                         | -0.1%                         | -0.1%                         | 100.3%        | 102.8%        | 100.2%       |
| Kendo          | 0.0%        | -0.2%        | 0.0%        | 0.0%                          | 0.0%                          | 0.0%                          | 100.6%        | 94.2%         | 99.9%        |
| Newspaper_CC   | 0.0%        | -0.2%        | -0.1%       | -0.1%                         | 0.0%                          | -0.1%                         | 100.0%        | 96.6%         | 98.7%        |
| GT_Fly         | 0.0%        | -0.1%        | 0.1%        | 0.0%                          | 0.0%                          | 0.0%                          | 100.4%        | 102.5%        | 98.5%        |
| Poznan_Hall2   | 0.0%        | -0.3%        | -0.2%       | -0.1%                         | -0.1%                         | 0.0%                          | 100.4%        | 103.6%        | 100.5%       |
| Poznan_Street  | 0.0%        | 0.1%         | 0.0%        | 0.0%                          | 0.0%                          | 0.0%                          | 100.0%        | 100.6%        | 99.4%        |
| Undo_Dancer    | 0.0%        | -0.3%        | 0.2%        | 0.0%                          | 0.0%                          | -0.1%                         | 100.2%        | 103.8%        | 98.1%        |
| 1024x768       | 0.0%        | -0.2%        | -0.1%       | -0.1%                         | -0.1%                         | -0.1%                         | 100.3%        | 97.9%         | 99.6%        |
| 1920x1088      | 0.0%        | -0.1%        | 0.0%        | 0.0%                          | 0.0%                          | 0.0%                          | 100.2%        | 102.6%        | 99.1%        |
| <b>average</b> | <b>0.0%</b> | <b>-0.2%</b> | <b>0.0%</b> | <b>0.0%</b>                   | <b>0.0%</b>                   | <b>0.0%</b>                   | <b>100.3%</b> | <b>100.6%</b> | <b>99.3%</b> |
| Shark          | 0.0%        | 0.1%         | -0.2%       | 0.0%                          | 0.0%                          | 0.0%                          | 100.7%        | 99.1%         | 99.5%        |

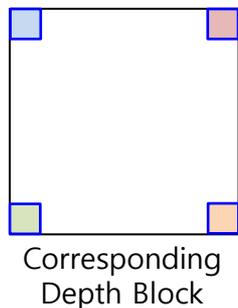


# Proposed Method

- ❖ In order to improve the coding performance of DV candidate
  - We propose to replace shifted DVs with proposed depth-based DV

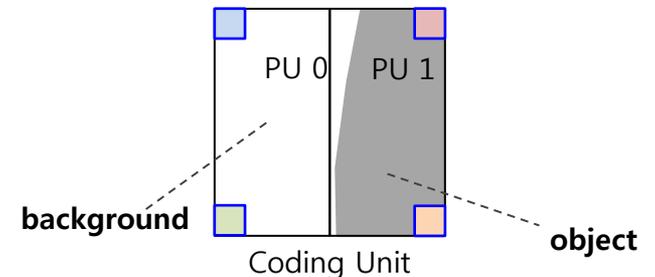


- Proposed depth-based DV (DoNBDV<sub>min</sub>) derivation
  - Choose the minimum depth value among 4 corner pixels in the depth block



$$\text{DoNBDV} = \max(\text{blue}, \text{red}, \text{green}, \text{orange})$$

$$\text{DoNBDV}_{\min} = \min(\text{blue}, \text{red}, \text{green}, \text{orange})$$



# Experimental Results

## ❖ Based on CTC with HTM 8.0

- 0.1% bit-saving for synthesized view

|                | video 0     | video 1     | video 2      | video PSNR /<br>video bitrate | video PSNR /<br>total bitrate | synth PSNR /<br>total bitrate | enc time     | dec time     | ren time     |
|----------------|-------------|-------------|--------------|-------------------------------|-------------------------------|-------------------------------|--------------|--------------|--------------|
| Balloons       | 0.0%        | -0.1%       | 0.2%         | 0.0%                          | 0.0%                          | 0.0%                          | 99.5%        | 94.7%        | 98.3%        |
| Kendo          | 0.0%        | 0.0%        | 0.1%         | 0.0%                          | 0.0%                          | 0.0%                          | 98.7%        | 95.5%        | 97.7%        |
| Newspaper_CC   | 0.0%        | 0.0%        | 0.1%         | 0.0%                          | 0.0%                          | 0.0%                          | 99.1%        | 95.1%        | 98.5%        |
| GT_Fly         | 0.0%        | 0.0%        | -0.1%        | 0.0%                          | 0.0%                          | 0.0%                          | 99.0%        | 96.6%        | 100.5%       |
| Poznan_Hall2   | 0.0%        | 0.0%        | -0.2%        | 0.0%                          | 0.0%                          | -0.2%                         | 98.6%        | 96.9%        | 98.6%        |
| Poznan_Street  | 0.0%        | 0.0%        | -0.1%        | 0.0%                          | 0.0%                          | 0.0%                          | 99.0%        | 95.6%        | 100.2%       |
| Undo_Dancer    | 0.0%        | 0.0%        | -0.3%        | -0.1%                         | 0.0%                          | -0.1%                         | 99.1%        | 99.9%        | 97.9%        |
| 1024x768       | 0.0%        | 0.0%        | 0.1%         | 0.0%                          | 0.0%                          | 0.0%                          | 99.1%        | 95.1%        | 98.2%        |
| 1920x1088      | 0.0%        | 0.0%        | -0.2%        | 0.0%                          | 0.0%                          | -0.1%                         | 98.9%        | 97.3%        | 99.3%        |
| <b>average</b> | <b>0.0%</b> | <b>0.0%</b> | <b>-0.1%</b> | <b>0.0%</b>                   | <b>0.0%</b>                   | <b>-0.1%</b>                  | <b>99.0%</b> | <b>96.3%</b> | <b>98.8%</b> |
| Shark          | 0.0%        | -0.1%       | 0.1%         | 0.0%                          | 0.0%                          | 0.0%                          | 98.9%        | 97.3%        | 100.5%       |

## ❖ Compared with disabled the shifted DVs

- 0.1% bit-saving for both coded and synthesized views

|                | video 0     | video 1      | video 2      | video PSNR /<br>video bitrate | video PSNR /<br>total bitrate | synth PSNR /<br>total bitrate | enc time     | dec time     | ren time     |
|----------------|-------------|--------------|--------------|-------------------------------|-------------------------------|-------------------------------|--------------|--------------|--------------|
| Balloons       | 0.0%        | -0.3%        | 0.0%         | -0.1%                         | -0.1%                         | -0.1%                         | 99.8%        | 97.4%        | 98.5%        |
| Kendo          | 0.0%        | -0.1%        | 0.1%         | 0.0%                          | 0.0%                          | -0.1%                         | 99.2%        | 90.0%        | 97.6%        |
| Newspaper_CC   | 0.0%        | -0.2%        | 0.0%         | -0.1%                         | 0.0%                          | -0.1%                         | 99.1%        | 91.8%        | 97.2%        |
| GT_Fly         | 0.0%        | -0.1%        | 0.0%         | 0.0%                          | 0.0%                          | 0.0%                          | 99.3%        | 99.1%        | 99.0%        |
| Poznan_Hall2   | 0.0%        | -0.3%        | -0.4%        | -0.1%                         | -0.2%                         | -0.2%                         | 99.0%        | 100.4%       | 99.1%        |
| Poznan_Street  | 0.0%        | 0.0%         | -0.1%        | 0.0%                          | 0.0%                          | 0.0%                          | 99.0%        | 96.2%        | 99.5%        |
| Undo_Dancer    | 0.0%        | -0.3%        | -0.1%        | -0.1%                         | -0.1%                         | -0.1%                         | 99.3%        | 103.7%       | 96.1%        |
| 1024x768       | 0.0%        | -0.2%        | 0.0%         | 0.0%                          | -0.1%                         | -0.1%                         | 99.4%        | 93.1%        | 97.8%        |
| 1920x1088      | 0.0%        | -0.2%        | -0.2%        | -0.1%                         | -0.1%                         | -0.1%                         | 99.2%        | 99.8%        | 98.4%        |
| <b>average</b> | <b>0.0%</b> | <b>-0.2%</b> | <b>-0.1%</b> | <b>-0.1%</b>                  | <b>-0.1%</b>                  | <b>-0.1%</b>                  | <b>99.3%</b> | <b>96.9%</b> | <b>98.1%</b> |
| Shark          | 0.0%        | 0.0%         | -0.1%        | 0.0%                          | 0.0%                          | 0.0%                          | 99.7%        | 96.4%        | 100.0%       |

# Conclusions

- ❖ We propose to replace shifted DV candidates with proposed DV
  - 0.1% gain for synthesized view
  - Compared with disabled shifted DVs
    - ➔ 0.1% gain for both coded and synthesized views
- ❖ We recommend to adopt the proposed method into next 3D-HEVC WD

Thanks **Sharp** for the cross checking (JCT3V-F0212).

