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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  6th Meeting: Torino, IT, 14-22 July, 2011 | Document: JCTVC-F116  WG11 Number: m20530 |

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| *Title:* | **Cross-verification results of TI’s Sub-8x8 PU coding with fixed reference index (JCTVC-F070)) by LG** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Information | | |
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| *Source:* | LG Electronics | | |

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# Abstract

This contribution reports cross-check result for proposal JCTVC-F070 by TI [1]. The proponent in [1] proposed to not code ref\_idx when PU size is small (i.e., 8x4, 4x8, and 4x4), instead, at decoder, the value of ref\_idx for inter blocks with small size is be inferred as 0. The experimental results perfectly match with the one provided by TI in R-D performance.

Proposal Description

Current WD text and HM3.0 implementation encode reference frame index (ref\_idx\_l0 and ref\_idx\_l1) down to the smallest block size. The proposal in [1] suggests to not encode such information when inter block size is small, instead, the value of both ref\_idx\_10 and ref\_idx\_l1 are inferred as 0 during decoding process. This suggestion might be motivated by the observation that in many cases, reference frame index for small blocks can be inferred. Figure 1 illustrates the proposed suggestion.

(a). Current condition (b). Proposed scheme

Note: (xx,yy) 🡪 (ref\_idx\_l0, ref\_idx\_l1)

nc 🡪 not coded

**Figure 1: Reference frame index signaling for small blocks – current vs. proposed scheme**

Experimental Condition

The proposed scheme has been implemented and integrated into HM3.0 and was provided by TI. The performance of the modified HM3.0 is compared relative to the HM3.0 software and was checked under the common test condition described in [2]. The computing platform for this cross-check experiment is Window XP 64 bits on Intel i7 core.

Results

R-D performance and execution time of the software are summarized in Table 1 and Table 2. Detailed results are included in the attached excel sheet. It was confirmed that these results match with the one provided by TI.

Table 1: Experimental results for Random Access with four reference frames

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Random access | | | Random access LC | | |
| Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A | 0.1 | 0.4 | 0.2 | 0.3 | 0.4 | 0.2 |
| Class B | 0.1 | 0.1 | 0.0 | 0.2 | 0.1 | 0.1 |
| Class C | 0.4 | 0.5 | 0.6 | 0.7 | 0.5 | 0.7 |
| Class D | 0.8 | 0.7 | 0.7 | 0.9 | 0.7 | 0.7 |
| Class E |  |  |  |  |  |  |
| All | 0.3 | 0.4 | 0.4 | 0.5 | 0.4 | 0.4 |
| Enc Time[%] | 108% | | | 111% | | |
| Dec Time[%] | 100% | | | 98% | | |

Table 2: Experimental results for Low Delay with four reference frames

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Low delay | | | Low delay LC | | |
|  | Y BD-rate | U BD-rate | V BD-rate | Y BD-rate | U BD-rate | V BD-rate |
| Class A |  |  |  |  |  |  |
| Class B | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.5 |
| Class C | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| Class D | 0.4 | 0.3 | 0.8 | 0.8 | 0.9 | 1.1 |
| Class E | 0.1 | 0.4 | 0.4 | 0.1 | 0.3 | 0.8 |
| All | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.7 |
| Enc Time[%] | 105% | | | 107% | | |
| Dec Time[%] | 100% | | | 99% | | |

Analysis and Opinion

## Complexity Reduction

The proposed scheme seems to be implemented and integrated correctly into HM3.0 software. Based on the implementation, the proposed scheme has different effect on complexity to encoder and decoder. The complexity with respect to decoding time decreases but to encoding time increases. This different effect may be explained as follow. Decoding process becomes simpler which leads to decoding complexity reduction because when dealing with small blocks, decoder does not have to parse but simply infer that the value for reference frame index is 0.

Encoding complexity is higher than that of the anchor because the current implementation applies normal encoding process and then checks whether the block being coded is small blocks or not. Such additional checking entails overhead which increases complexity of encoder. Perhaps, if the implementation is optimized, we think the current reported encoding complexity could be reduced.

## R-D Performance

The proposed scheme gives loss on average 0.3 for RAHE, 0.5 RALC, 02 for LDHE, and 0.4 for LDLC. These results suggest it is necessary to signal reference frame index down to 4x4 block size.

Conclusion

The results of proposal by TI has been verified and confirmed. The proposed scheme has been correctly implemented and integrated into HM3.0 and is available.

References

1. M. Zhou et al., “Sub-8x8 PU coding with fixed reference index”, JCTVC-F070, Torino, IT, July, 2011.
2. Frank Bossen, “Common test conditions and software reference configurations”, JCTVC-D600, Daegu, January 2011.