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| *Title:* | **Cross-verification report on orange-ft’s wavefront parallel processing (JCTVC-F275))** | | |
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| *Source:* | LG Electronics | | |

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# Abstract

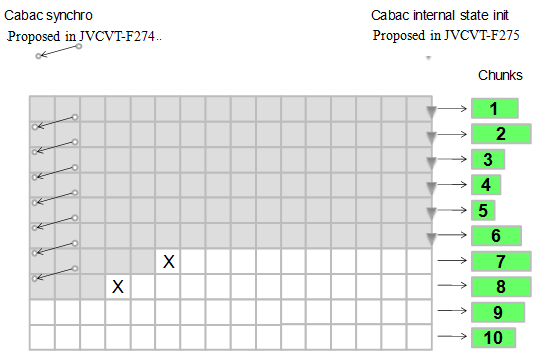
This contribution is a report of cross-check result for wavefront parallel processing (WPP) proposal JCTVC-F275 by Orange Labs [1]. The proponent in [1] proposes to combine WPP with a flush and re-initialization of the internal state variables of CABAC at the end of each line of LCU. The experimental results perfectly match with the one provided by Orange Labs in R-D performance.

Proposal Description

Several attempts to enable parallel encoding and decoding have been proposed by using wavefront parallel processing (WPP) technique. One of obstacles faced by WPP is the synchronization and initialization in CABAC module. In [1], together with related contribution JCTVC-F274, it is proposed to flush all internal state of CABAC at the last LCU of each row and re-initialize L and R variable (with default initialization value) in the next row. To do this, the required actions are [1]:

* Writing all bits that may be pending in CABAC internal state variables
* Writing a stop bit
* Resetting CABAC internal variables L and R (representing respectively the lower bound of the interval and the range of the interval) to their default values.

In addition to flushing CABAC internal state at the end LCU of each row, it is also propose to record entry point for each chunk (i.e., the part of the bitstream created by the encoding of a line of LCUs) in SEI. Figure 1 illustrates the concept of flushing CABAC internal state and chunks whereas Figure 2 and 3 illustrate the variation of storing chunks entry point in SEI.

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**Figure 1: When the encoding of the last symbol of the last LCU of every line is finished, CABAC internal state is flushed (all remaining bits are written in the bitstream) and the internal state variables L and R are initialized [1]**



**Figure 2: Bitstream organization when** lcu\_lines\_mode **is zero [1]**



**Figure 3: Bitstream organization when** lcu\_lines\_mode **is one [1]**

Experimental Condition

The proposal has been implemented and integrated into HM3.0 and was provided by Orange Labs. The performance of the modified HM3.0 is compared relative to the HM3.0 software and is being 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, 2 and 3. Detailed results are included in the attached excel sheet. It was confirmed that these results perfectly match with the ones provided in [1].

We notice that experiment for Class E of low delay gives peculiar performance result (i.e., highlighted row in Table 3) when compared to results from other classes. Such result might not be expected and we think that it might be worthwhile to investigate why such result occurs for better understanding of the proposed method.

Table 1: Cross-check experimental results for [1] with Intra only

|  |  |  |  |
| --- | --- | --- | --- |
|  | Intra | | |
| Y BD-rate | U BD-rate | V BD-rate |
| Class A | 0.1 | -0.2 | -0.5 |
| Class B | 0.2 | 0.1 | -0.1 |
| Class C | 0.1 | 0.1 | 0.1 |
| Class D | 0.1 | -0.1 | -0.1 |
| Class E | 0.6 | 0.1 | 0.1 |
| All | 0.2 | 0.0 | -0.1 |

Table 2: Cross-check experimental results for [1] with random access

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Random access |  |
| Y BD-rate | U BD-rate | V BD-rate |
| Class A | 1.2 | 0.8 | 0.4 |
| Class B | 0.8 | 1.2 | 1.1 |
| Class C | 0.7 | 1.3 | 1.0 |
| Class D | 0.8 | 0.7 | 0.6 |
| Class E |  |  |  |
| All | 0.9 | 1.0 | 0.8 |

Table 3: Cross-check experimental results for [1] with low delay

|  |  |  |  |
| --- | --- | --- | --- |
|  | Low delay | | |
|  | Y BD-rate | U BD-rate | V BD-rate |
| Class A |  |  |  |
| Class B | 1.3 | 2.5 | 2.1 |
| Class C | 1.0 | 1.8 | 1.5 |
| Class D | 0.9 | 1.4 | 1.6 |
| Class E | 3.8 | 3.5 | 2.9 |
| All | 1.6 | 2.2 | 2.0 |

Conclusion

The software performance reported in [1] has been verified and confirmed.

References

1. Gordon Clare et al., “Wavefront and Cabac Flush: Different Degrees of Parallelism without Transcoding”, JCTVC-F275, Torino, IT, July, 2011.
2. Frank Bossen, “Common test conditions and software reference configurations”, JCTVC-D600, Daegu, January 2011.