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| *Title:* | A combined proposal from JCTVC-G366, JCTVC-G657, and JCTVC-G768 on context reduction of significance map coding with CABAC | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
| *Author(s) or Contact(s):* | Cheung Auyeung, Jun Xu 1730 N. First Street, MD:3NW San Jose, CA 95112 USA | Tel: Email: | 1-408-352-4725 {[cheung.auyeung, jun.xu}@am.sony.com](mailto:cheung.auyeung,%20jun.xu%7d@am.sony.com) |
|  | Gergely Korodi, Jinwen Zan, Da-ke He  295 Phillip Street  Waterloo, Ontario, Canada N2L 3W8 | Tel: Email: | +1 519 888 7465 {gkorodi, jzan, dhe}@rim.com |
|  | Yinji Piao, Elena Alshina, Junghye Min, JeongHoon Park 416. Maetan 3-dong,Yeongtong-gu,Suwon-si,Gyeonggi-do Korea | Tel: Email: | +82-10-6296-4261 {yj100.piao, elena\_a.alshina , jh643.min, jeonghoon } @samsung.com |
| *Source:* | Sony Electronics Inc., Research In Motion Limited, Samsung Electronics Co., Ltd. | | |

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# Abstract

This contribution combines the contributions on significant\_coeff\_flag context reduction in JCTVC-G366 from Sony, JCTVC-G657 from RIM, and JCTVC-G768 from Samsung to provide 40 context reductions. The combined proposal resulted in an average BD-Rate of 0.0% for I\_HE, RA\_HE, LB\_HE, and LP\_HE. This contribution also demonstrated that the proposed significance map context reduction can work with level context reduction such as the CE11 JCTVC-G121 with no impact on average BDR provided by the level context reductions.

# Introduction

The JCTVC-G366[1], JCTVC-G657[2], and JCTVC-G768[3] proposed significant\_coeff\_flag context reduction with CABAC. There are many commonality in the approaches used in these three proposals. In light of the commonalities, the proponents worked together to identify the combination of the three proposals [1,2,3] with minimal impact on BDR that resulted in more total context reductions than that their individual proposal achieved.

# Joint proposal

In particular, this contribution proposes the following combination of context reduction for a total of 40 context reductions:

* 15 context reduction of 4x4 blocks from JCTC-G657 [2].
* 10 context reduction of 8x8 blocks from JCTC-G366 [1].
* 15 context reduction of 16x16/32x32 blocks from JCTVC-G768 [3].

# WD text

The corresponding technical and WD descriptions are in [2, 1, 3] respectively.

# Simulation results

The context reductions were integrated into HM4.0 with and without the level context reductions from CE11 JCTVC-G121/F132 [4, 5].

As shown in **Table 1**, the combined proposal resulted in an average BD-Rate of 0.0% for I\_HE, RA\_HE, LB\_HE, and LP\_HE.

As shown in **Table 2**, when the proposed 40 significance map context reductions were combined with the 36 level contexts reductions from CE11 JCTVC-G121/F132 [4,5] for a total of 76 context reductions, the BD-Rate for I\_HE, RA\_HE, LB\_HE, and LP\_HE became 0.1%, 0.0%, 0.0%, and 0.1% respectively.

TI kindly agreed to provide the crosscheck for this joint proposal.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra HE** | | |
|  | Y | U | V |
| Class A | 0.1% | 0.3% | 0.4% |
| Class B | 0.0% | 0.2% | 0.1% |
| Class C | 0.0% | 0.1% | 0.1% |
| Class D | 0.0% | 0.1% | 0.1% |
| Class E | 0.1% | 0.1% | 0.1% |
| Class F |  |  |  |
| **Overall** | 0.0% | 0.1% | 0.2% |
|  | 0.0% | 0.1% | 0.1% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 102% | | |
|  |  |  |  |
|  | **Random Access HE** | | |
|  | Y | U | V |
| Class A | -0.1% | 0.4% | 0.6% |
| Class B | 0.0% | 0.1% | 0.0% |
| Class C | 0.0% | 0.0% | 0.0% |
| Class D | 0.0% | 0.3% | -0.1% |
| Class E |  |  |  |
| Class F |  |  |  |
| **Overall** | 0.0% | 0.2% | 0.1% |
|  | 0.0% | 0.1% | 0.1% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |
|  |  |  |  |
|  | **Low delay B HE** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | -0.1% | -0.2% |
| Class C | 0.1% | -0.1% | -0.2% |
| Class D | 0.0% | 0.4% | -0.3% |
| Class E | 0.0% | -0.4% | 0.1% |
| Class F |  |  |  |
| **Overall** | 0.0% | 0.0% | -0.2% |
|  | 0.0% | 0.0% | -0.3% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |
|  |  |  |  |
|  | **Low delay P HE** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | -0.1% | 0.3% |
| Class C | 0.1% | -0.1% | -0.2% |
| Class D | 0.1% | -0.3% | -0.6% |
| Class E | 0.0% | -0.1% | -0.8% |
| Class F |  |  |  |
| **Overall** | 0.0% | -0.2% | -0.3% |
|  | 0.0% | -0.1% | -0.4% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |

**Table 1: The 40 context reduction proposed in this contribution resulted in average BD-Rate of 0.0% for all test cases in the common test conditions.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra HE** | | |
|  | Y | U | V |
| Class A | 0.1% | 0.3% | 0.4% |
| Class B | 0.1% | 0.2% | 0.2% |
| Class C | 0.1% | 0.2% | 0.2% |
| Class D | 0.1% | 0.2% | 0.2% |
| Class E | 0.1% | 0.1% | 0.2% |
| Class F |  |  |  |
| **Overall** | 0.1% | 0.2% | 0.2% |
|  | 0.1% | 0.2% | 0.2% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |
|  |  |  |  |
|  | **Random Access HE** | | |
|  | Y | U | V |
| Class A | -0.1% | 0.4% | 0.3% |
| Class B | 0.0% | 0.1% | 0.2% |
| Class C | 0.0% | -0.1% | 0.1% |
| Class D | 0.1% | 0.0% | -0.2% |
| Class E |  |  |  |
| Class F |  |  |  |
| **Overall** | 0.0% | 0.1% | 0.1% |
|  | 0.0% | 0.1% | 0.1% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Low delay B HE** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | -0.2% | -0.3% |
| Class C | 0.1% | -0.2% | -0.1% |
| Class D | 0.0% | -0.1% | -0.5% |
| Class E | 0.1% | -0.5% | 0.1% |
| Class F |  |  |  |
| **Overall** | 0.0% | -0.3% | -0.2% |
|  | 0.0% | -0.2% | -0.2% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |
|  |  |  |  |
|  | **Low delay P HE** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | 0.0% | -0.3% |
| Class C | 0.0% | 0.1% | 0.0% |
| Class D | 0.1% | -0.1% | -0.6% |
| Class E | 0.2% | -0.1% | -0.1% |
| Class F |  |  |  |
| **Overall** | 0.1% | 0.0% | -0.3% |
|  | 0.1% | 0.0% | -0.3% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |

**Table 2: BD-Rate of 76 context reduction: the proposed 40 significance map context reductions combined with 36 level context reductions from JCTVC-G121.**

# Summary

As shown in Table 3, this contribution reduced 40 contexts for the coding of significance map with CABAC. This contribution also demonstrated that the proposed significance map context reduction can work with level context reduction such as the CE11 JCTVC-G121 [4,5] with no impact on average BDR provided by level context reductions.

|  |  |  |  |
| --- | --- | --- | --- |
|  | I\_HE | RA\_HE | LD\_HE |
| Proposed 40 significance map context reduction | 0.0 | 0.0 | 0.0 |
| 36 level context reduction from JCTC-G121 [5] | 0.1 | 0.0 | 0.0 |
| Proposed 40 significance map context reduction  and 36 level context reduction from JCTVC-G121 | 0.1 | 0.0 | 0.0 |

Table : Average BD-Rate of the proposed 40 significance map context reduction with/without the 36 level context reductions from JCTVC-G121. Results from JCTVC-G121 are also provided as benchmark.

# References

1. Cheung Auyeung and Jun Xu, “Description Context reduction of significance map coding with CABAC”, JCTVC-G366, 7th Meeting: Geneva, CH, 21-30 November, 2011.
2. Gergely Korodi, Jinwen Zan, and Da-ke He, “Encoding and decoding significant coefficient flags for small Transform Units using partition sets”, JCTVC-G657, 7th Meeting: Geneva, CH, 21-30 November, 2011.
3. Yinji Piao, Junghye Min, and JeongHoon Park, “Reduced contexts for significance map coding of large transform in CABAC”, JCTVC-G768, 7th Meeting: Geneva, CH, 21-30 November, 2011.
4. Vivienne Sze, “Reduction in contexts used for significant\_coeff\_flag and coefficient level”, JCTVC-F132, 6th Meeting: Torino, IT, 14-22 July, 2011.
5. Vivienne Sze, “CE11: Reduction in contexts used for coefficient level”, JCTVC-G121, 7th Meeting: Geneva, CH, 21-30 November, 2011.

# Patent rights declaration(s)

**Sony Electronics Inc. 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).**

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