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| *Title:* | **Cross-check of JCTVC-J0313 (Modified coefficient scan order mapping for transform skip mode)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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# Abstract

This contribution reports the results of a cross-check of JCTVC-J0313, which proposed two possible modifications of scan order mappings when transform skip mode is used. The simulation results reportedly matched those provided by the proponents.

# Introduction

In the current HEVC draft (WD7) [1], different scan orders are used to code residual coefficients of 4x4 and 8x8 TUs in intra coded CUs. Specifically, for 9 prediction modes centered at directional horizontal prediction (modes 6-14), vertical scan is used, while for 9 prediction modes centered at directional vertical prediction (modes 22-30), horizontal scan is used. Otherwise, up-right diagonal scan is used.

In JCTVC-J0313 [2], two modifications were proposed and tested. In the first modification, it is proposed that when transform skip mode is used, the scans used for modes 6-14 and modes 22-30 are swapped, i.e., horizontal scan is used for modes 6-14 and vertical scan is used for modes 22-30.

In the second modification, it is proposed that when transform skip mode is used, in addition to swapping the scans used, the range of prediction modes is expanded for which a non-diagonal scan is used. Specifically, horizontal scan is used for modes 2-17 and vertical scan is used for modes 18-34.

The source code was reviewed and found to match the proposed modification. In particular, when determining the scan order to use, an additional check was performed on whether transform skip mode is used in order to switch between scan assignments.

# Simulation results

We have tested the two modifications in common conditions [3] for All-Intra HE10, Random Access HE10 and Low-Delay B HE10, as these are the cases in common conditions where transform skip is used.

**Modification 1:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra HE10** | | |
|  | Y | U | V |
| Class A | 0.0% | 0.0% | 0.0% |
| Class B | 0.0% | 0.0% | 0.0% |
| Class C | -0.1% | -0.1% | -0.1% |
| Class D | -0.1% | -0.1% | -0.2% |
| Class E | 0.0% | 0.0% | 0.0% |
| **Overall** | 0.0% | -0.1% | -0.1% |
|  | 0.0% | -0.1% | -0.1% |
| Class F | -0.9% | -0.8% | -0.8% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Random Access HE10** | | |
|  | Y | U | V |
| Class A | 0.0% | 0.0% | -0.4% |
| Class B | 0.0% | 0.0% | 0.0% |
| Class C | 0.0% | 0.0% | -0.1% |
| Class D | 0.0% | -0.2% | -0.6% |
| Class E |  |  |  |
| **Overall** | 0.0% | -0.1% | -0.3% |
|  | 0.0% | -0.1% | -0.3% |
| Class F | -0.7% | -0.5% | -0.6% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 101% | | |
|  |  |  |  |
|  | **Low delay B HE10** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | 0.1% | -0.1% |
| Class C | 0.0% | 0.0% | 0.0% |
| Class D | 0.0% | 0.5% | 0.0% |
| Class E | 0.1% | -0.9% | 0.0% |
| **Overall** | 0.0% | 0.0% | 0.0% |
|  | 0.0% | 0.0% | 0.0% |
| Class F | -0.3% | 0.3% | 0.3% |
| Enc Time[%] | 101% | | |
| Dec Time[%] | 102% | | |

**Modification 2:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra HE10** | | |
|  | Y | U | V |
| Class A | 0.0% | 0.0% | 0.0% |
| Class B | 0.0% | 0.0% | 0.0% |
| Class C | -0.1% | -0.1% | -0.1% |
| Class D | -0.1% | -0.2% | -0.2% |
| Class E | 0.0% | 0.0% | 0.0% |
| **Overall** | -0.1% | -0.1% | -0.1% |
|  | -0.1% | -0.1% | -0.1% |
| Class F | -1.0% | -1.0% | -0.9% |
| Enc Time[%] | 101% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Random Access HE10** | | |
|  | Y | U | V |
| Class A | 0.0% | 0.0% | -0.2% |
| Class B | 0.0% | 0.0% | 0.0% |
| Class C | 0.0% | 0.0% | -0.1% |
| Class D | -0.1% | -0.1% | -0.4% |
| Class E |  |  |  |
| **Overall** | 0.0% | 0.0% | -0.2% |
|  | 0.0% | 0.0% | -0.2% |
| Class F | -0.7% | -0.5% | -0.7% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Low delay B HE10** | | |
|  | Y | U | V |
| Class A |  |  |  |
| Class B | 0.0% | 0.2% | 0.0% |
| Class C | 0.0% | 0.0% | 0.0% |
| Class D | -0.1% | 0.2% | -0.2% |
| Class E | 0.0% | -0.2% | -0.3% |
| **Overall** | 0.0% | 0.1% | -0.1% |
|  | 0.0% | 0.1% | 0.0% |
| Class F | -0.4% | 1.0% | 0.3% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |

# Conclusions

We have performed a cross-check of the two modification proposed in JCTVC-J0313. The simulation results matches those provided by the proponent.

# References

[1] B. Bross et al., “High efficient video coding (HEVC) text specification draft 7,” in JCTVC-I1003\_d6, Geneva, CH, May 2012.

[2] R. Cohen and A. Vetro, “Modified coefficient scan order mapping for transform skip mode,” in JCTVC-J0313, Stockholm, SE, Jul 2012.

[3] F. Bossen, “Common HM test conditions and software reference configurations,” in JCTVC-I1100, Geneva, CH, May 2012.