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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  19th Meeting: Strasbourg, FR, 17–24 Oct. 2014 | Document: JCTVC-S0036 |

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| *Title:* | **Non-CE2: Transform skip signalling for intra block copy** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

In this contribution, a collective signalling scheme is proposed for all transform skipped TUs at the maximum allowed RQT depth in intra block copy coded CU. In SCM 2.0, *transform\_skip\_flag* is coded per each TB not larger than the maximum allowable size for transform skip. This contribution proposes a modified transform skip signalling method which can representatively signal the transform skip in intra block copy coded CU. Under the AI condition, experimental results show an average gain of -0.19% in BD-rate. It is also reported that -0.49% and -0.31% BD-rate gain is achieved respectively for “text and graphics with motion, 1080p” RGB and YUV sequences.

# Introduction

For screen content, intra block copy (IBC) as a ‘prediction’ and transform skip mode (TSM) as a ‘residual coding’ method have shown very good coding efficiency. By considering their common effectiveness, this contribution introduces a new flag (named *transform\_skip\_all\_ones\_in\_cu\_flag)* which can collectively represent those *transform\_skip\_flag's* of transform-skipped TUs at the maximum allowed RQT depth in intra block copy coded CU. Depending on the flag, a decoder can determine those *transform\_skip\_flag* without actual parsing, and additionally, one bit of *split\_transform\_flag* can be saved by this proposed scheme.

# Proposed method

It is observable that transform skip mode (TSM) is more frequently selected in IBC-coded CU than in intra or inter CUs. This seems to be natural because screen content is a target of TSM and IBC. Based on this simple observation, this contribution proposes a collective signaling method of the *transform\_skip\_flag’* (simply called ‘representative flag’ in this document) for transform-skipped TUs at the maximum allowed RQT in IBC-coded CU.

At CU level, the representative flag is coded in bitstream if following three conditions are all met.

* Condition 1) Current CU contains non-zero residual data
* Condition 2) Current CU can have transform block (TB) whose size is allowed for TSM
* Condition 3) Current CU is IBC coded

Encoder shall set the representative flag equal to 0 when the current CU has no TU at the maximum allowed RQT depth. Conditions 1 and 2 specify whether the current CU can have TSM. When the representative flag is coded in bitstream, depending on its value, it means the following:

If the representative flag is one, the decoding process skips parsing the *split\_transform\_flag* at the RQT depth 0 (it is implied 1, instead) and the *transform\_skip\_flag* (it is implied 1, instead) of all TUs at the max. allowed RQT depth by assuming the followings.

A) Current CU contains at least one TU whose size reaches the maximum allowed RQT depth (the corresponding TU is called as TUMaxDepth).

B) Among TBs of TUMaxDepth, those TB's satisfying TSM condition (i.e., CBF is one and TB size not larger than MaxLog2TransformSkipSize) are all TSM coded.

If the representative flag is zero, the regular decoding process in SCM 2.0 follows to parse the *split\_transform\_flag* and *transform\_skip\_flag*.

The inferred meaning of the proposed *transform\_skip\_flag* signalling is as follows. A) implies that TU is to be split at least one time if current CU size is not equal to TUMaxDepth. Therefore, at least, 1 bit of *split\_transform\_flag* at ‘depth 0’ can be saved. Also every *transform\_skip\_flag* of TB's of TUMaxDepth is represented by the representative flag (which is 1) without actual individual flag.



**Fig. 1. An illustration of RQT structure with the proposed method**

An illustration of the proposed method is depicted in Fig. 1 under the following assumption:

1. Log2MaxTransformSkipSize is equal to 3
2. Size of current CU is 16x16
3. Every CBF of each TB equals to 1
4. Other conditions are identical to common test conditions for Screen content

By the proposed method, the ‘*representative flag*’ is set to 1. Then, 1 bit for *split\_transform\_flag* (corresponding to ‘depth 0’ split information) and 24 bits for *transform\_skip\_flag* (corresponding to ‘depth 2’ TB’s) are saved in this example. Therefore, 4 bits of *split\_transform\_flag* (corresponding to ‘depth 1’ split information) and 6 bits of *transform\_skip\_flag* (corresponding to ‘depth 1’ TB’s) are coded in bitstream.

Its proposed changes in the Specification is in the attached file.

# Experiment Results

Under the common test condition for Screen content coding [1], lossy results are depicted in Table 1. For AI, the proposed method improves coding gains on average -0.19%. For further detail, refer to attached excel file.

**Table 1. Lossy results of the proposed method**



# Conclusion

This contribution proposes a collective transform skip signalling method for intra block copy CU. The proposed method introduces one flag at CU level which is conditionally signalled. Depending on the CU level flag, bits for *transform\_skip\_flag* and *split\_transform\_flag* can be saved. By this method, an average gain of -0.19% for AI is achieved in lossy coding. Moreover, en/decoding time increment compared to current design is negligible.

# References

1. H. Yu, R. Cohen, K. Rapaka, J. Xu, “Common Test Conditions for Screen Content Coding”, Joint Collaborative Team on Video Coding, JCTVC-R1015, Sapporo, Japan, 30 June – 9 July 2014

# Patent rights declaration(s)

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