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# Abstract

This document defines Core Experiment (CE) 2 on depth intra coding to be performed for the 9th JCT-3V meeting.

# Introduction

The goal of this CE is to investigate the methods for depth intra coding proposed at the 8th JCT-3V meeting. Tools under test will be evaluated according to their impact on both compression efficiency and implementation complexity.

# Participants

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# Tools under investigation

## Advanced boundary chain coding for depth intra mode [JCT3V-H0121]

This contribution presents an improved version of advanced boundary chain (ABC) coding (JCT3V-G0094), for depth intra coding.

Advanced boundary chain coding separates a block into two partitions following an arbitrary contour – without introducing Access Unit (AU) dependency (i.e. relying on corresponding texture video) - described by a chain-code and can be applied to blocks of sizes from 4x4 to 32x32.

This proposal further improves JCT3V-G0094 by providing a more versatile description of arbitrary contours.

## Single depth intra mode for 3D-HEVC [JCT3V-H0087]

In this contribution, an intra coding mode termed as single depth mode is proposed to code the smooth area within a depth map. A CU-level flag is signaled to indicate whether a CU is coded as single depth mode. When a CU is coded as single depth mode, it is reconstructed by filling this CU with one single depth value. Additionally, an index is transmitted to select one out of several available depth sample candidates derived from the spatial neighboring pixels. Compared to the anchor HTM-10.0r1, the proposed method reportedly shows overall 0.3% and 0.2% BD-rate savings under common test conditions and all intra conditions, respectively.

In contrast to that, the proposal introduces a different signaling method, where the SDC flag still needs to be coded, i.e. also a residual might be coded. It was encouraged to further study the prediction mode, however with more flexibility by enabling sending the SDC residue values that are the same as the spatial neighbors.

Harmonization with DDD was suggested.

## Residual DC quantization in intra SDC [JCT3V-H0102]

DLT is used to reduce the magnitude of the residual DC for the general modes in intra SDC. DLT enables DC to be signaled as an index instead of the value. To reconstruct the residual DC in a decoder side, DC of the predicted pixels should be first calculated and then re-mapping from the DLT index to the value is performed. In order to simplify these operation, the proposed method quantizes the residual DC with one shift operation to reduce the magnitude of the residual DC, instead of using DLT. The results shows that the proposed method achieves the coding gain of -0.1% and removes the DC calculation and re-mapping processes.

The same functionality may be possible using the existing DLT. The proposed method may also be evaluated with other DMM modes.

It seems is desirable to further study this within the context of the existing design. This study should include the usage of the same quantized values signaled by DLT, i.e. implementing the same functionality as encoder-side operation. It should further be investigated whether the scheme can also be applied in combination with DMM.

# Mandates

Mandates for the CE are as follows:

* To study the coding efficiency improvement and compleixty issues as in JCT3V-H0121, JCT3V-H0087 and JCT3V-H0102.
* It is highly recommended that the techinques in JCT3V-H0121 to be properly clarified with working draft text, including syntax, semantics and decoding processes.
* It is recommended that technique in JCT3V-H0087 should be demonstrated on top of the current SDC scheme with advanced encoder design.
* It is recommended hanmonization and interaction between the technique as proposed in JCT3V-H0087 and DDD can be studied, e.g., inserting the DDD value as a new candidate or as an encoder option of the current SDC scheme.
* It is highly recommneded the techinque in JCT3V-H0102 could be compared with the scheme that is based on the current DLT method, e.g., a similar quantization method should be investigated by using the DLT.

NOTE  ‑ A corresponding DLT could be generated at the encoder to achieve the same step size for quantization of the DC for SDC and DMM. This could be very interesting when being applied to sequences, which are currently not using the DLT, because of their depth map characteristics. A more advanced encoder could ignore these characteristics and construct a DLT for the quantization.

* It is recommended that the complxiy impart of techinques in JCT3V-H0121 should also be analyzed, especially regarding the CABAC coded bins compare with other INTRA coding methods.
* It is recommended that the overlap between techniques in JCT3V-H0087 and SDC can investigated, e.g., by applying additional residue coding on top of JCT3V-H0087.
* It is recommended that the harmonization of techniques in JCT3V-H0102 and DMM can be investigated.

# Software, Configuration and Evaluation

## Software

Experiments in this CE will use the HTM version 11.0 software that is recommended in JCT3V-H1100. Proponents are requested to provide software that can be compiled under Windows and Linux platforms.

## Test Sequences, Bit Rates and Coding Conditions

The CE will use the test sequences, configuration and conditions that are recommended in JCT3V-H1100.

## Evaluation of CE Results

The performance measurements are evaluated by switching on and off individual tools to identify their relative performance. The following measurements are considered to be used in this core experiment.

* **Coding Performance Measurements:** Measure impact on bitrate/PSNR. PSNR shall be calculated for the decoded texture views, relative to original texture views and for the synthesized views relative to uncompressed synthesized views. Use 4-point BD-PSNR and BD-Rate according to common conditions. The anchors will be generated according to common test conditions.

# Timelines

2014/04/25: Release HTM version 11.0

2014/06/19: Make source code, simulation results and draft text available for all proponents and cross-checkers.

2014/06/26: Register and upload documents for the 9th JCT-3V meeting