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**Email of convenor: leonardo@chiariglione.org**

**Committee URL: mpeg.chiariglione.org**

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**ISO/IEC JTC 1/SC 29/WG 11**

**CODING OF MOVING PICTURES AND AUDIO**

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| **Source:** | **3DG** |
| **Title:** | **Description of Core Experiment 13.39 for G-PCC: on Bit count coding for predictive coding** |

**Description of Core Experiment 13.39 for G-PCC: on Bit count coding for predictive coding**

# Abstract

This document provides a description of G-PCC Core Experiment (CE) 13.39 on Bit count coding for predictive coding.

# Introduction

The goal of CE13.39 is to investigate the improved bit count coding in m53538[1] in terms of coding gain and complexity.

# Information about proposed tools

## M53538: Proposal 4 on Improved Bit Count Coding

In 129th MPEG meeting in Brussels, EE13.8[2] was introduced to facilitate investigations on low latency coding for mapping and automotive applications with the EE13.8 software[3] used as anchor for EE13.8 evaluation.

In the EE13.8 software, the value of numBits, which indicates the number of bits needed to encode the absolute value of residual for each axis, is arithmetic encoded with 5 bits in Figure 1. It assumes that the maximum absolute value of residual could be represented with 32 bits.

\_aec->encode(numBits & 1, ctxs[0]);

\_aec->encode((numBits >> 1) & 1, ctxs[1 + (numBits & 1)]);

\_aec->encode((numBits >> 2) & 1, ctxs[3 + (numBits & 3)]);

\_aec->encode((numBits >> 3) & 1, ctxs[7 + (numBits & 7)]);

\_aec->encode((numBits >> 4) & 1, ctxs[15 + (numBits & 15)]);

*Figure 1*

However, the maximum absolute value of residual depends on the bit depth of the point cloud in each axis and could be less than 32 bits. By considering this feature, the improvement modification was made as Figure 2, in which the value of numBits is arithmetic encoded with variable bits based on the bit depth of the point cloud in each axis.

int resi\_bit\_cnt = ceillog2(uint32\_t(geom\_bit\_depth[k] + 1));

for (int n = 0; n < resi\_bit\_cnt; n++) {

\_aec->enode((numBits >> n) & 1, ctxs[(1<<n) - 1 + (numBits & ((1 << n) - 1))]);

}

*Figure 2*

The bit depth of the point cloud is stored as geom\_bit\_depth variable in GeometryBrickHeader and encoded into the bitstream, so that it can be decoded for use to determine the residual bit count that is used to decode numBits at the decoder side.

The proposal shows improvement for coding performance under C2 conditions, as well as some improvements for geometry compression ratio under CW conditions in CTC[4] compared to EE13.8 software.

# Experimental description

In this CE, the proposed bit count coding for predictive coding method will be investigated in terms of coding gain and complexity.

## Mandates

Evaluate Mandates for this CE13.39 is to evaluate implementation and performance of Bit count coding for predictive coding.

## Participants

| **Name** | **Company** | **E-mail address** | **Type** |
| --- | --- | --- | --- |
| Loi Keng Liang | Panasonic | [kengliang.loi@sg.panasonic.com](file:///D:\Documents\01_業務\07_PCC\01_MPEG\01_document\2020_04_Alpbach\06_CEdescription\kengliang.loi@sg.panasonic.com) | Proponent |
| David Flynn | Apple | [davidflynn@apple.com](file:///D:\Documents\01_業務\07_PCC\01_MPEG\01_document\2020_04_Alpbach\06_CEdescription\davidflynn@apple.com) | Crosscheck |
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## Information for conducting tests

Proposed method should be evaluated in both coding performance and compression efficiency in TMC13v10 with predictive geometry coding of the CTC setting.

### Software

TMC13v10 shall be used for this experiment. The proposed tool shall be implemented on top of TMC13v10.

### Test configurations

Parameters and configurations for TMC13v10 software will be provided by the proponent.

### Evaluation Method

The point cloud test material will be tested under the following conditions of the CTC with predictive geometry coding:

* C2 Lossy Geometry – Lossy Attributes
* CW Lossless Geometry – Lossless Attributes

## CE13.39 Coordinators

Loi Keng Liang ([kengliang.loi@sg.panasonic.com](mailto:kengliang.loi@sg.panasonic.com))

# Timeline:

* **2020-05-15**: Expected date for release of cross-verified TMC13v10 software and anchors
* **2020-05-29**: Deliver source code and results for cross check
* **2020-06-06**: Report of preliminary cross check results
* **2020-06-24**: MPEG document upload deadline

# References

1. [G-PCC] EE13.8 related proposal on Predictive tree encoding modifications, ISO/IEC JTC1/SC29 WG11 Doc. M53538, Alpbach, AT, April 2020.
2. “Description of Exploratory Experiment 13.8 for G-PCC: On low latency coding for mapping and automotive applications”, ISO/IEC JTC1/SC29 WG11 Doc. N19148, Brussels, BE, January 2020.
3. EE13.8 software <http://mpegx.int-evry.fr/software/MPEG/PCC/CE/mpeg-pcc-tmc13/tree/mpeg129/ee13.8/predgeom>
4. Common Test Conditions for PCC, ISO/IEC JTC1/SC29 WG11 Doc. N18665, Gothenburg, SE, July 2019.