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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 13.26 for G-PCC: on Axis Order** |

**Abstract**

Core experiment 13.26 aims to evaluate the effects of changing the order of the x, y, and z axes on geometry coding and attribute coding in G-PCC.

1. **Mandate**

The mandate of the core experiment is to evaluate the proposed methods [3][4][5] to:

* Determine the effect of using a sequence-level axis coding order on both geometry and attribute coding.
* Determine the effect of using a slice-level axis coding order on both geometry and attribute coding.
* Determine the effect of using an independent axis coding orders for geometry and attribute coding.
* Study the complexity of the proposed methods.

1. **Participants**

| Participant | Contact | E-mail address | Type |
| --- | --- | --- | --- |
| Xidian University | Wei Zhang | [wzhang@xidian.edu.cn](mailto:wzhang@xidian.edu.cn) | Proponent/  Crosschecker |
| Apple | David Flynn | [davidflynn@apple.com](mailto:davidflynn@apple.com) | Proponent |
| LGE | Sejin Oh  Yousun Park | [sjin.oh@lge.com](mailto:sjin.oh@lge.com)  [yousun.park@lge.com](mailto:yousun.park@lge.com) | Proponent/  Crosschecker |
| Blackberry | Jonathan Taquet | jtaquet@blackberry.com | Crosschecker  (m51095) |
| PKUSZ | Yiting Shao | ytshao@pku.edu.cn | Crosschecker |

1. **Methods to be evaluated**

## RAHT transform order from m50750

In contribution m50750 [3], a method for determining the RAHT transform order at sequence level was proposed by adaptively manipulating the Morton code bit-interleaving order. An index indicating the RAHT transformation order is proposed to be added to the attribute parameter set. This design only functions for attribute information compression at sequence level while leaving the geometry information unchanged.

## G-PCC geometry swizzling from m51027

In contribution m51027 [4], it is proposed to add a field to the sequence parameter set that identifies one of six possible permutations of x, y, and z to be used to label the three components of the position (geometry) information. In this design, there is no need to introduce any additional decoding steps to remap the axes.

## Morton code generation with adaptive axis order from m51095

In contribution m51095 [5], applying the different order of axis for Morton code is proposed since points on the longest axis of the bound box could be considered as the more related attribute neighbour candidates. Especially in Cat3 reflectance, the distribution of the density in X or Y axis is considered more dense so searching the X and Y axis faster than the Z axis makes possible to find the nearest neighbours. To enable to search points on the longest axis first, Morton bit-interleaving order is determined according to the length of axis of the bounding box. Generating adaptive morton code scheme with adaptive axis order for Predicting and Lifting mechanism is proposed in order to better select the neighbor’s candidates.

1. **Evaluation method**

Evaluation will be performed according to the common test conditions [1] for G-PCC using TMC13v8 [2] using category one and three content. The following experiments will be performed.

## Evaluation of combined geometry and attribute axis order

Evaluation will be performed on all six permutations of the axis coding order. Further evaluation may consider automatically determining the axis coding order based upon the proposed methods.

## Evaluation of slice-level coding order

Evaluation will be performed using the proposed automatic methods to control slice-level signalling of both the geometry and attribute coding axis coding orders.

## Evaluation of decoupled geometry-attribute axis coding orders

Evaluation will be performed using the proposed automatic methods to control attribute-level signalling of axis coding orders.

1. **Timeline:**

* **2019-11-01**: Expected date for release of cross-verified TMC13v8 software and anchors
* **2019-12-06**: CE Software and results are released to cross-checkers
* **2019-12-20**:Preliminary feedback from cross-checkers to proponents
* **2020-01-02**: MPEG document upload deadline.

1. **References**
2. “Common Test Conditions for PCC” ISO/IEC JTC1/SC29 WG11 MPEG2019”, ISO/IEC JTC1/SC29/WG11 MPEG2019 Doc. w18883, Geneva, CH, October 2019
3. “G-PCC Test Model 8”, ISO/IEC JTC1/SC29/WG11 MPEG2019 Doc. w18882, Geneva, CH, October 2019
4. “[G-PCC][New proposal] On RAHT transform order”, ISO/IEC JTC1/SC29 WG11 (MPEG) input document m50750, Geneva, CH, October 2019
5. “[G-PCC][New proposal] G-PCC geometry swizzling”, ISO/IEC JTC1/SC29 WG11 (MPEG) input document m51027, Geneva, CH, October 2019
6. “[G-PCC](New Proposal) Morton code generation with adaptive axis order”, ISO/IEC JTC1/SC29 WG11 (MPEG) input document m51095, Geneva, CH, October 2019