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

**CODING OF MOVING PICTURES AND AUDIO**

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**Alpbach, AT – April 2020**

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| **Source:** | **3DG** |
| **Title:** | **Description of Core Experiment 13.22 for G-PCC: On octree coding** |

# Abstract

In this document, we provide descriptions for the core experiment 13.22 on the study of improvements on tree-based geometry coding for Geometry-based PCC. This is a continuation of the Core Experiment [4].

The current implementation of the octree representation of the geometry in G-PCC may suffer from restrictive conditions on the IDCM activation.

The goals of this Core Experiment are now focused on:

* introducing new “looser” conditions for IDCM activation
* mitigating the negative compression impact of the new IDCM conditions by introducing non-ordered coding of directly coded points in a DMC node

# CE 13.22 on Improvements to Octree coding

## Mandates

* study the impact on compression performance and complexity of the proposed new IDCM conditions
* study the impact on compression performance of the proposed introducing non-ordered coding of directly coded point
* evaluate the trade-off compression performance vs complexity of the combination

Related changes to the G-PCC Specification Text [2] shall be reported.

## Participants, description of tools, and implementation notes

The following people are participating in this CE. Their specific roles are detailed in the next section. Proposals are based on the input contributions

1. m52957, *On modifying IDCM implicit conditions and introducing non-ordered two-point IDCM [1]*

Proponents and cross checkers are

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## Information on proposed tools

### *The new azimuthal coding mode* from m52957 [1]

Inferred Direct Coding Mode (IDCM) has been introduced some two years ago in order to lower the complexity of both encoder and decoder by pruning the (oc)tree representing the geometry of the point cloud such that less nodes are processed. Instead, direct bypass coding of point coordinates is performed and is much less complex than entropy coding of occupancy flags of a node.

Also, IDCM lowers output latency as IDCM decoded points are quickly available for further processing.

IDCM has been designed to preserve compression performance by employing restrictive implicit conditions on the IDCM use. These restrictions do allow for a marginal impact on compression loss relative to a full tree coding.

Some applications are ready to sacrifice a reasonable amount of compression performance to significantly lower the complexity of the codec, for example embarked lightweight encoder in cars or decoders in mobile devices. A trade-off between complexity and compression can be tuned through the Direct Coding Mode by relaxing the restrictive implicit conditions, thus leading to more (I)DCM coded points.

However, compression performance is observed to be less efficient when DCM is used more systematically, particularly on denser point clouds. We show that this drawback can be mitigated by profiting from the non-ordered geometry of points to code two points relatively to each other.

## Information for conducting tests

Adoption of the tool should be based on the discussion of the compression gains and the complexity of said tools.

### Software

TMC13v10 [2] shall be used for these experiments. The proposed tools shall be implemented on top of TMC13v10.

### Test configurations

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

### Evaluation Method

The point cloud test material will be tested for the test sequences of category

* (3) Dynamic Acquisition

as defined by the CTC [3]. The following test conditions will be under evaluation

1. *CW AI lossless geometry – (lossless attribute)*
2. *C2 AI, lossy geometry – (lossy attribute)*

Note that the tested technologies should have an impact on geometry compression only and that attribute compression performance are reported informatively.

## CE 13.22 Coordinators

Sébastien Lasserre ([slasserre@blackberry.com](mailto:slasserre@blackberry.com))

# Timeline:

* **2020-05-15***: Cross-checked G-PCCv10 software (TMC13v10) and anchors*
* **2020-05-29**: Source code and results are released to cross-checkers;
* **2020-06-06**: Preliminary feedback from cross-checkers to proponent;
* **2020-07-01**: MPEG document upload deadline.

# References

1. m52957, *[GPCC] [new] On modifying IDCM implicit conditions and introducing non-ordered two-point IDCM*, Alpbach, AT, April 2020
2. *G-PCC Test Model v10*, ISO/IEC JTC1/SC29/WG11 w19323, Alpbach, AT, April 2020.
3. *Common Test Conditions for PCC*, ISO/IEC JTC1/SC29 WG11 w19324, Alpbach, AT, April 2020.
4. “*CE 13.22 On octree coding*”, ISO/IEC JTC1/SC29/WG11 N19100