

m54615

Point indexes definition for lifting morton sort skip

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■ Problem statement

- Morton sort skip was adopted at the previous meeting.
- It is not defined explicitly that how to label indexes to points in the current spec.
- Therefore, processing order at attribute decoding is ambiguous when Morton sort skip is used.

■ Proposal

- **The following two aspects are proposed.**
 1. Point indexes are defined explicitly in the spec according to geometry decoding order,
 2. Morton sort skip can be enabled only when predictive coding is used.

- Morton sort skip is a functionality realizing low-latency attribute coding.
- When Morton sort skip is enabled, sorting process by Morton code order is skipped and attribute coding are processed according to index i.

```
unprocessedPointCount = PointCount
for (i = 0; i < unprocessedPointCount; i++) {
    unprocessedPointIndexes[i] = lifting_morton_sort_skip_enabled_flag ? i : Order[i]
}
for (lod = 1; lod < LevelDetailCount; lod++)
    unprocessedPointCountPerLevelOfDetail[lod] = 0;
unprocessedPointCountPerLevelOfDetail[0] = PointCount
```

- However, it is not defined explicitly how to label “index i” to points in the spec.
- When Morton sort skip is not enabled, the processing order is unique because it can be defined as Morton code order regardless of point indexes.

- **Aspect 1 : Point indexes are labeled as geometry decoding order**
 - **How to label point indexes are defined explicitly in the spec according to geometry decoding order.**

8.3.2.1 Level of Detail Generation

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First, an index i is labeled to each point according to geometry decoding order. Then, if `lifting_morton_sort_skip_enabled_flag` equal to 0, the point sorting process based on Morton code in clause 5.9.8 is invoked. Let `Order[i]` be the array of point indexes sorted according to their Morton codes and `McodeUnsorted` the array of unsorted Morton codes.

- **Aspect 2 : Morton sort skip can be enabled only when predictive coding is used**
 - **On top of the aspect 1, it is proposed that Morton sort skip can be enabled only when predictive coding is used because of the following reasons.**
 - When predictive coding is not used, geometry decoding order seems to be still ambiguous due to IDCM and so on.
 - Additionally, Morton sort skip can realize low-latency coding only when predictive coding is used.

7.4.2.4 Attribute parameter set semantics

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lifting_morton_sort_skip_enabled_flag equal to 1 specifies that the sorting process based on Morton code is skipped. **lifting_morton_sort_skip_enabled_flag** equal to 0 specifies that the sorting process based on Morton code is applied. **When the value of `gps_predictive_mode_enabled_flag` is equal to 0, the value of `lifting_morton_sort_skip_enabled_flag` shall be equal to 0.**

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■ Proposal

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 1. Point indexes are defined explicitly in the spec according to geometry decoding order,
 2. Morton sort skip can be enabled only when predictive coding is used.

■ It is recommended that both aspect 1 and 2 are adopted to the next draft.