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**Description of Core Experiment 13.28 for G-PCC: on early prediction for RAHT prediction**

# Abstract

This document provides a description of G-PCC Exploration Experiment (CE) 13.28 on early termination for RAHT prediction.

# Introduction

The goal of CE13.28 is to investigate the early termination method for transform domain prediction of RAHT provided in m51374[1] in terms of coding gain and complexity.

# Information about proposed tools

## m51374: [new proposal] Early termination for transform domain prediction of RAHT

The transform domain prediction was introduced to improve coding efficiency on RAHT in 127th MPEG meeting [2]. The prediction method produces more than 30% gain for attribute coding while the coding time is increased, especially about 2 times in C1 condition. It would be desired to reduce the coding time and introduce more flexible control function on it.

In the transform domain prediction, 19 neighbour parent nodes are used to create the prediction value for the encoding target nodes (child nodes) of the center node. The accuracy of the prediction would be better in the denser point cloud like cat1 contents because the number of valid neighbour parent nodes is large. As the result, the coding efficiency is more significant in cat1 content compared to cat3 sparse contents.

Based on this feature, m51374 introduces the early termination function for the transform domain prediction to reduce the coding time on it. In this function, the following two parameters in every 8 child nodes are calculated.

* NumValidP: total number of valid neighbour parent node
* NumValidGP: total number of valid neighbour grandparent node

Then, the prediction will be disable in case that either NumValidP or NumValidGP is less than threshold. It means that the prediction is terminated when the number of valid neighbour nodes becomes small.

Figure 1 shows the example of the transform domain prediction and parameter definition on m51374. In initial test, the threshold TH1 equal to 2 and TH2 equal to 6 are set.

Figure 2 shows the decision flow to disable the prediction in every encoding 8 nodes. At first, NumValidGP is checked if it is larger than TH1 (= 2) before finding neighbour parent nodes. Then if it true, the neighbour parent nodes are searched and the value of NumValidP is calculated. In this flow, if either NumValidGP or NumValidP is less than TH1 or TH2 respectively, the prediction is disable and target 8 node is encoded without it. Otherwise, it is encoded with prediction.

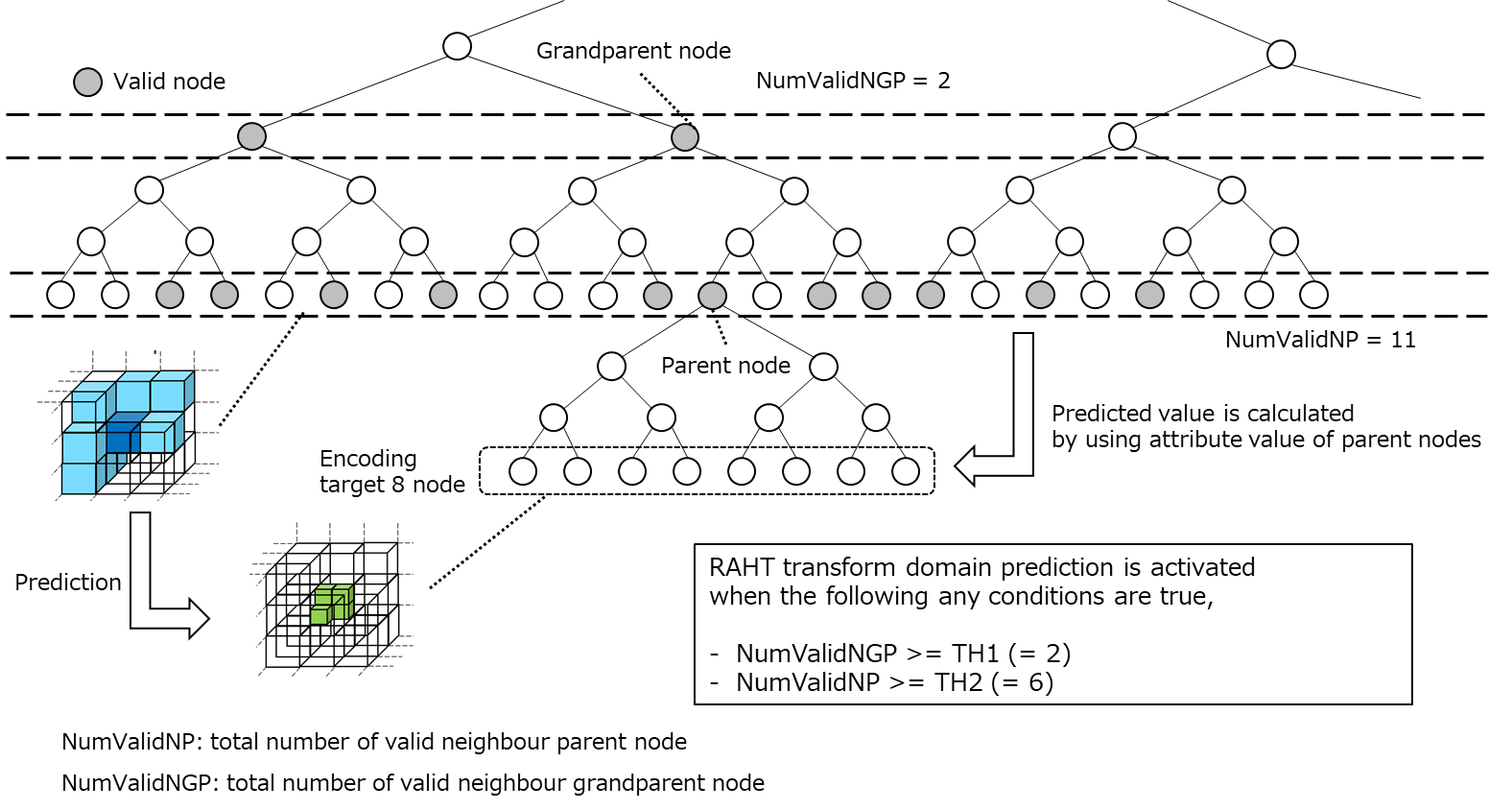


Figure 1: example of the transform domain prediction and parameter definition in m51374

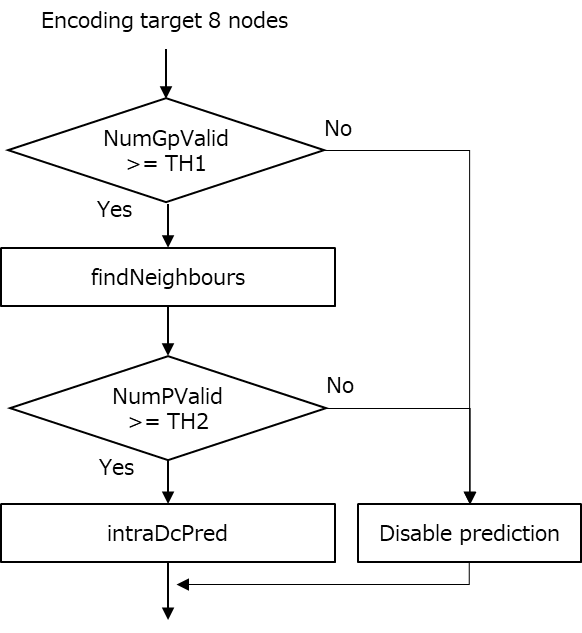


Figure 2: decision flow to disable transform domain prediction

# Experimental description

In this CE, the early terminated method will be investigated in terms of coding gain and complexity.

## Mandates

* Evaluate and report compression performance, computation time and complexity of the early termination for transform domain prediction of RAHT. Especially, the number of early termination in each RAHT layer will be reported.

## Participants

| **Name** | **Company** | **E-mail address** | **Type** |
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## Information for conducting tests

Proposed method should be evaluated in both compression efficiency as well as computation time compared to RAHT with the CTC setting.

### Software

TMC13v8[3] shall be used for these experiments. The proposed tools shall be implemented on top of TMC13v8.

### Test configurations

Parameters and configurations for TMC13v8 software will be provided by the proponent.

### Evaluation Method

The point cloud test material will be tested under the following RAHT conditions of the CTC [4]:

* C1 Lossless Geometry – Lossy Attributes
* C2 Lossy Geometry – Lossy Attributes

## CE13.28 Coordinators

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# Timeline:

* **2019-11-01**: Expected date for release of cross-verified TMC13 software and anchors
* **2019-12-13**: Deliver source code and results for cross check
* **2019-12-27**: Report of preliminary cross check results
* **2019-01-08**: MPEG document upload deadline

# References

1. [G-PCC] [new proposal] Early termination for transform domain prediction of RAHT, ISO/IEC JTC1/SC29 WG11 Doc. M51374, Geneva, CH, October 2019.
2. G-PCC CE13.18 report on upsampled transform domain prediction in RAHT, ISO/IEC JTC1/SC29 WG11 Doc. m49380, Gothenburg, SE, July 2019.
3. PCC Test Model v8, ISO/IEC JTC1/SC29/WG11 Doc. N18882, Geneva, CH, October 2019.
4. Common Test Conditions for PCC, ISO/IEC JTC1/SC29 WG11 Doc. N18883, Geneva, CH, October 2019.