INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND AUDIO

ISO/IEC JTC1/SC29/WG11 MPEG2019/M49455
July 2019, Göteborg, Sweden

Source	**Poznań University of Technology**
Status	**Input**
Title	**Summary report on Immersive Video CE-5: Depth and color refinement**
Author	Adrian Dziembowski (CE-5 Coordinator)

Abstract

This document reports the experiments performed during Core Experiment 5.

1 Introduction

The goal of the experiment was to study performance of input data (views and depth maps) refinement for Immersive Video purposes.

The experiments were performed on the test set containing two natural-content sequences: NC1-D (TechnicolorPainter) and NC1-E (IntelFrog). The results were calculated for 4 views (for NC1-D) and 3 views (for NC1-E).

Participants were allowed to change "MPix" value in order to change number of atlases. Changing of other parameters was forbidden.

Two participants registered for the experiments: Philips and PUT (Poznań University of Technology) in collaboration with ETRI (Electronics and Telecommunications Research Institute). Both participants performed their experiments.

2 Summary of experiments

2.1 *m48273: Philips response to Immersive Video CE-5 (Original depth maps)*

Philips has studied the impact on the overall performance of the refined depth maps from the Technicolor-Intel proposal that are already included in the CTC [N18443]. They did this by feeding the unrefined 10-bit depth maps into the test model.

2.2 *m48092: PUT/ETRI Response to Immersive Video CE-5: Depth and color refinement*

PUT/ETRI examined the influence of proposed color and depth refinement techniques on the quality of synthesized views. In order to distinguish the impact of both techniques, PUT/ETRI experiment consisted of three sub-experiments:

1. usage of refined views and unrefined depth maps,
2. usage of unrefined views and refined depth maps,
3. usage of refined views and depth maps.

The proposed color refinement technique allows to reduce BD rate for VMAF and SSIM for both test sequences. Obviously, it reduces PSNR values.

Proposed depth refinement method reduces pixel rate and BD rates for all objective quality metrics for NC1-D sequence. It also increases BD rates for NC1-E sequences. PUT remarks, that in depth refinement experiments the wrong .json file with camera parameters was used, what caused slight movement of all the objects in the scene.

PUT also suggest to continue CE-5 until the next meeting.

3 Summary of crosschecks

3.1 *Crosscheck of m48273*

PUT performed partial crosscheck of Philips response (m48273). The results obtained by PUT are similar enough to results provided by Philips (highest noticed difference in bitrate is 0.17%, in quality: 0.12%). The differences are in line with results published in m48099.

PUT has crosschecked:

- NC1-D, all input views, QP3,
- NC1-D, 4 input views, QP4,
- NC1-E, all input views, QP2 and QP5.

PUT did not crosscheck 4 input view case for NC1-E, because Philips' results for that case were not reported when crosschecking was performed.

3.2 *Crosscheck of m48092*

Philips has partially crosschecked the PUT/ETRI CE-5 response [MPEG/m48092] and they can reproduce the results although not bit exact.
Philips has crosschecked:

- NC1 – D, color+depth refinement, case 1 (all views), all QP's
- NC1 – D, color+depth refinement, case 2 (4 views), all QP's
- NC1 – E, color+depth refinement, case 1 (all views), all QP's
- NC1 – E, color+depth refinement, case 2 (4 views), QP2 and QP4
- NC1 – E, depth refinement, case 2 (4 views), QP2 and QP4

Philips also tried to crosscheck NC1 – E, color, case 2 but they noticed quite late that five atlases were used instead of four (as for the other 4-input view encodings). Philips remarks that this makes it more difficult to compare the experiments.

CE-5 uses TMIV 1.0 unmodified. Proposed color and depth refinement software (AVS) including configuration files were available on the MPEG Git server. The initial version did not build but PUT provided a fix and Philips has used commit 382ca1b3 for crosschecking.

TMIV configuration files were not included and although the CE-5 description was sufficient, it took some effort to derive suitable configuration files.