INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC 1/SC 29/WG 4
MPEG VIDEO CODING

ISO/IEC JTC 1/SC 29/WG 4 m66418
January 2024, Online

Title: [INVR] Color Corrected SKKU_VRroom1D
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Abstract

This document presents the color corrected *SKKU_VRroom1D* by Sungkyunkwan University (SKKU) – South Korea. The original version was proposed in October 2023 meeting [1]. The test sequence was captured using 30 cameras positioned in a 1-dimensional array, representing a person using a head-mounted display (HMD) and several non-Lambertian objects. Color corrected YUV, compressed mp4, camera parameter, and a pose trace are introduced with an online accessible link.

1 Introduction

During the last INVR meeting, test sequence *SKKU_VRroom1D* was accepted as an optional natural content [2]. Additionally, color corrected YUV files and a pose trace were requested. In this meeting, color corrected YUV files, mp4 files, camera parameters, and a pose trace are introduced.

2 Procedure of Color Correction

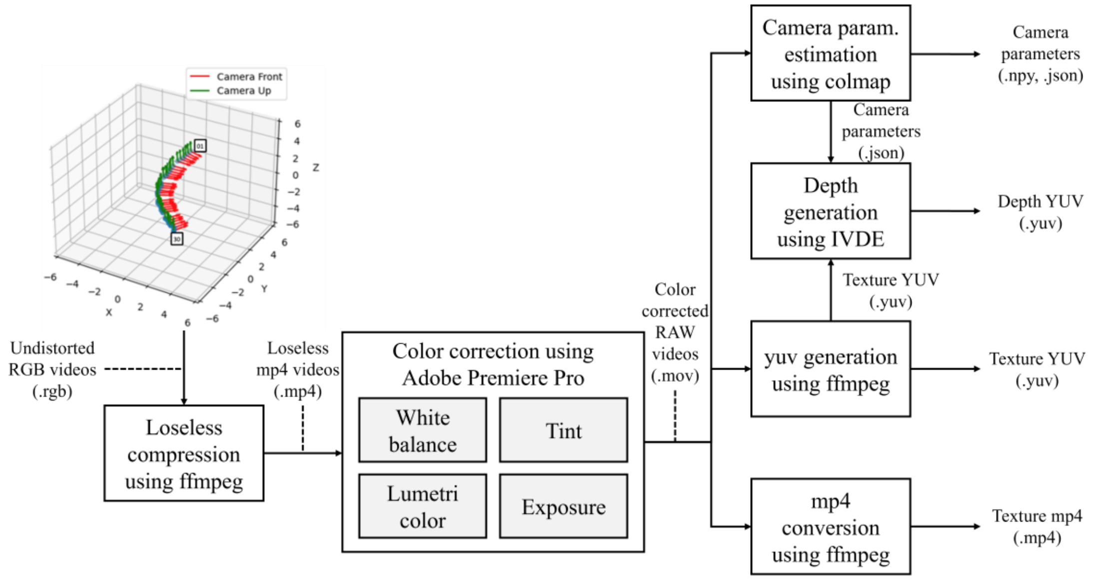

Figure 1. Color correction, camera parameter and depth estimation processes

This section provides detailed descriptions about color correction, camera parameter and depth estimation processes, as shown in Figure 1. Test sequence *SKKU_VRroom1D* was captured using 30 Intel RealSense L515 cameras, which produce 24-bit RGB raw video file. Because of illumination effects around the scenes, global color difference exists. Therefore, Adobe Premiere Pro was used to conduct color correction. Undistorted RGB files were given to ffmpeg, and a loseless compression was applied to generate lossless mp4 videos, which are then transferred to Adobe Premiere Pro. During the

color correction, four processes were applied to preserve inter-view consistency: white balance, tint, lumetri color, and exposure. The color corrected raw videos (.mov) are given as input to ffmpeg, to produce 1) texture yuv files for MIV experiments and 2) texture mp4 files for INVR experiments. Also, the color corrected images are provided to colmap, generating camera parameters for INVR (.npy) and MIV (.json). For MIV experiments, the depth YUVs can be generated using immersive video depth estimation (IVDE) v7.0 [3].
Table 1 presents characteristics of *SKKU_VRroom1D*. As recommended test views, view *v11* and *v27* were chosen because they contain reflected objects by mirror, which is helpful when observing non-Lambertian effects. Figure 2 shows the camera structures and acquisition environment. Center-forwarding camera structure was used to effectively capture non-Lambertian and high frequency objects and their movements. Figure 3 and 4 show undistorted and color corrected snapshots, where only odd-numbered views (e.g., v01, v03, …) were included.

Table 1. The description of *SKKU_VRroom1D*

Item	Specification
Number of frames	300
Number of views	30 (v01-v30)
Recommended test view	v11, v27
Format	mp4 (H.264 codec, yuv420p10le), yuv (yuv420p10le)
Resolution	1920×1080
FPS	30.0

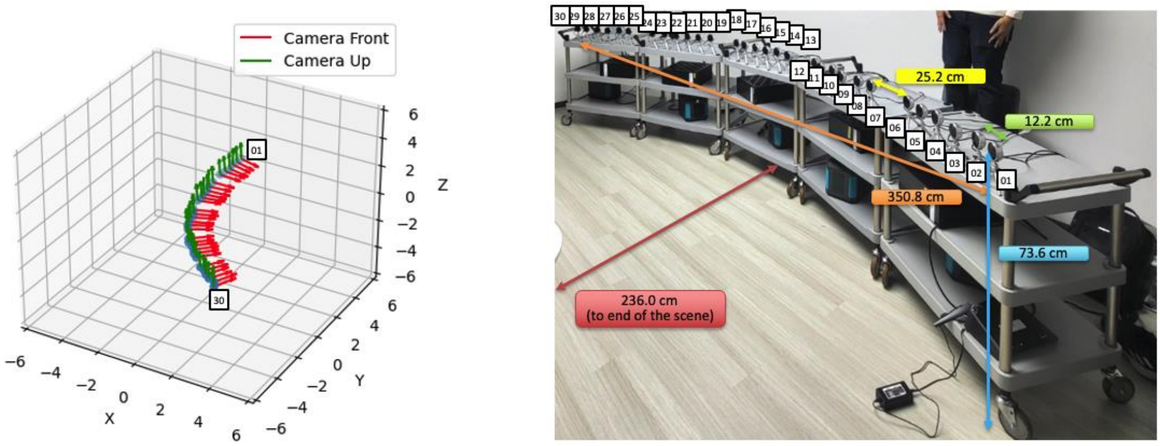

Figure 2. The visualization of camera rotation and position (left), and the acquisition environment (right)

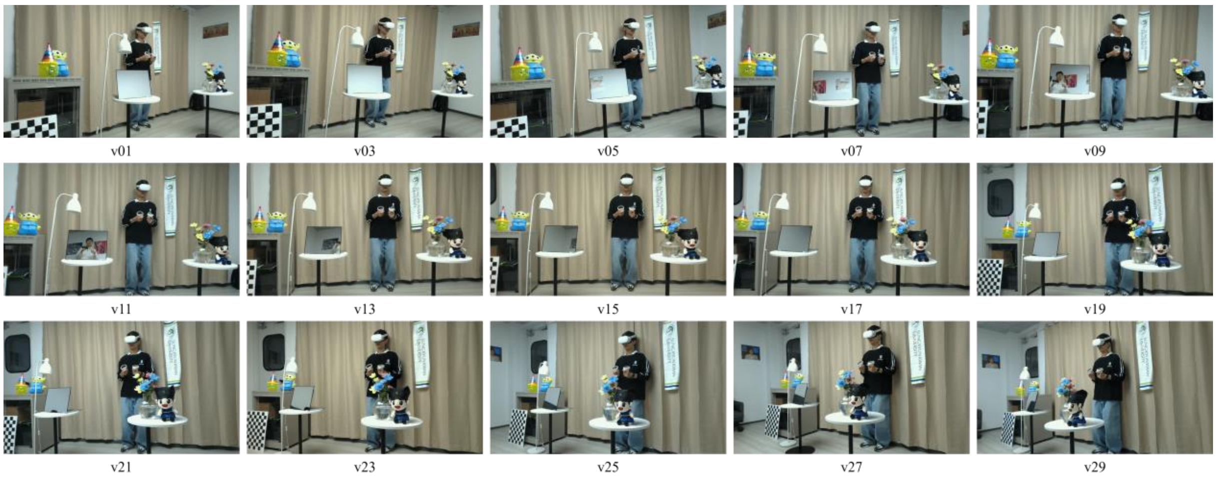

Figure 3. Snapshots of odd-numbered views in *SKKU_VRroom1D* before color correction (frame #16)

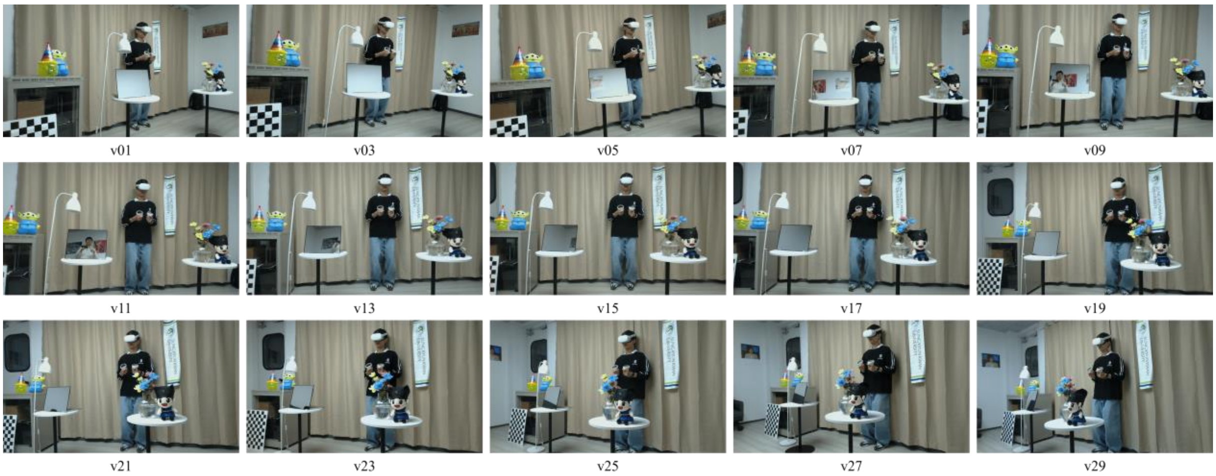

Figure 4. Snapshots of odd-numbered views in *SKKU_VRroom1D* after color correction (frame #16)

Figure 5 presents the enlarged snapshots to show effects of color correction. As depicted in Figure 4(a), the colors of a curtain and a flag vary across different views. After the color correction is applied, the consistency of colors between views is maintained, as demonstrated in Figure 4(b). Some distortions were observed around the mirror and object edges in depth maps generated by IVDE, which will be studied and released later.

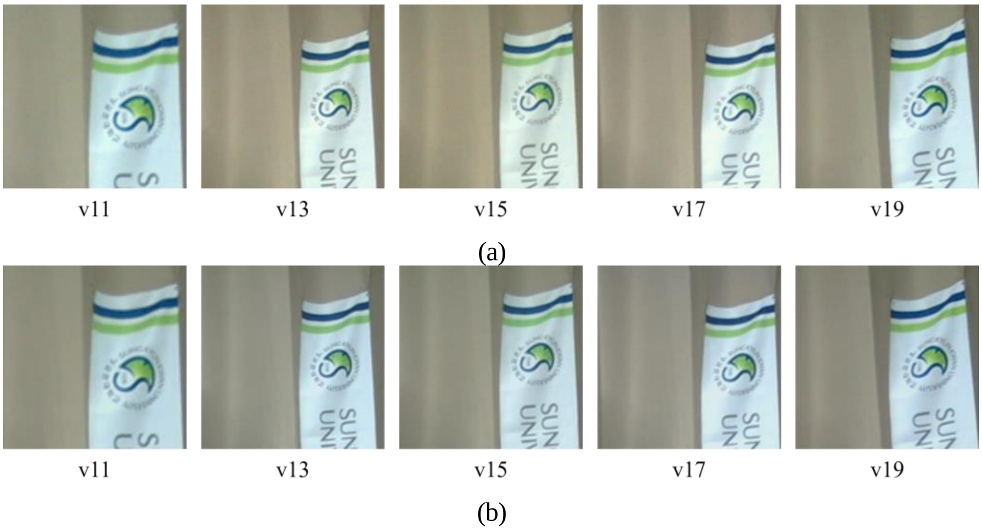

Figure 5. Enlarged snapshots of subset views in *SKKU_VRroom1D*, (a) before color correction, (b) after color correction (frame #16)

3 Test Sequence Link

The *SKKU_VRroom1D* test sequence is available on the following link (http://mcsl.skku.edu/skku_vrroom-datasets/) under the copyright of SKKU. The link provides four compressed zip files:

File	Description
cam_param.zip	Pose data (*.npy) for NeRF experiments, MIV-compliant camera parameter (*.json), and a pose trace (*.csv) around all the source views.
raw_rgb.zip	30 synchronized raw RGB views with 396 frames (RGB24).
corrected_mp4.zip	Color corrected videos of 300 frames (*.mp4, AVC/H.264, yuv420p10le).
corrected_texture_yuv.zip	Color corrected texture videos of 300 frames (*.yuv, yuv420p10le).

Note that a pose trace video using MIV full views mode is included as an attachment.

4 Recommendation

SKKU_VRroom1D test sequence can be usefully employed to evaluate various aspects of the performance of INVR models. We recommend this revised test sequence to be used as one of INVR contents.

5 References

[1] J. Choi, Y. Ryu, Y. Choi, J. -B. Jeong, J. -H. Park, I. Yang, E. -S. Ryu, "[INVR]EE2.1-Related: Report with New Natural INVR Video Contents: SKKU_VRroom", ISO/IEC JTC1/SC29/WG4 input document m64721, October 2023, Hannover.
[2] Y. Liao, G. Bang, "BoG report on Implicit Neural Visual Representation (INVR)", ISO/IEC JTC1/SC29/WG4 input document m65727, October 2023, Hannover.
[3] D. Mieloch, P. Garus, M. Milovanović, J. Jung, J. Y. Jeong, S. L. Ravi, B. Salahieh, "Overview and Efficiency of Decoder-Side Depth Estimation in MPEG Immersive Video", *IEEE Transactions on Circuits and Systems for Video Technology (IEEE TCSVT)*, Vol. 32, No. 9, pp. 6360-6374, 2022.