

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

**ISO/IEC JTC1/SC29/WG11
MPEG2010/M17490
April 2010, Dresden, Germany**

**Source: GIST (Gwangju Institute of Science and Technology)
Status: Report
Title: Modified Depth Data of ‘Newspaper’ Sequence
Author: Cheon Lee and Yo-Sung Ho**

1. Introduction

This document describes the modified depth data of ‘Newspaper’ sequence. The current depth data of ‘Newspaper’ sequence are provided by Samsung [1], and those are used for EE4. Although experts have agreed those are acceptable as reference data [2], they pointed out that the virtual views still have visual artifacts on background. For maturity of depth data, we have modified depth values of background with a table-based depth modification method. The synthesized images using the modified depth data shows better rendering quality; visual artifacts on the background have been removed clearly. In order to conduct EE4, we have provided them to Poznan University.

2. Visible Artifacts and Depth Modification

Visual artifacts appear due to the wrongly estimated depth value. Since refining the depth value around object boundary is an open problem, most of sequences have similar artifacts. By ongoing several EEs, the depth data of ‘Newspaper’ have been improved significantly, but it still have visual artifacts on background as shown in Fig. 1. Those artifacts are due to the false depth values in the depth data as shown in Fig. 2. The background area should be the value of 33, but those areas are around 95.



Fig. 1. Visual artifacts on synthesized image

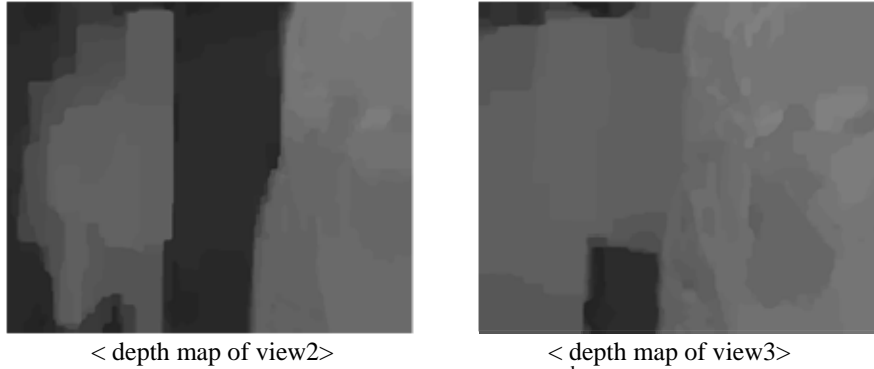


Fig. 2. Depth maps of 143rd frame

In order to remove artifacts from the synthesized image, we modify the depth values using the table-based depth modification method as depicted in Fig. 3. Since the first 92 frames have accurate depth values for the target region, we can use them as a reference depth. The target frames have unstable and erroneous depth values because of the moving objects. First, we make a table by observing the color and depth values of the reference frames. Then, we select one closest color for the target frame from the table. Indicating the target area of frame, we can specify the ROI (region-of-interest) area. In case of ‘Newspaper’, we set the reference frame as from 0 to frame 92, and the target frame as frame 93 to 299 frame. The target areas are set as Table 1.

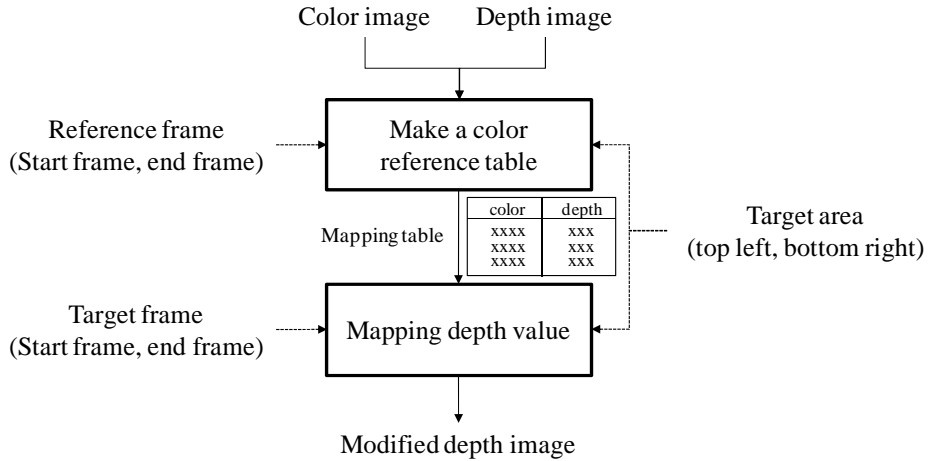


Fig. 3. Procedure of depth modification method

Table 1. Target area

View Number	Top left	Bottom right
2	(489, 0)	(824, 376)
4	(378, 0)	(785, 372)
6	(312, 0)	(824, 376)

In the step of depth mapping, we select one closest color from the mapping table. If the difference of the target color and the closest color is less than a threshold, we overwrite the corresponding depth value to the target pixel. Otherwise, we use the current depth as it was. Figure 4 is a comparison of depth images between the previous depth and the modified depth. The modified depth images show more clear depth values on the background region. The consequent synthesized images showed better quality as well. Figure 5 shows PSNR values for whole 300 frames. The first 92 frames are the same with the previous one, but from the 93rd frame, the quality has been improved



(a) Current depth images: view2 (left), view4 (center), view6 (right)



(b) Modified depth images: view2 (left), view4 (center), view6 (right)



(c) Synthesized images using modified depth: view3 (left), view5 (right)

Fig. 4. Comparison of depth images and synthesized images

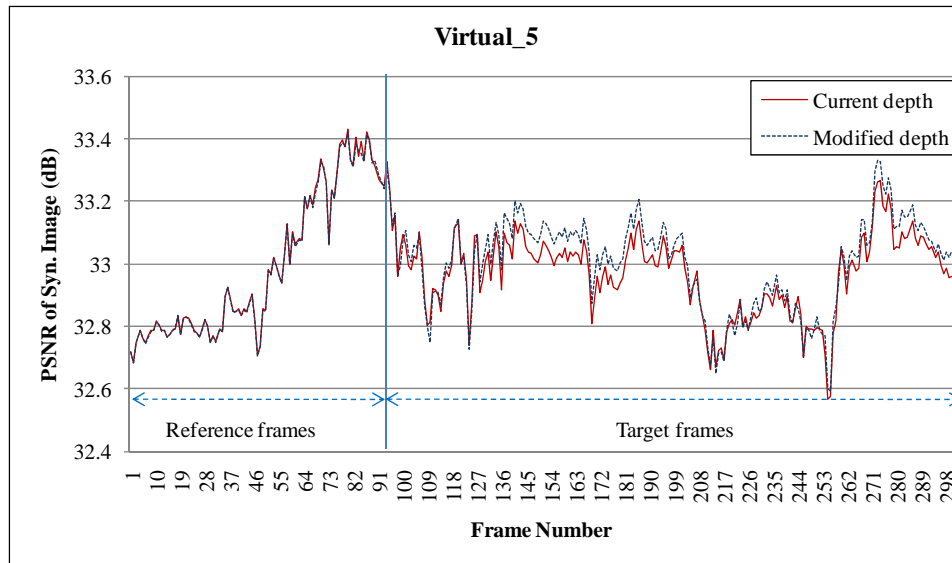


Fig. 5. PSNR values of virtual view5 images

To change the depth data of ‘Newspaper’ sequence, we have discussed the use of modified depth data with chairs of 3DVC group by mailing list, and they have allowed using them. Thus, we have provided the modified depth data to Poznan University. For preparation of 3D viewing, we will bring the modified depth data and synthesized images according to conditions in N11095.

3. Conclusion

We have modified the depth data of ‘Newspaper’ sequence to remove visual artifacts from the background region. Those data shows better rendering quality. To conduct EE4, We have sent the modified depth data to Poznan University. We are ready for 3D viewing.

4. Acknowledgements

This research was supported by the MKE(The Ministry of Knowledge Economy), Korea, under the ITRC(Information Technology Research Center) support program supervised by the NIPA(National IT Industry Promotion Agency) (NIPA-2010-(C1090-1011-0003))

5. References

- [1] ISO/IEC JTC1/SC29/WG11 “3DV EE1 & EE4 Results on Newspaper sequence,” M17028, June 2009.
- [2] ISO/IEC JTC1/SC29/WG11 “Description of Exploration Experiments in 3D Video Coding,” N11095, January 2010.