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Title: Color Corrected Newspaper Sequence for 3D Video Coding

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1. Introduction

This document reports the color corrected ‘Newspaper’ sequence. Although the ‘Newspaper’ sequence has been released [1, 2], it was reported the sequence has the low color consistency between views. The low color consistency problem decreases the performance of other processes such as depth estimation and compression. Therefore, we correct the color distribution of the ‘Newspaper’ sequence. In this contribution, we describe the procedure of color correction and the results.

2. Procedure of Color Correction

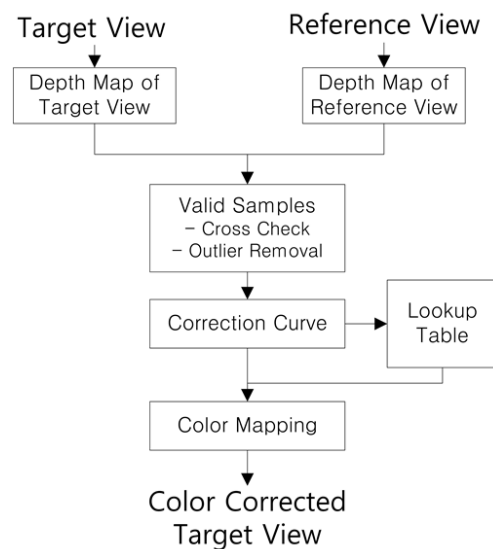


Fig. 1. Color Correction Method

At first, we categorize the nine views of the sequence into reference and target views. The reference view is regarded as a criterion during the process. View3 is selected as the reference view due to its high brightness and position. We compare the color difference

between the reference and target views, and correct the color distribution of the target view. The overall diagram of the color correction process is shown in Fig. 1.

2.1. Valid Sample Extraction

In order to compare color difference, it is essential to analyze corresponding color values between views. We extract the correspondences by the stereo matching algorithm with the normalized cross correlation. It is robust to the color inconsistency problem. In order to increase the accuracy of the extracted samples, correspondences are independently estimated for the each channel and view position and cross-checked. Finally, outliers in the samples are removed by sorting and selecting.

2.2. Color Correction

We model the correction curve which considers the three camera properties: gain, offset, and gamma. It is expressed as (1).

$$P_{ref} = C_{gain} \{P_{tar} / (2^{bitdepth} - 1)\}^{C_{gamma}} \times (2^{bitdepth} - 1) + C_{offset} \quad (1)$$

where P_{ref} and P_{tar} are pixel values of reference and target views. C_{gain} , C_{offset} , and C_{gamma} represent coefficients for each property. $2^{bitdepth}$ is the total number of gray levels for each color channel.

With the samples obtained in Sec. 2.1, the unknown coefficients in the camera characteristic model are estimated by nonlinear regression with outlier removal. We generate three lookup tables for each color channel, and convert the color distribution of target views. The lookup table of view8 is manually modified for further improvement.

3. Results



(a) Original Sequence



(b) Color Corrected Sequence

Fig. 2. Comparison of the original and the corrected sequence

Figure 2 shows the result of color correction. Figure 2(a) is the original sequence and Fig. 2(b) is the corrected sequence.

In order to easily observe the quality of the color correction, we enlarge and show the background region of each view in Fig. 3. While the color distributions of the original sequence are different, the difference decreases in the corrected sequence. We will bring the corrected data at Daegu meeting.

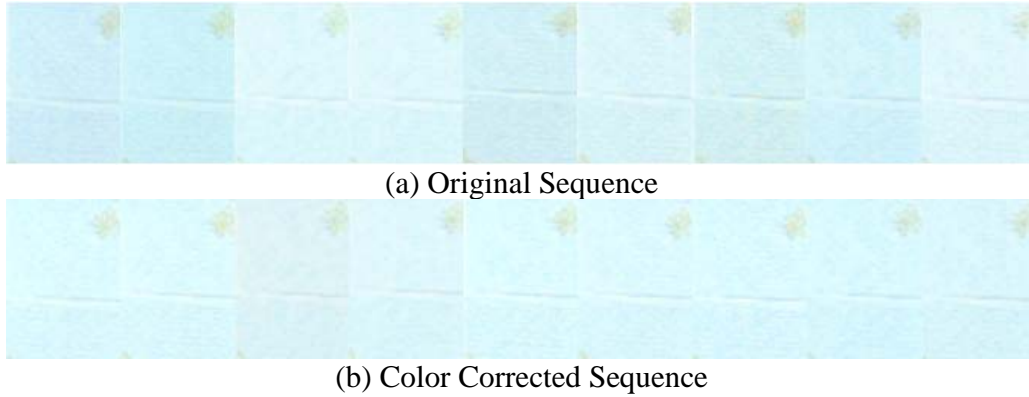


Fig. 3. Enlarged images of the background region

4. Coding Results

We performed the coding experiment on the color-corrected ‘Newspaper’ sequence. Our coding condition is the same with the condition of [3]. Table 1 shows the total bit rates and PSNR of synthesized images for the 2-view configuration. The synthesis results for the 5th view are obtained by the decoded pairs of reconstructed color and depth files.

Table 1. Total bit rates and PSNR of synthesized images for 2-view configuration

Target	Color			Depth		Total		Synthesis	
Bit rates	QP	Bitrate (kbps)		QP	Bitrate (kbps)	Bitrate (kbps)		PSNR (dB)	
(Mbps)		Previous	New			Previous	New	Previous	New
0.375	42	303.08	303.824	46	84.56	387.65	388.384	29.42	30.12
0.5	39	412.23	413.8072	44	106.76	519	520.5672	30.5	31.36
0.75	35	620.68	623.74	41	155.58	776.26	779.32	31.5	32.56
1.25	31	998.11	1009.052	36	286.39	1284.49	1295.442	32.36	33.64

Table 2 describes the total bit rates and the average PSNR of two synthesized views, the 3rd viewpoint and the 4th viewpoint, for the 3-view configuration. The synthesis results for the 3rd are obtained by the 2nd and the 4th reconstructed video pairs, and the synthesis results for the 5th are obtained by the 4th and the 6th reconstructed video pairs.

Table 2. Total bit rates and PSNR of synthesized images for 3-view configuration

Target	Color			Depth	Total			Synthesis	
Bit rates	QP	Bitrate (kbps)		QP	Bitrate (kbps)	Bitrate (kbps)		PSNR (dB)	
(Mbps)		Previous	New		Previous	Previous	New	Previous	New
0.5	43	425.29	386.6512	50	102.05	527.34	488.7012	28.83	29.02
0.7	40	564.02	505.3192	44	166.03	730.05	671.3492	29.91	30.34
1	37	783.59	695.42	41	239.84	1023.43	935.26	30.63	31.365
1.35	34	1077.55	956.5752	39	306.68	1384.24	1263.2552	31.07	32.115

5. Conclusion

We have corrected the color distribution of the ‘Newspaper’ sequence. The sequence has improved color consistency between views, and shows better coding efficiency than the original one. We are ready to upload the modified sequence on the ftp site.

6. Acknowledgements

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7. References

- [1] ISO/IEC JTC1/SC29/WG11, “Call for Contributions on 3D Video Test Material,” N9595, January 2008.
- [2] ISO/IEC JTC1/SC29/WG11, “Multiview Video Test Sequence and Camera Parameters,” M15419, April 2008.
- [3] ISO/IEC JTC1/SC29/WG11, “3DV EE4 Results on Newspaper,” M19277, January 2011.